PROJECT 2

🩺 Pod 15 DevOps Project Documentation – High Availability Hosting for MediCare

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Team: Pod 15 – DevOps Track

Project Objective: To build and document a **fault-tolerant AWS VPC infrastructure** for the MediCare healthcare website, with **redundancy across 2 Availability Zones**, **automatic DNS failover via Route 53**, and **web hosting on EC2 instances**.

🧠 Overview

This project showcases our ability to:

- Design a **2-tier network** using AWS VPC
- Deploy **EC2 instances across two AZs**
- Secure the network with NACLs and security groups
- Deploy a public website with **SSH-based configuration**
- Register a custom domain and configure **DNS failover** using Route 53 health checks

We also documented our progress visually with **screenshots at every stage** to ensure traceability and clarity during review and grading.

🧩 Architecture Components

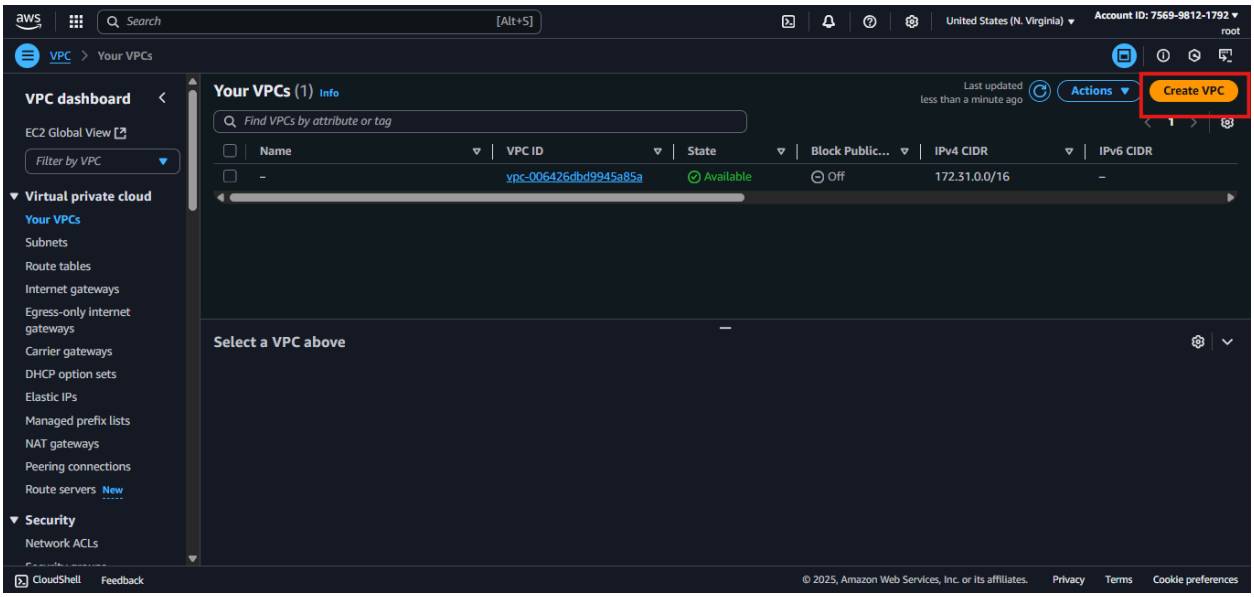
Component	Description
VPC	`10.0.0.0/16` custom VPC for network isolation
Public Subnet A	`10.0.1.0/24` in Availability Zone A
Public Subnet B	`10.0.3.0/24` in Availability Zone B
Private Subnet A	`10.0.2.0/24` in Availability Zone A
Private Subnet B	`10.0.4.0/24` in Availability Zone B
Internet Gateway	Enables public access for web traffic
Route Tables	Define traffic flow (0.0.0.0/0 routed to IGW)
EC2 Instances (2)	Amazon Linux-based Nginx web servers in AZ-A and AZ-B
Security Groups	Restrict and allow traffic based on port and IP rules
NACLs	Stateless firewalls securing subnet-level traffic flows
Route 53	Manages DNS failover between the EC2 instances

🔧 Step 1: VPC and Subnet Setup

We built the foundation of our cloud network by setting up a **Virtual Private Cloud (VPC)** and **subnets**. A VPC is like your private office space in the cloud — it gives you full control over networking. Subnets are the rooms in that office, where specific services live.

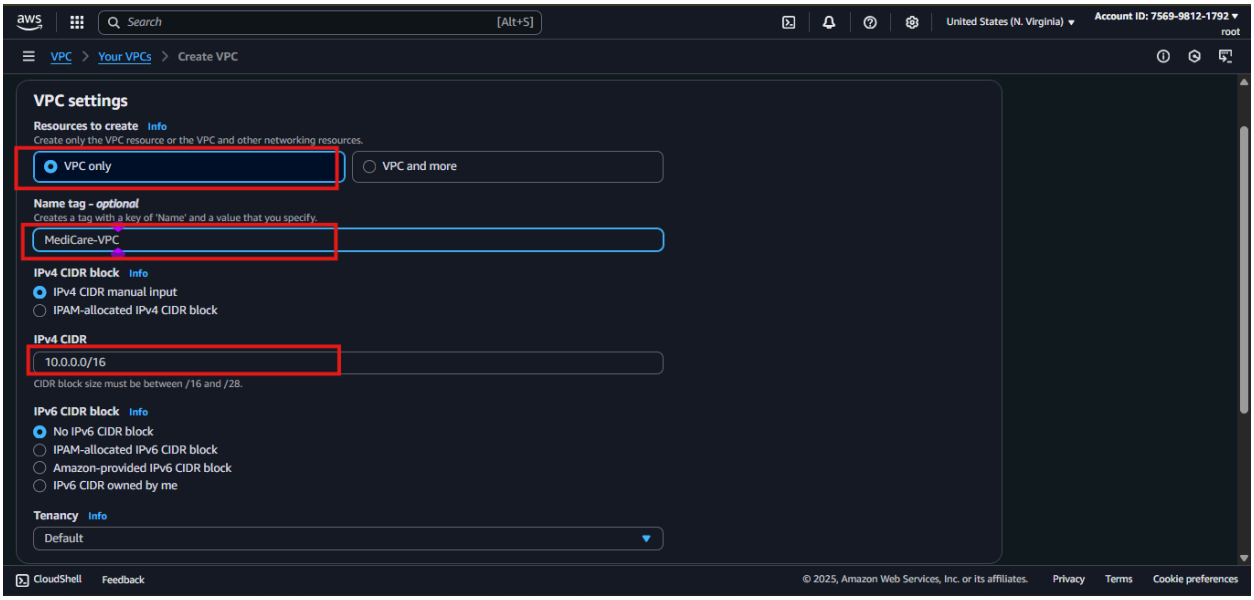
We designed the network to span across **two Availability Zones (AZ-A and AZ-B)** so that if one zone goes down, the other can keep the service running.

1.1 Create a New VPC

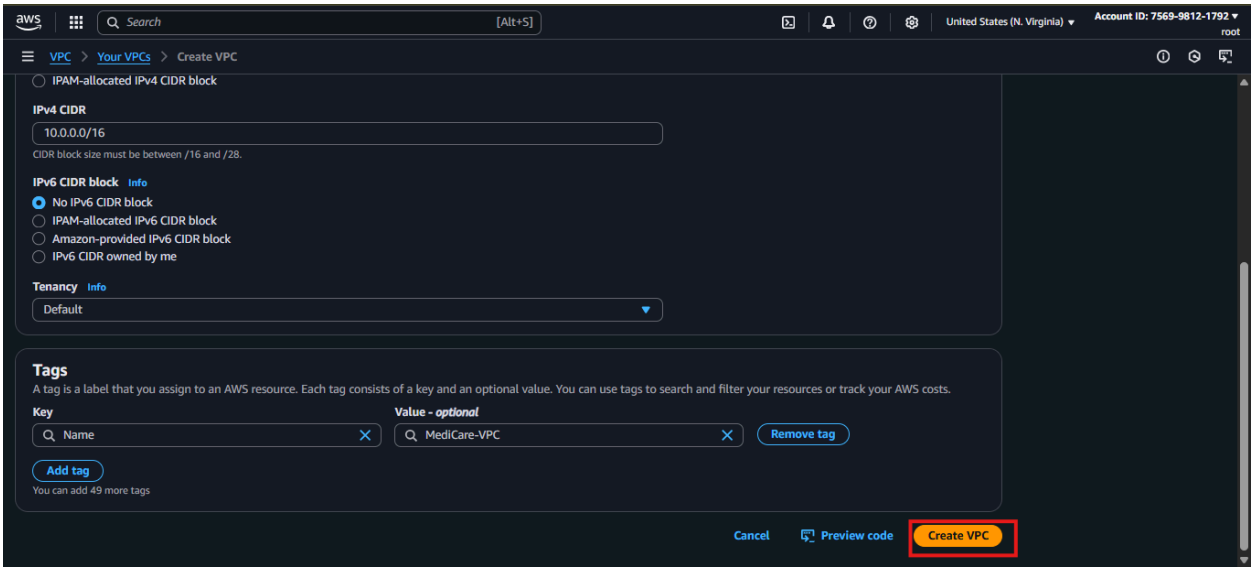


We started by creating a custom VPC named `MediCare-VPC`.

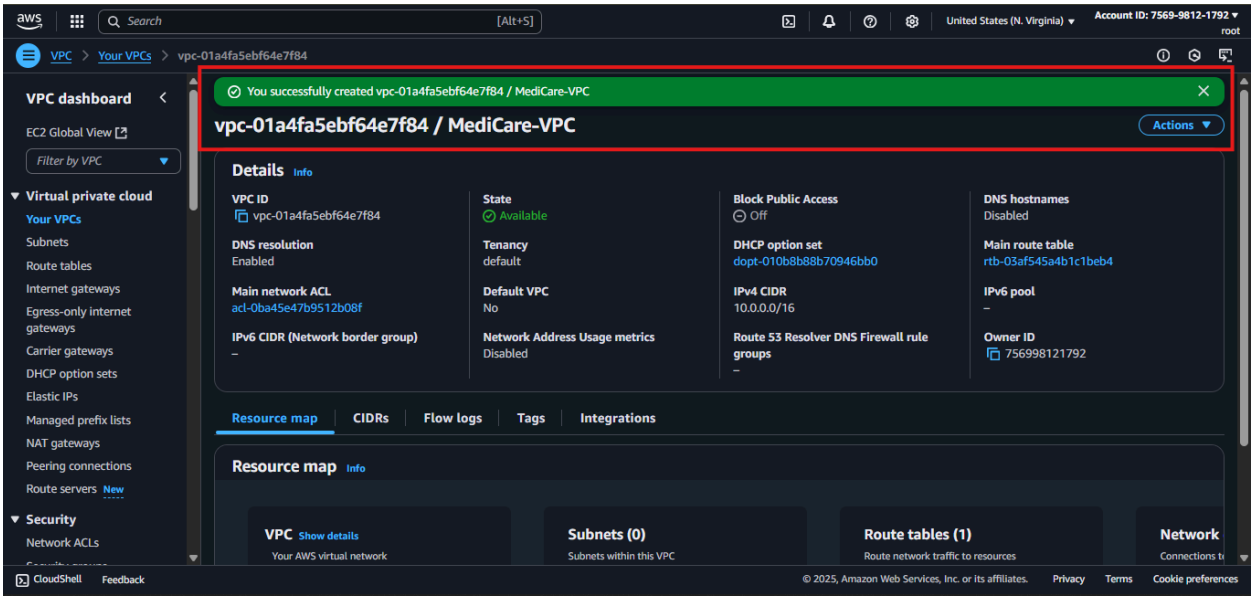
- Went to the VPC dashboard in AWS.
- Clicked “Create VPC” and chose VPC only.
- Gave it the CIDR block: `10.0.0.0/16`



- VPC creation form with CIDR block set

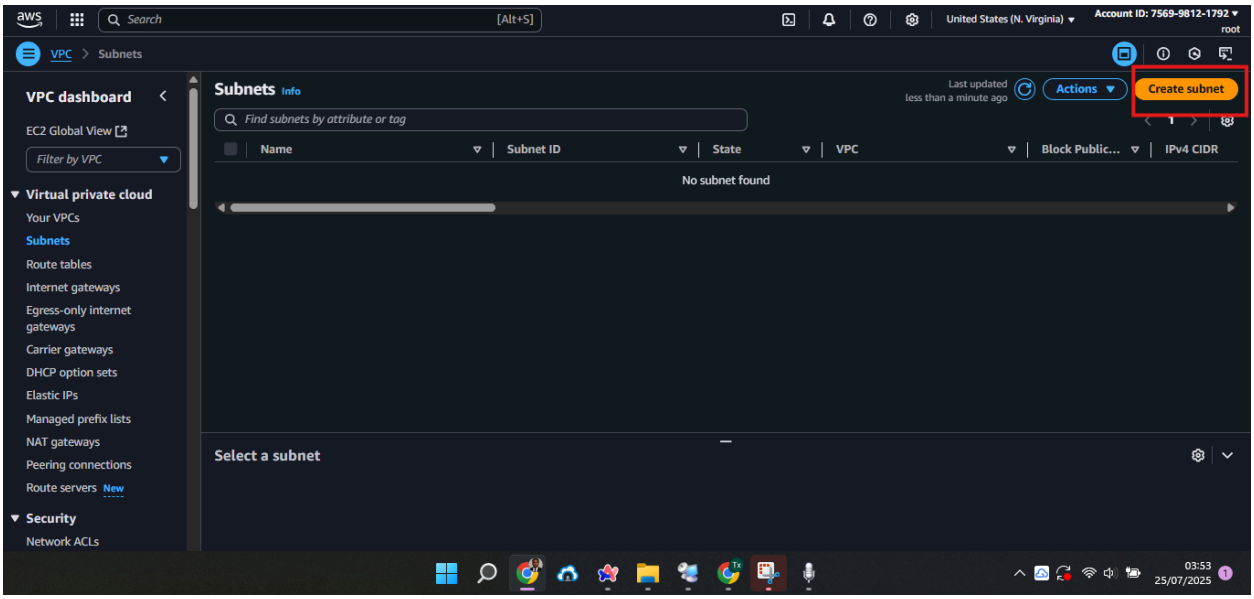


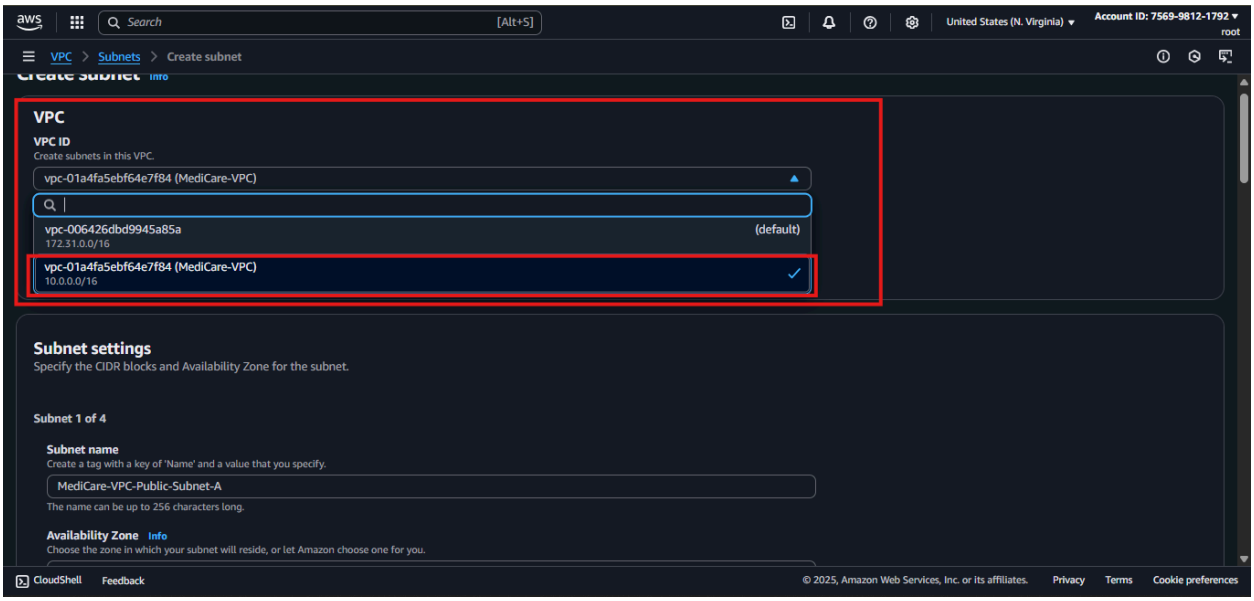
- Confirmation screen showing the VPC listed in dashboard



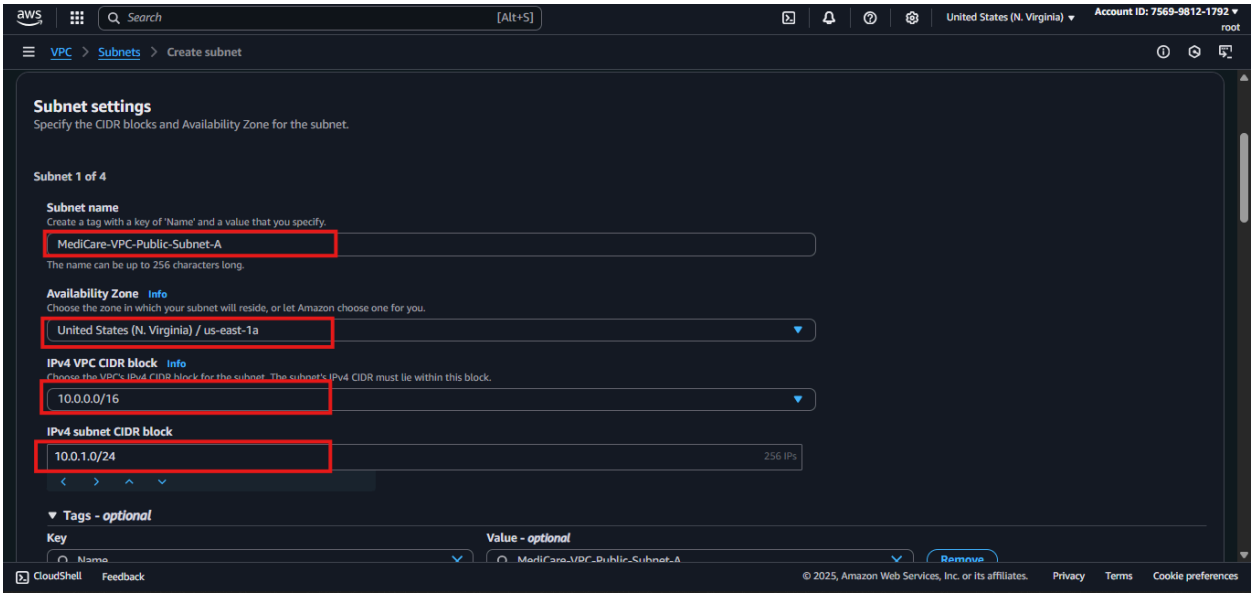
1.2 Create Four Subnets (Public and Private in 2 AZs)

We created four subnets to split traffic across two availability zones:

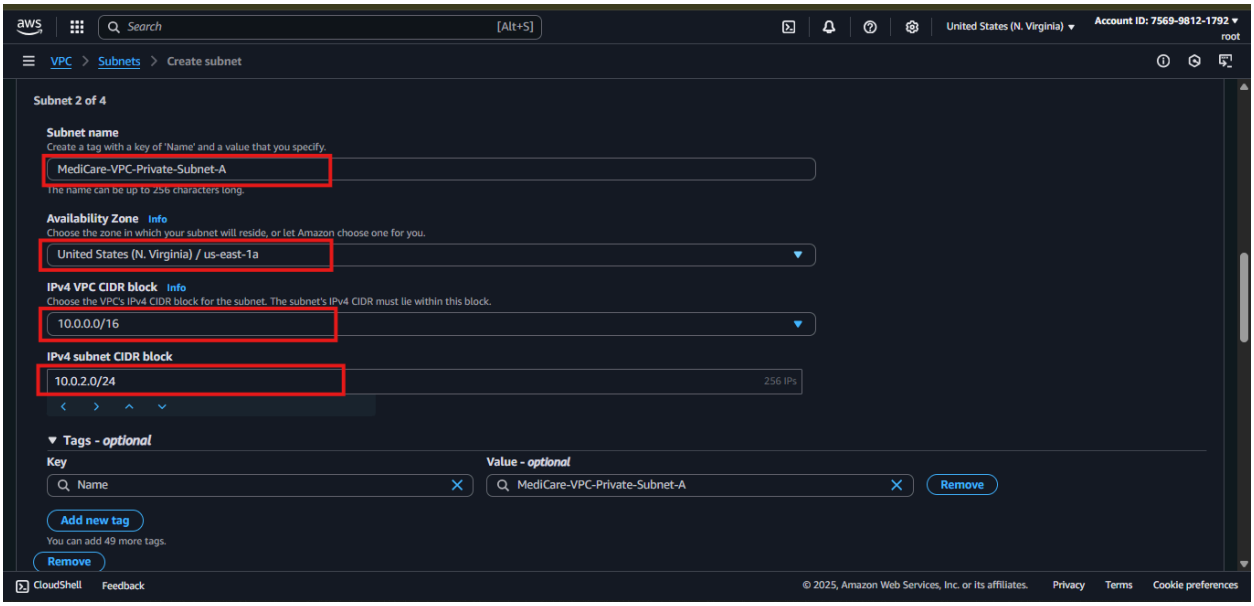




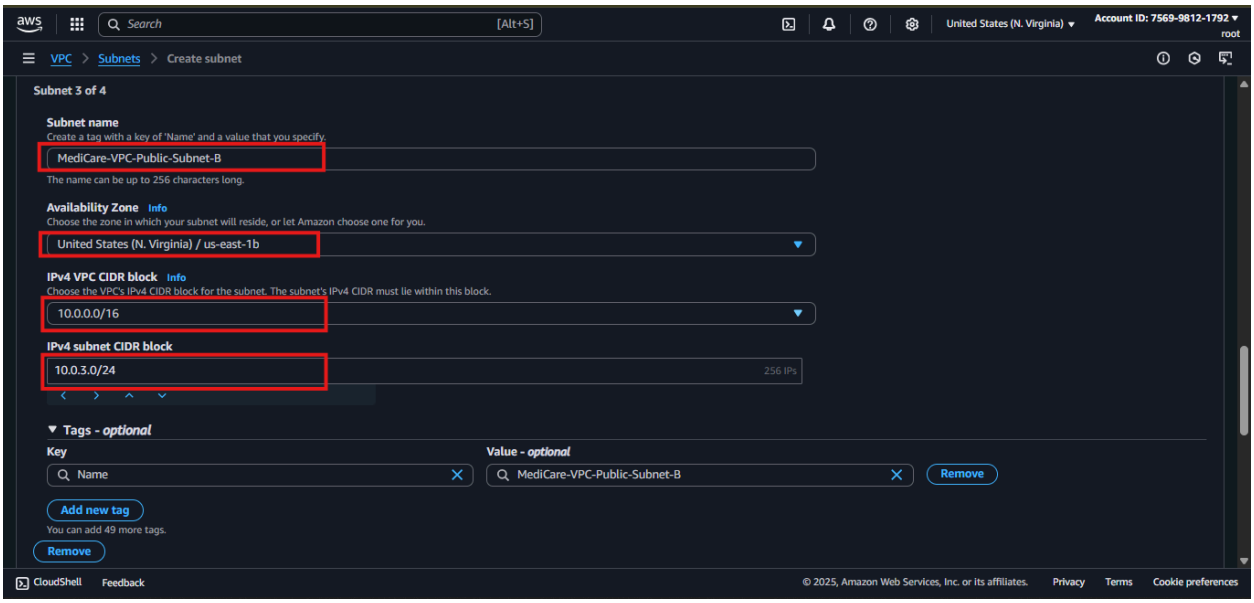
- Public Subnet A → `10.0.1.0/24` in AZ-A



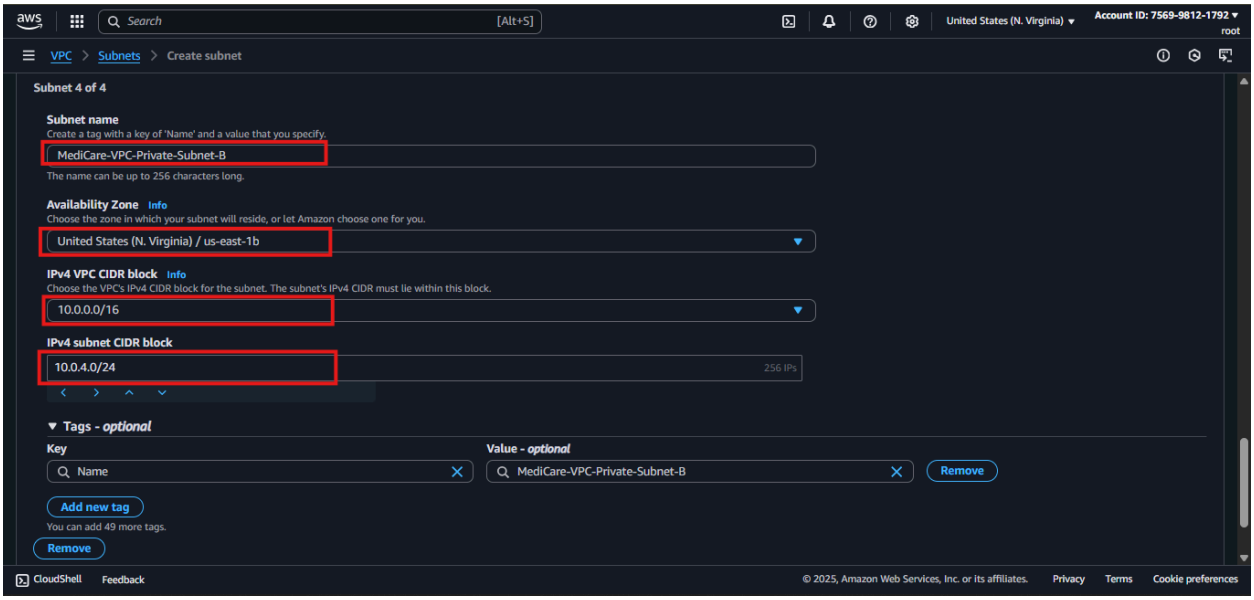
- Private Subnet A → `10.0.2.0/24` in AZ-A



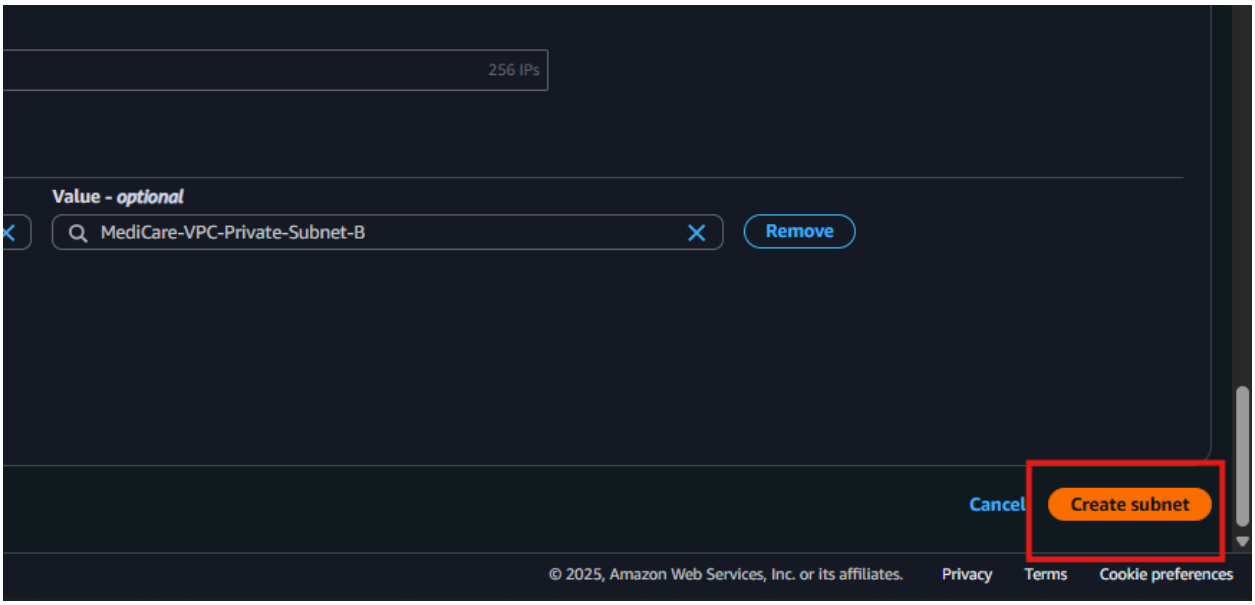
- Public Subnet B → `10.0.3.0/24` in AZ-B

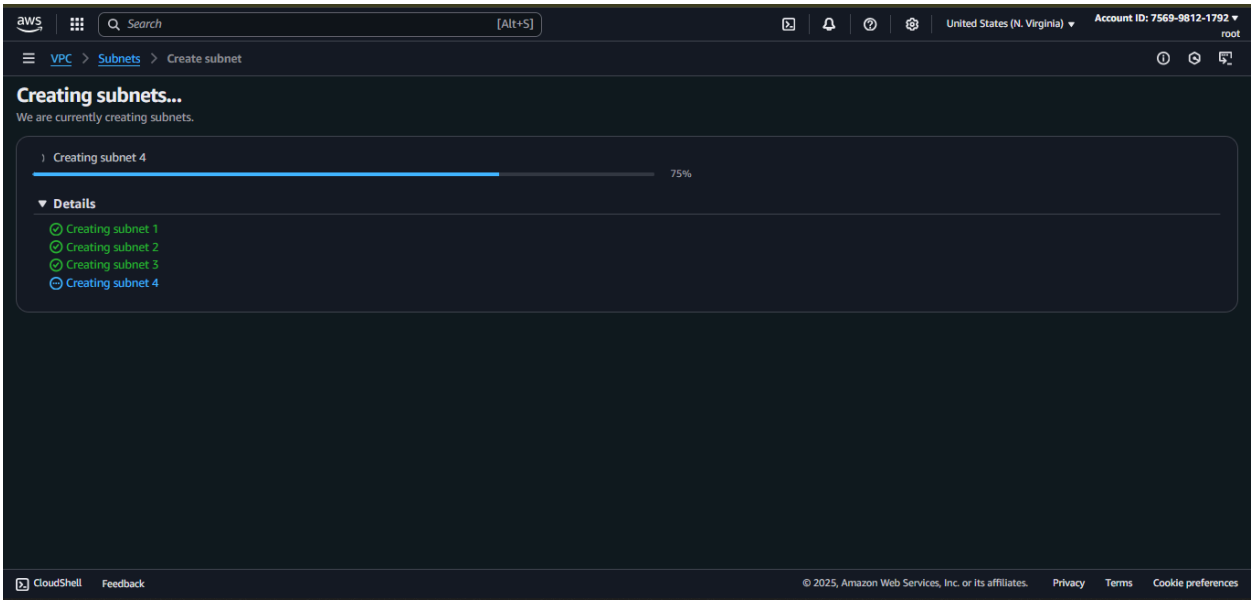


- Private Subnet B → `10.0.4.0/24` in AZ-B

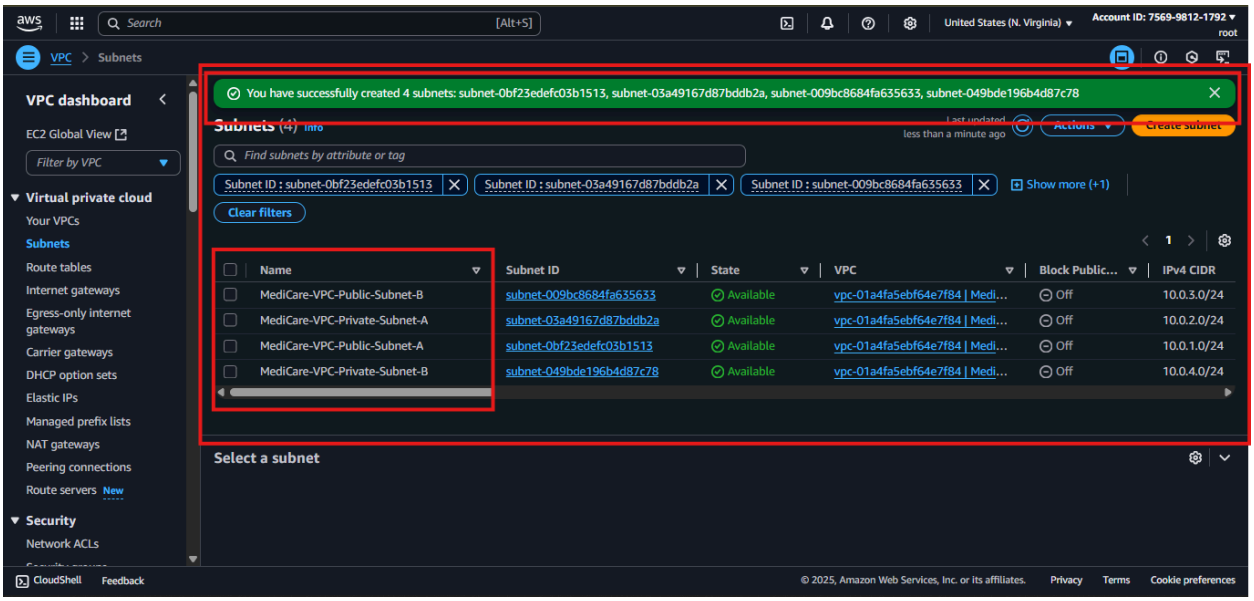


- Subnet creation form showing AZ and CIDR



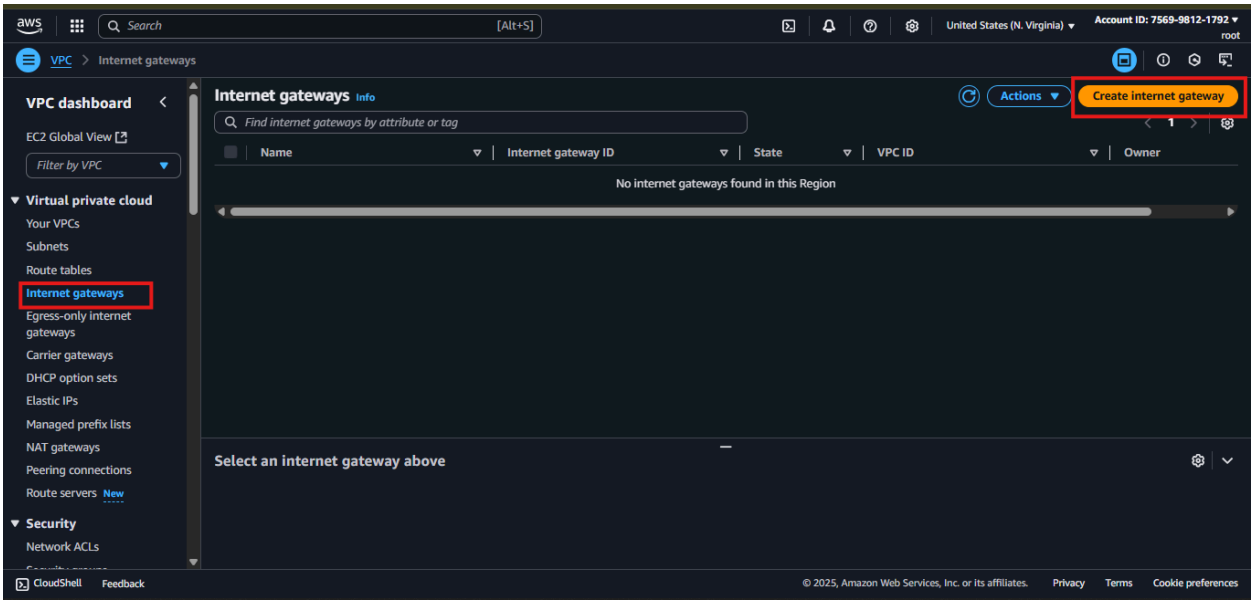


We confirmed that all subnets were created successfully and attached to the VPC. This was done by reviewing the subnet list filtered by VPC ID.



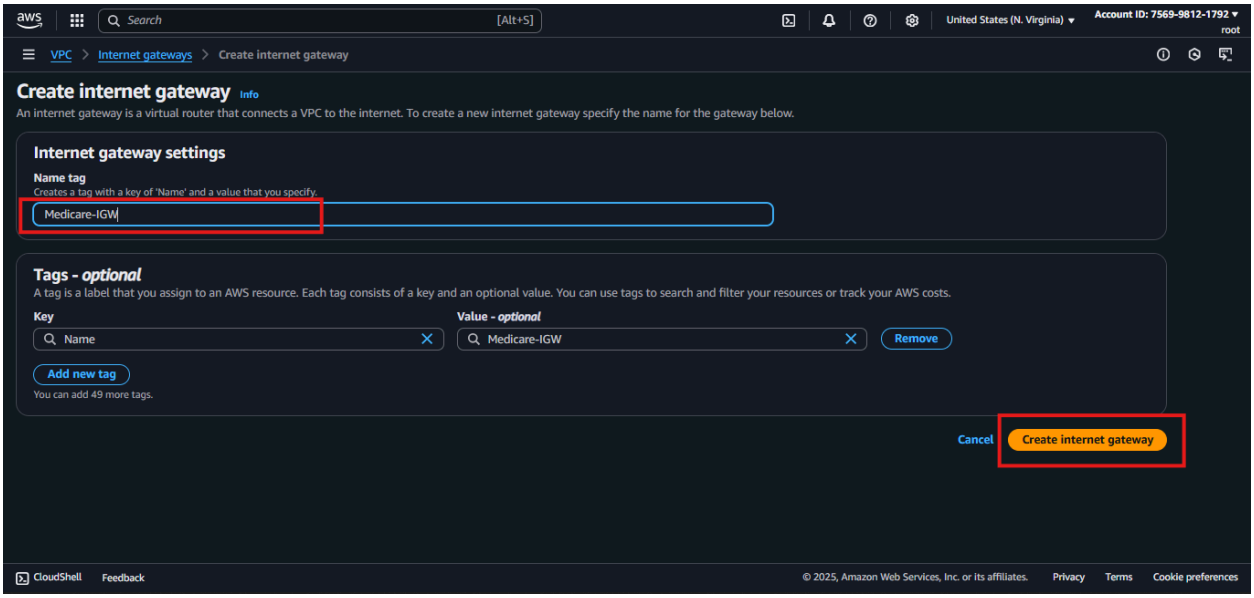
🌐 Step 2: Internet Gateway and Routing

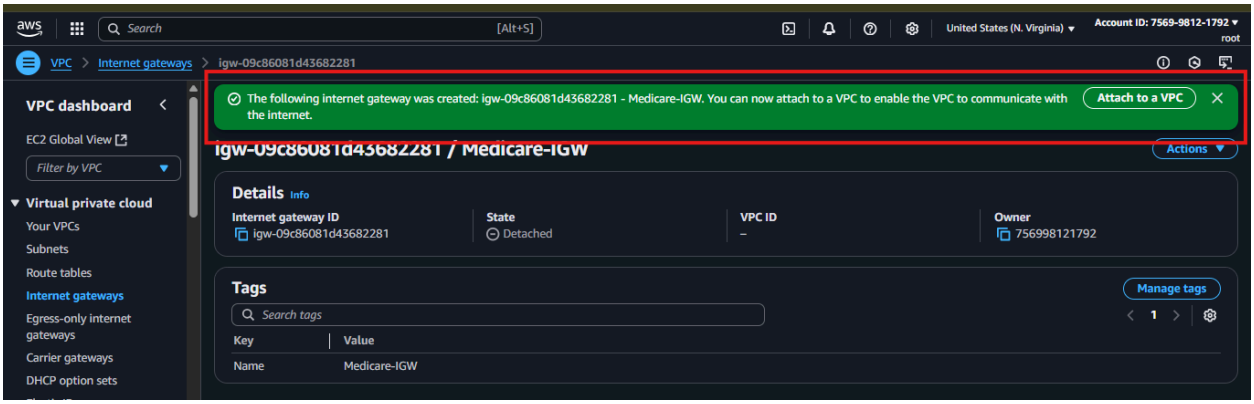
To make our public subnets internet-accessible, we configured an **Internet Gateway (IGW)** and updated the **route table**.



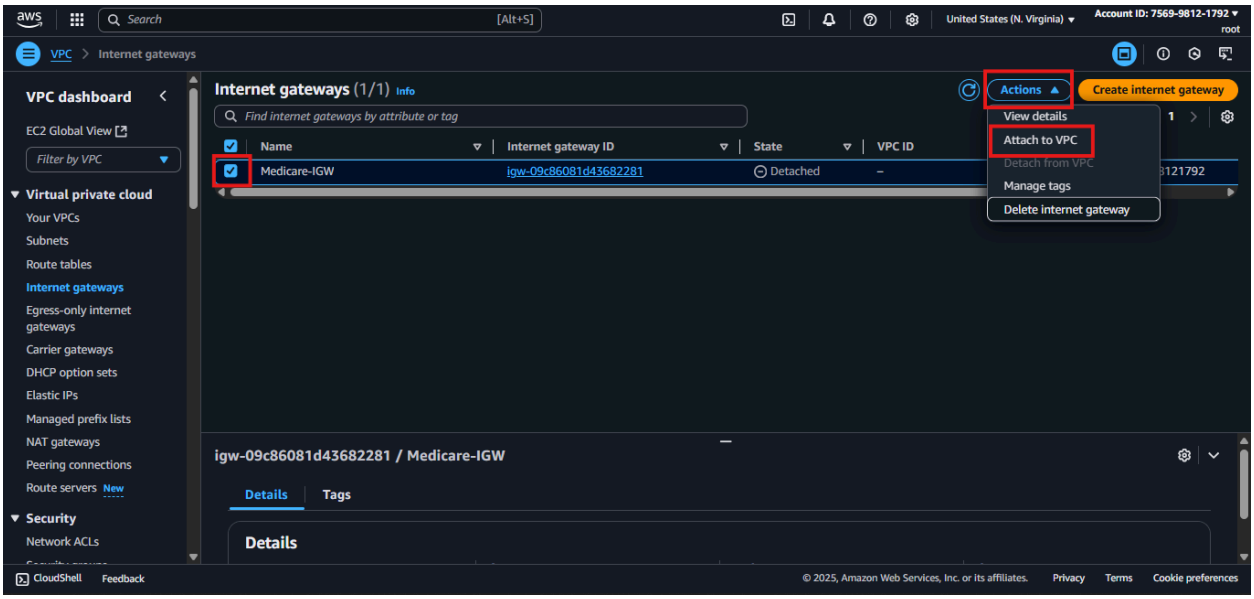
2.1 Create and Attach Internet Gateway

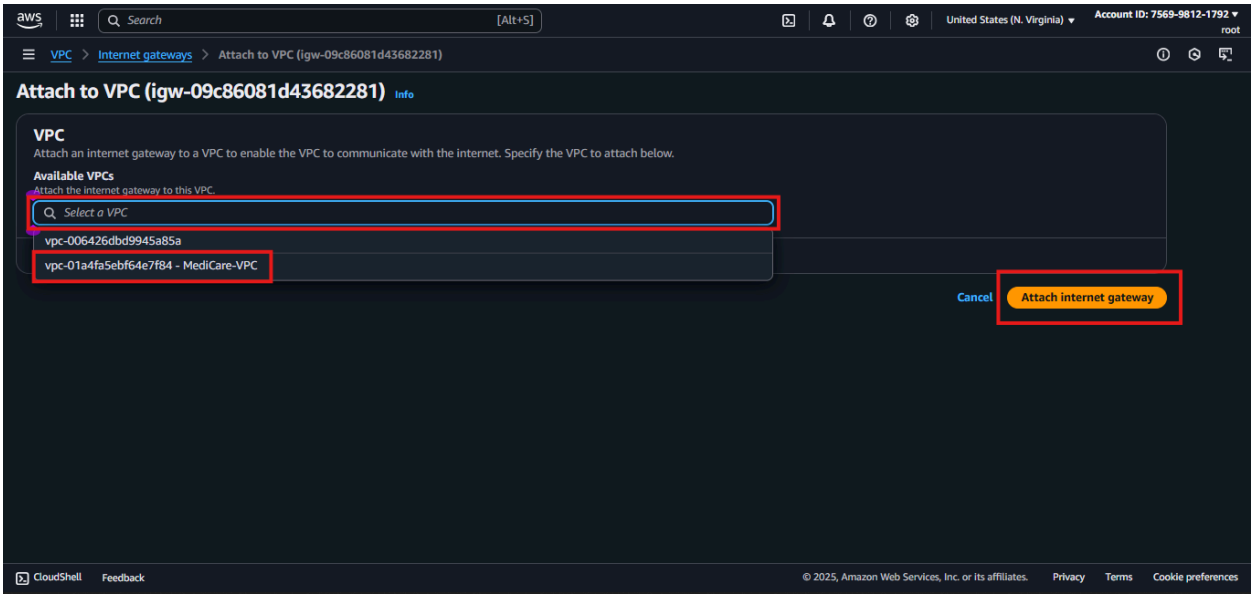
- Created a new IGW named `Medicare-IGW`





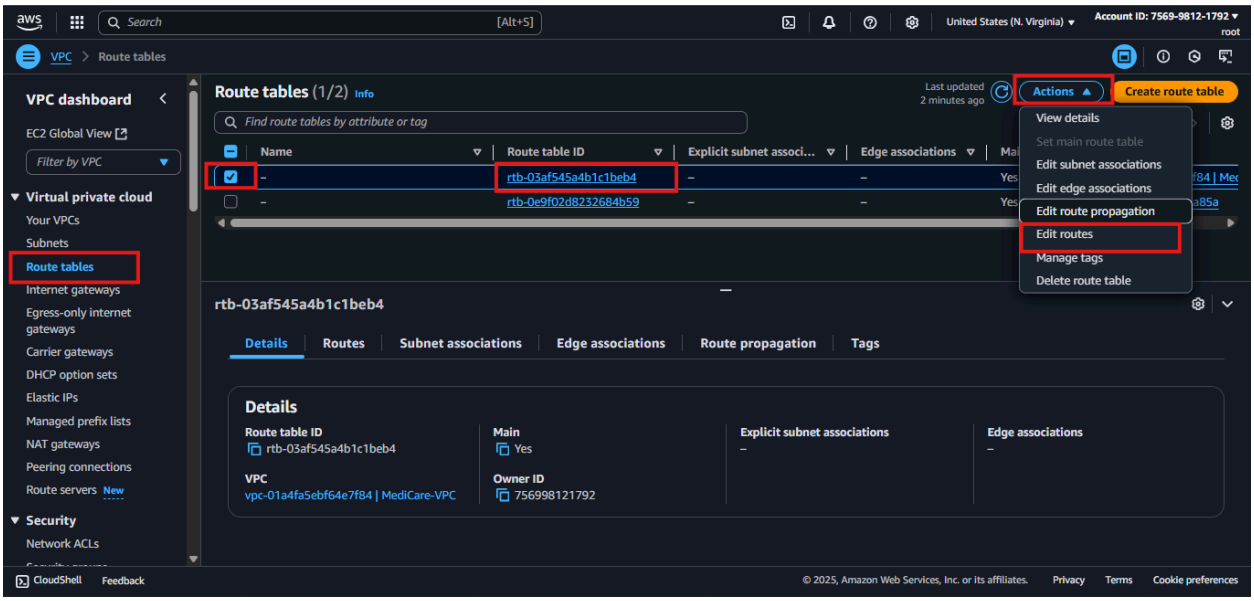
- Attached it to the `MediCare-VPC`



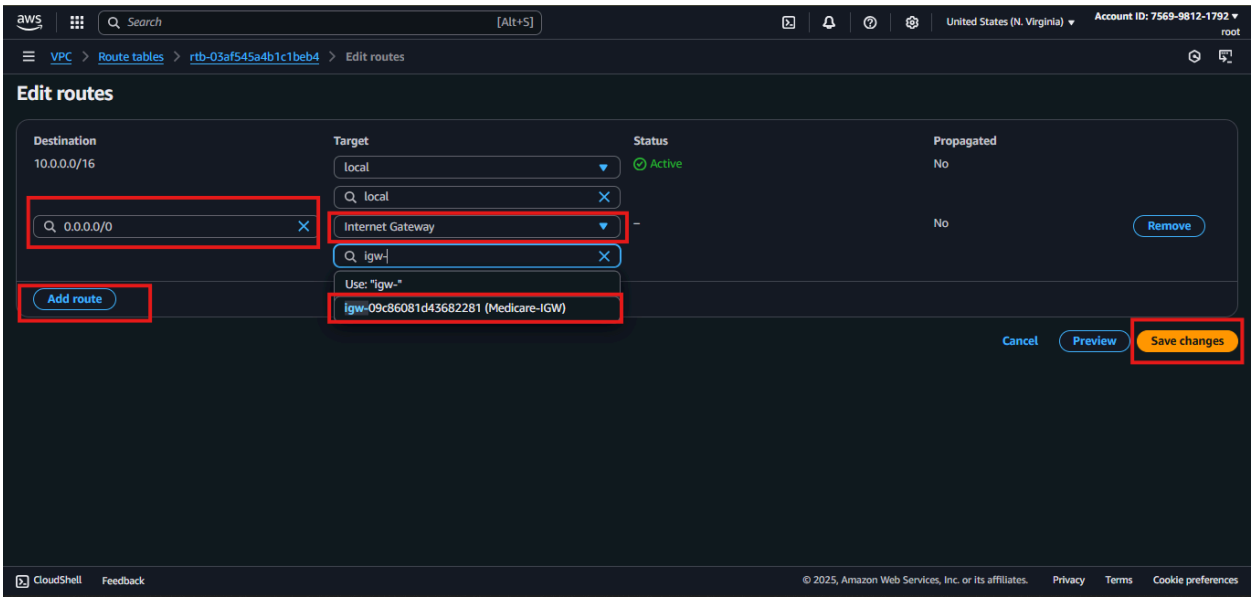


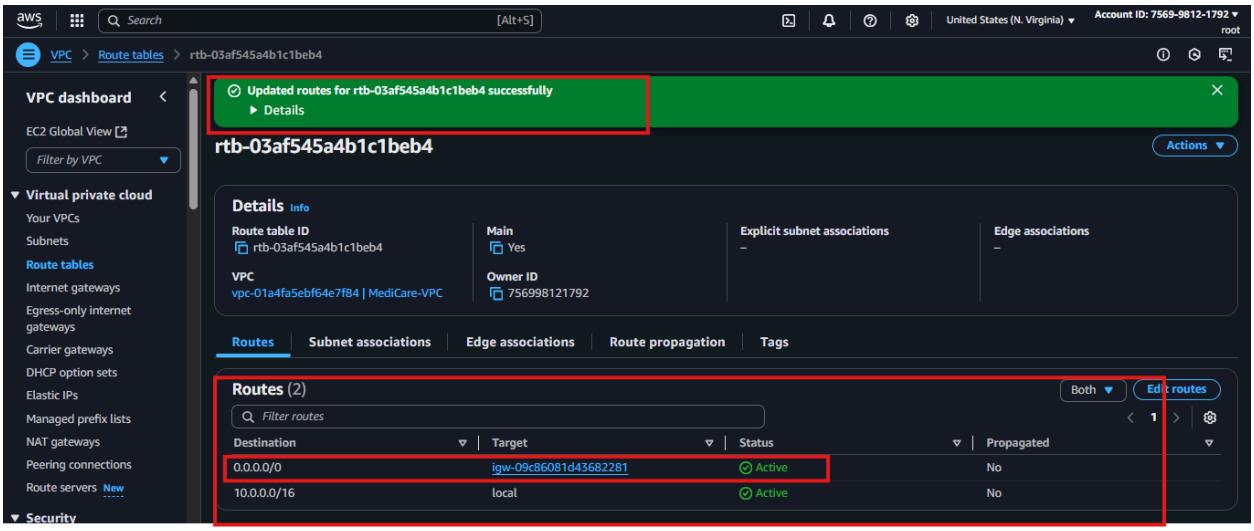
- IGW attached to VPC confirmation

2.2 Create Route Table and Add Routes

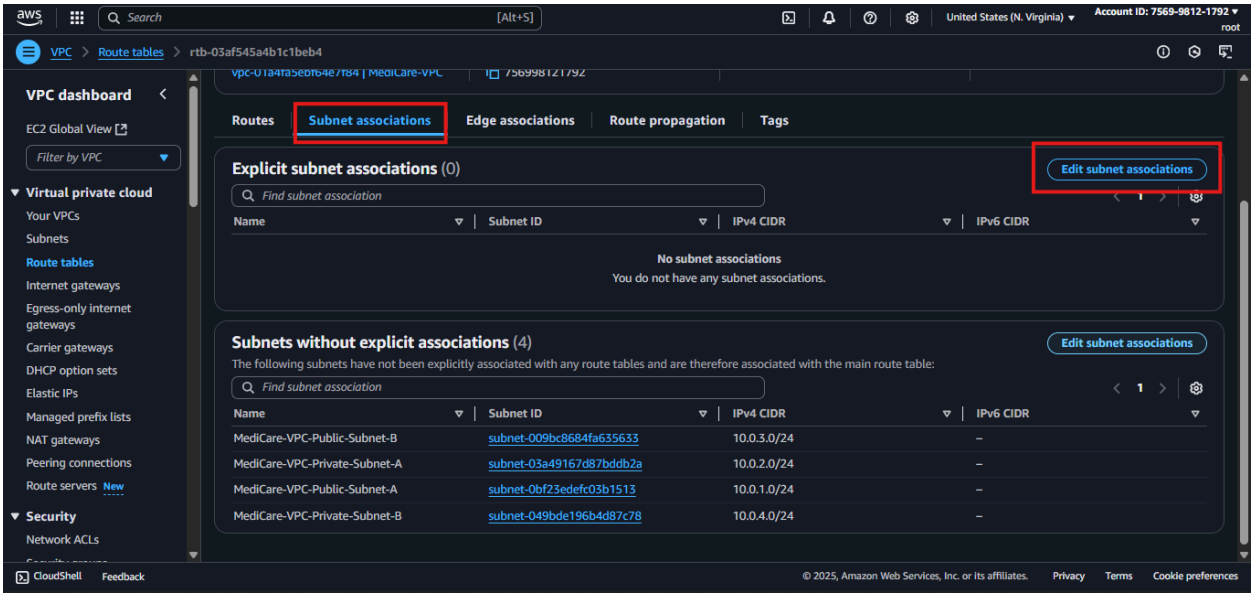


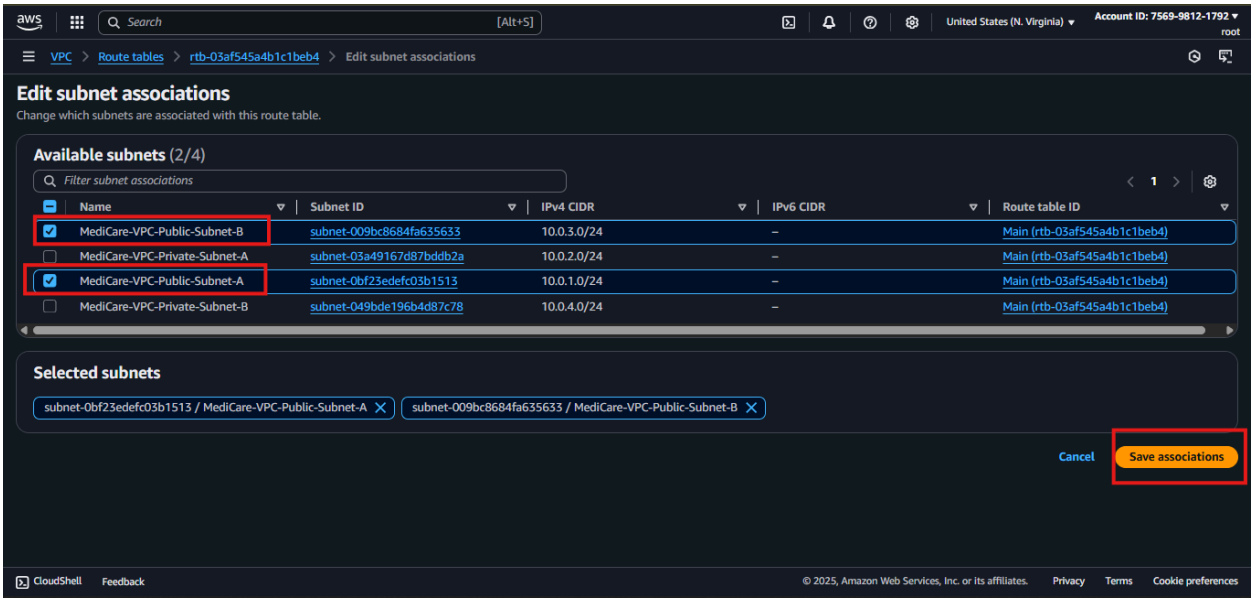
- Created a custom route table
- Added a route `0.0.0.0/0` pointing to the IGW



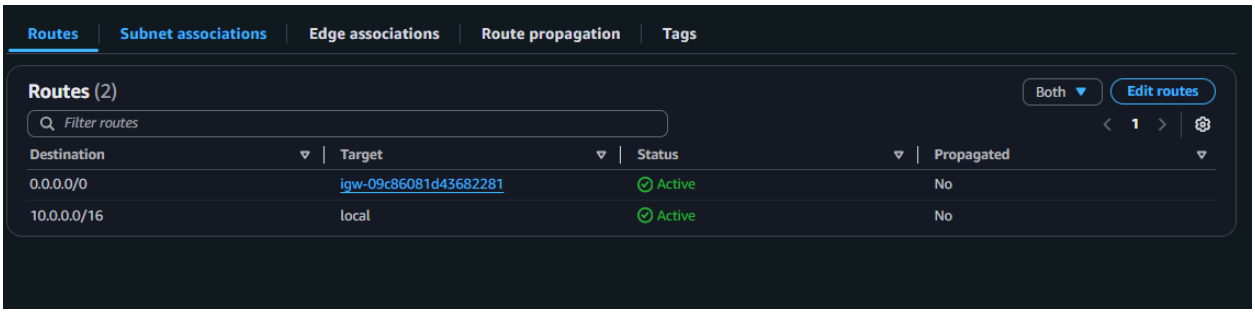


- Associated the route table with Public Subnet A and B

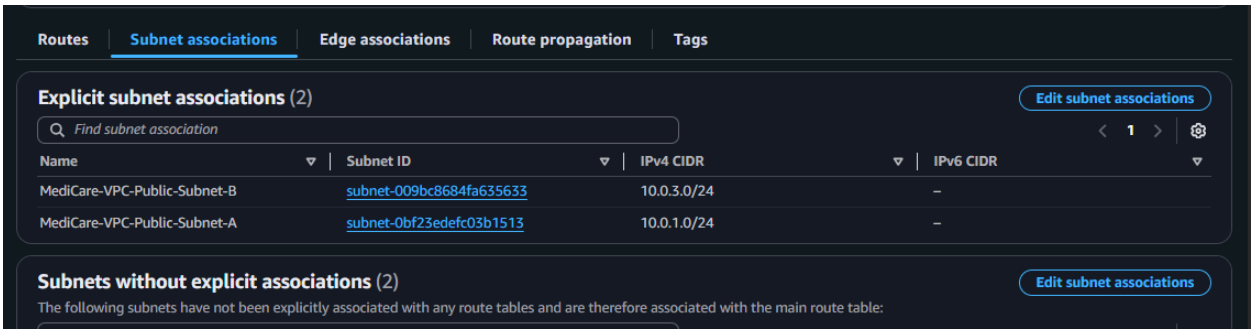




- Route table configuration



- Add route screen showing IGW target
- Subnet association page showing Public Subnet A & B linked

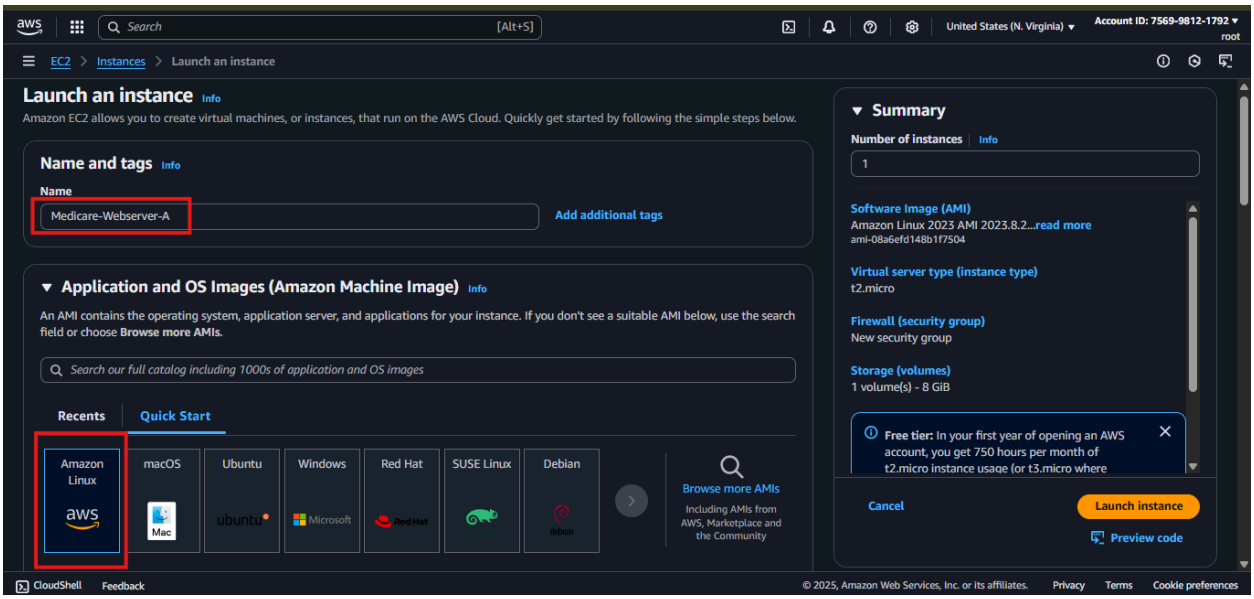


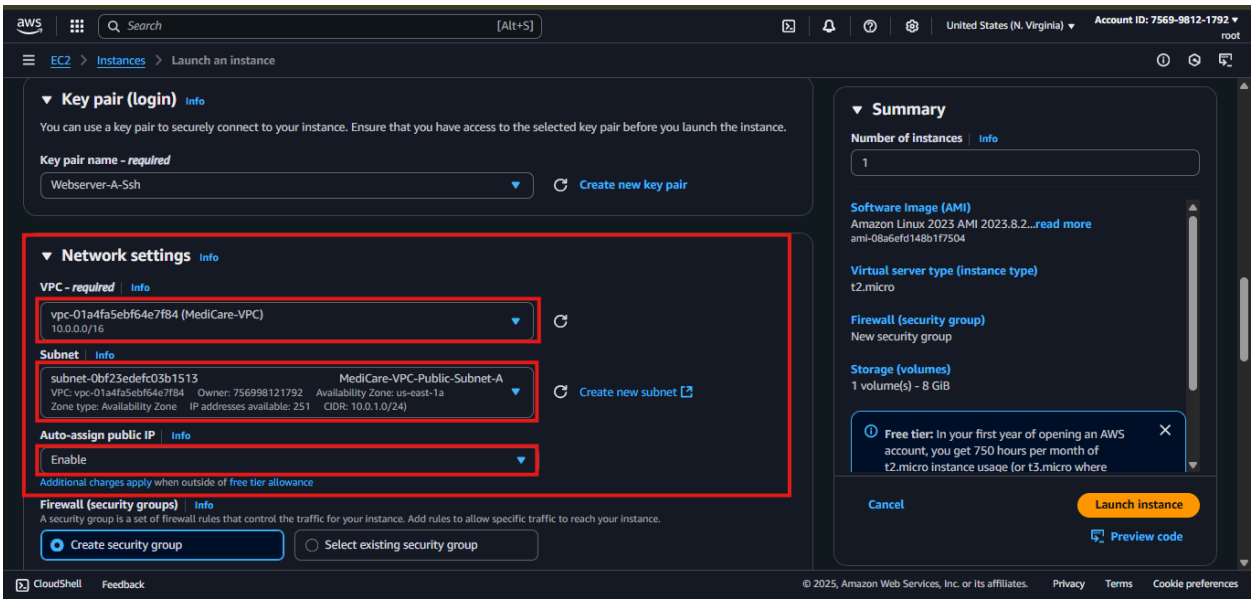
🖥️ Step 3: EC2 Instance Deployment

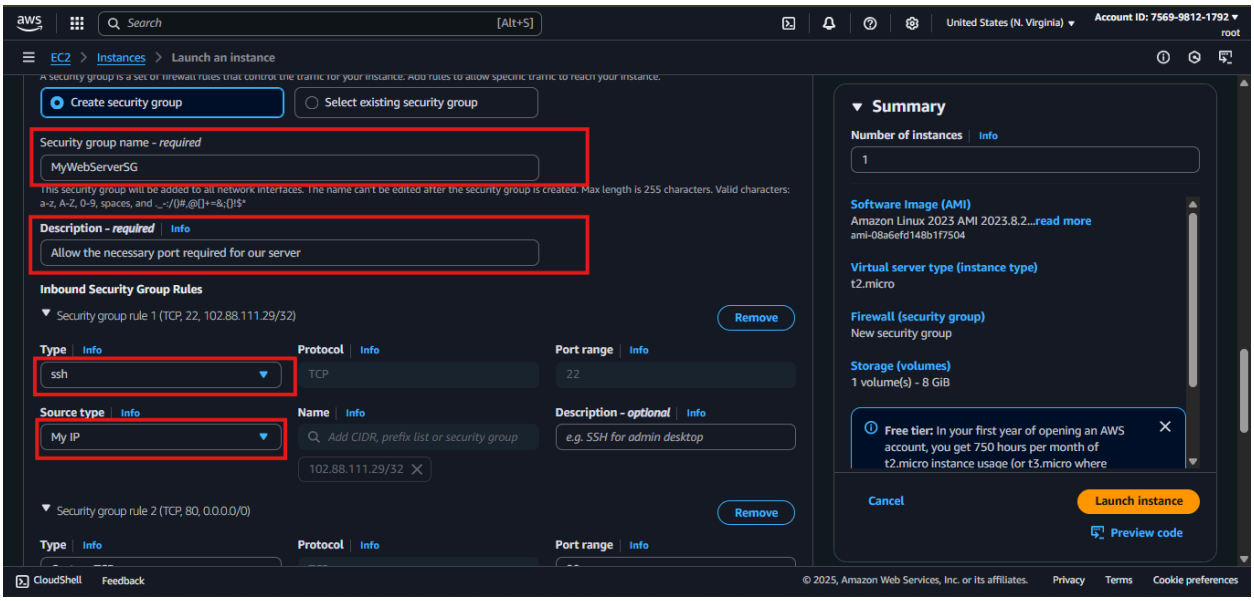
We launched two EC2 instances (Amazon Linux 2) in separate availability zones to host the MediCare website.

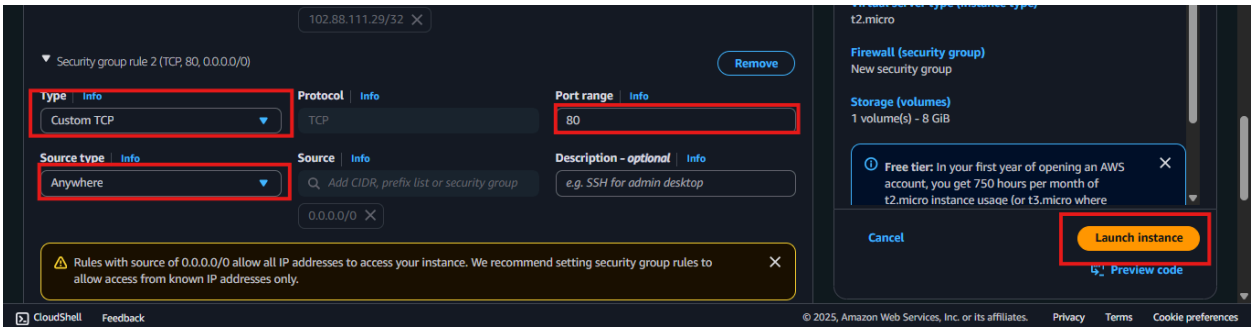
3.1 Launch EC2 Instances in Both AZs

- Launched Medicare-EC2-A in Public Subnet A (AZ-A)

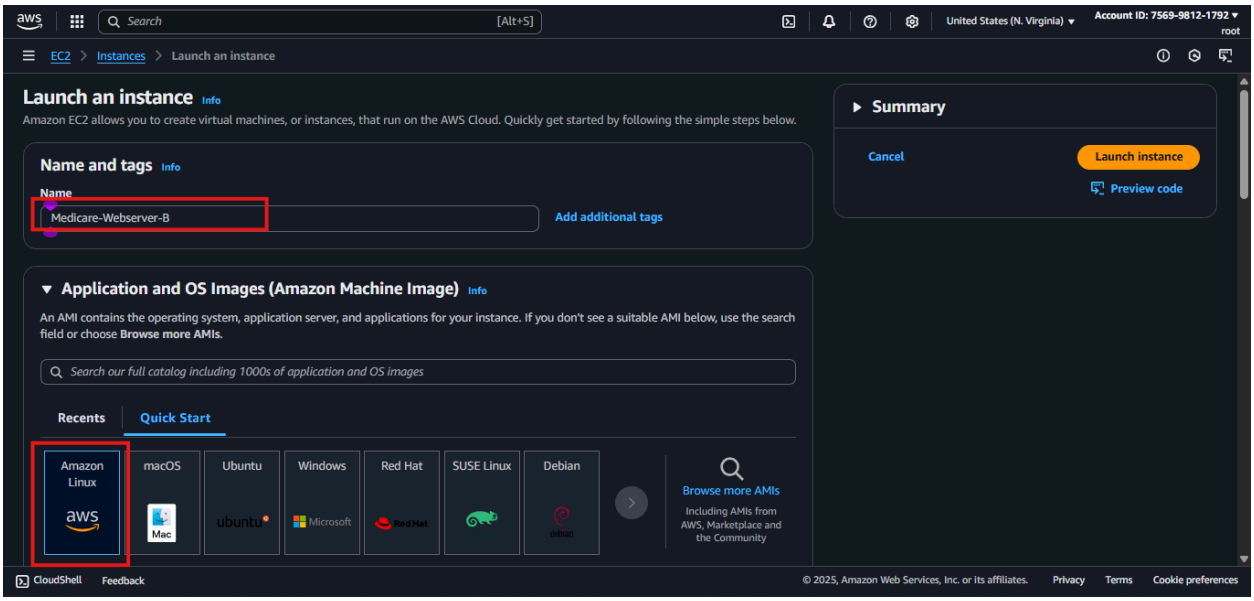

Search [Alt+S]
United States (N. Virginia)
Account ID: 7569-9812-1792
root
EC2 > Instances > Launch an instance
Launch an instance Info
Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.
Name and tags Info
Name
Medicare-Webserver-A
Add additional tags
Application and OS Images (Amazon Machine Image) Info
An AMI contains the operating system, application server, and applications for your instance. If you don't see a suitable AMI below, use the search field or choose Browse more AMIs.
Search our full catalog including 1000s of application and OS images
Recents
Quick Start
Amazon Linux
macOS
Ubuntu
Windows
Red Hat
SUSE Linux
Debian
Browse more AMIs
Including AMIs from AWS, Marketplace and the Community
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-08a6efd148b1f7504
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Free tier: In your first year of opening an AWS account, you get 750 hours per month of t2.micro instance usage (or t3.micro where
Cancel
Launch instance
Preview code
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences


Search [Alt+S]
United States (N. Virginia)
Account ID: 7569-9812-1792
root
EC2 > Instances > Launch an instance
Key pair (login) Info
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.
Key pair name - required
Webserver-A-Ssh
Create new key pair
Network settings Info
VPC - required Info
vpc-01a4fa5ebf64e7f84 (MediCare-VPC)
10.0.0.0/16
Subnet Info
subnet-0bf23edefc03b1513 MediCare-VPC-Public-Subnet-A
VPC: vpc-01a4fa5ebf64e7f84 Owner: 756998121792 Availability Zone: us-east-1a
Zone type: Availability Zone IP addresses available: 251 CIDR: 10.0.1.0/24)
Create new subnet
Auto-assign public IP Info
Enable
Additional charges apply when outside of free tier allowance
Firewall (security groups) Info
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.
Create security group
Select existing security group
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-08a6efd148b1f7504
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Free tier: In your first year of opening an AWS account, you get 750 hours per month of t2.micro instance usage (or t3.micro where
Cancel
Launch instance
Preview code
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences

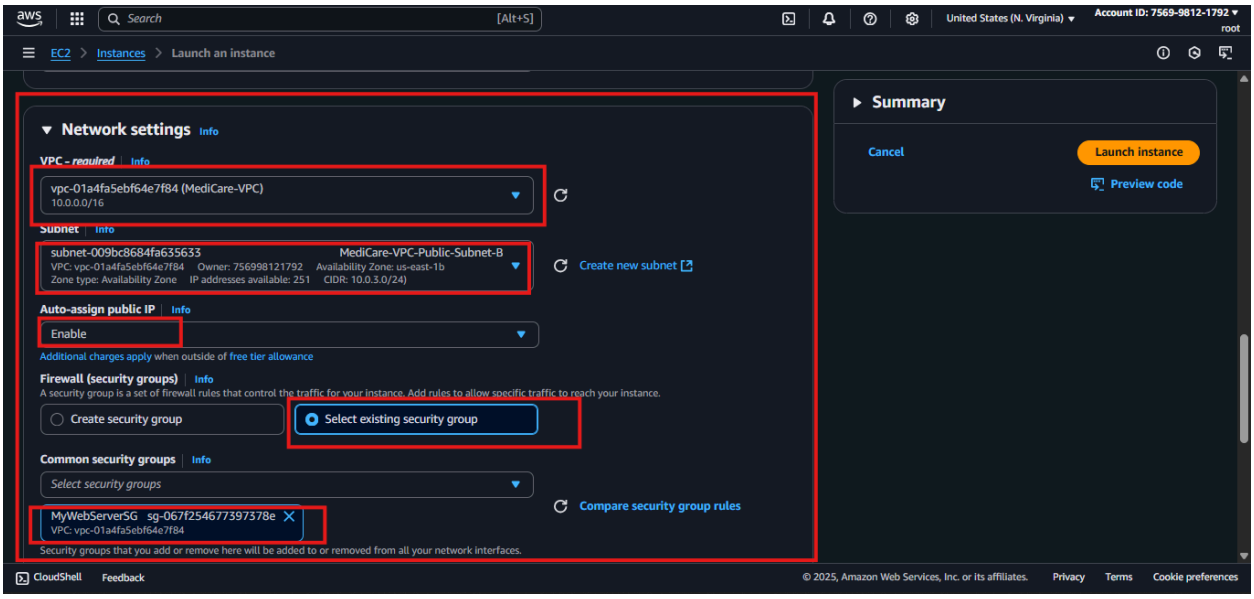




- Launched Medicare-EC2-B in Public Subnet B (AZ-B)

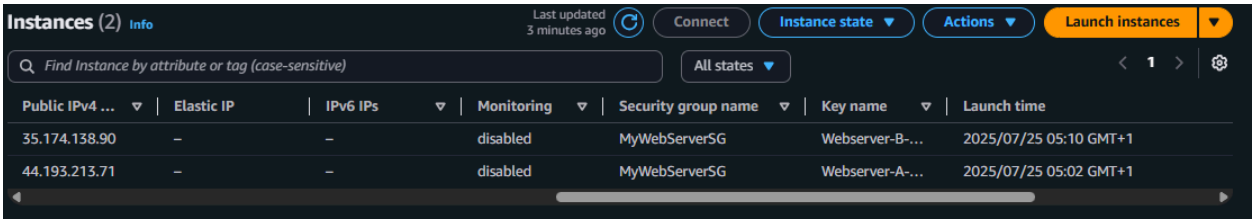


- Enabled auto-assign public IP for both



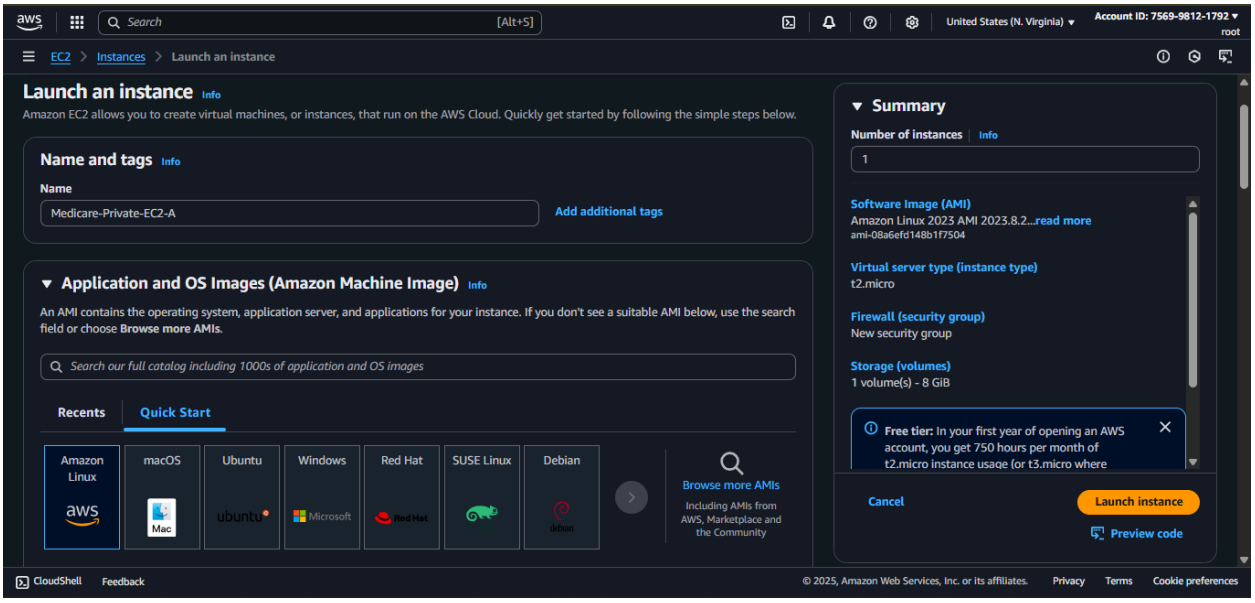
3.2 Verify EC2 Status and Public IPs

- EC2 instance dashboard showing running state and public IP

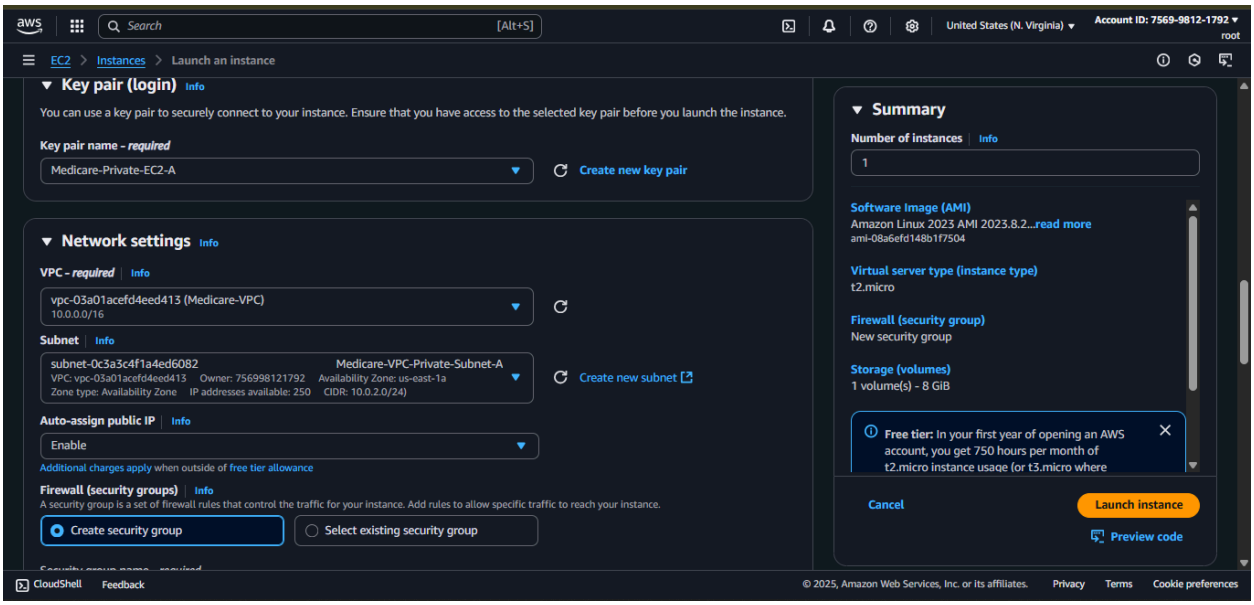


3.3 Launch EC2-A in Private Subnet A

- Navigate to EC2 → Launch Instance
- AMI: Amazon Linux 2

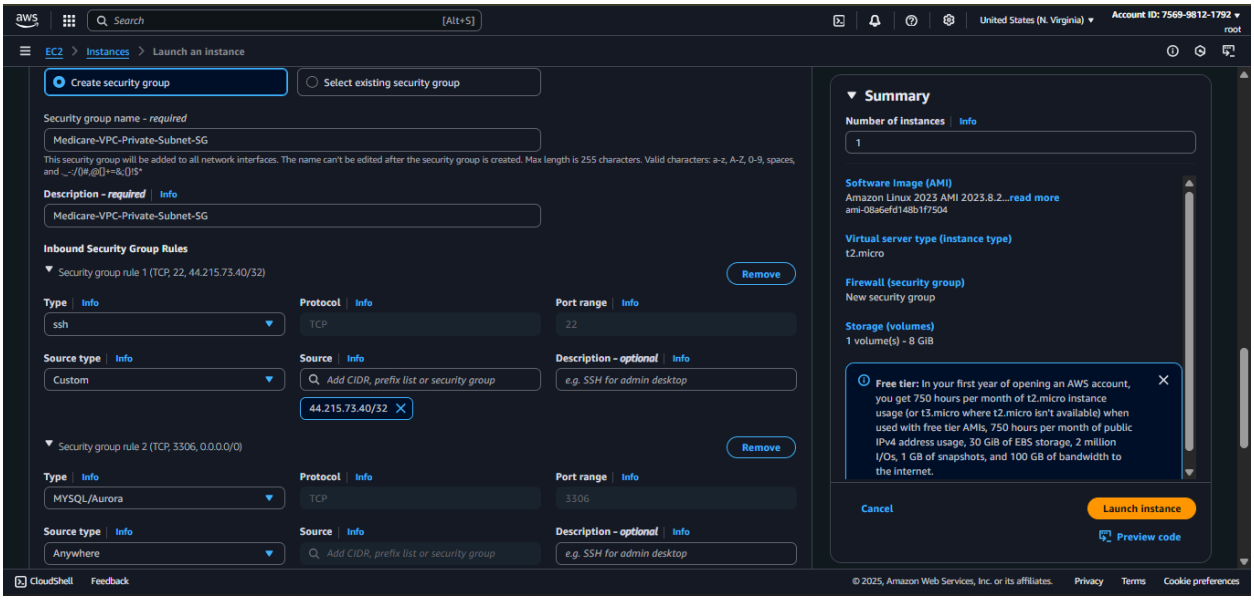


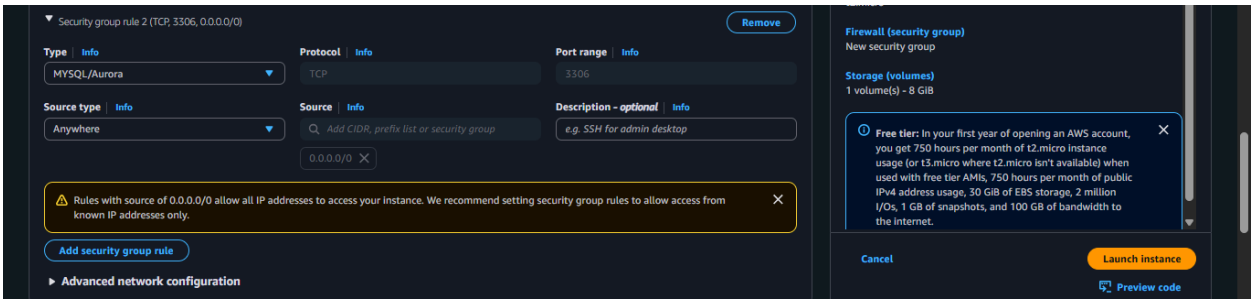
- Instance type: t2.micro (free tier)
- Network: Select our custom VPC
- Subnet: Choose `Private Subnet A (10.0.2.0/24)`
- Auto-assign public IP: **Disabled**
- Key pair: Select existing `.pem` key



Security Group Configuration

- inbound SSH rule for the Elastic IP, which will be attached to our bastion host later
- Inbound MySQL Rule for Database





3.4 Launch EC2-B in Private Subnet B

Repeat the same steps for AZ-B:

- Subnet: `Private Subnet B (10.0.4.0/24)`
- Confirm instance is private (no public IP)

📸 **Screenshots to Include:**

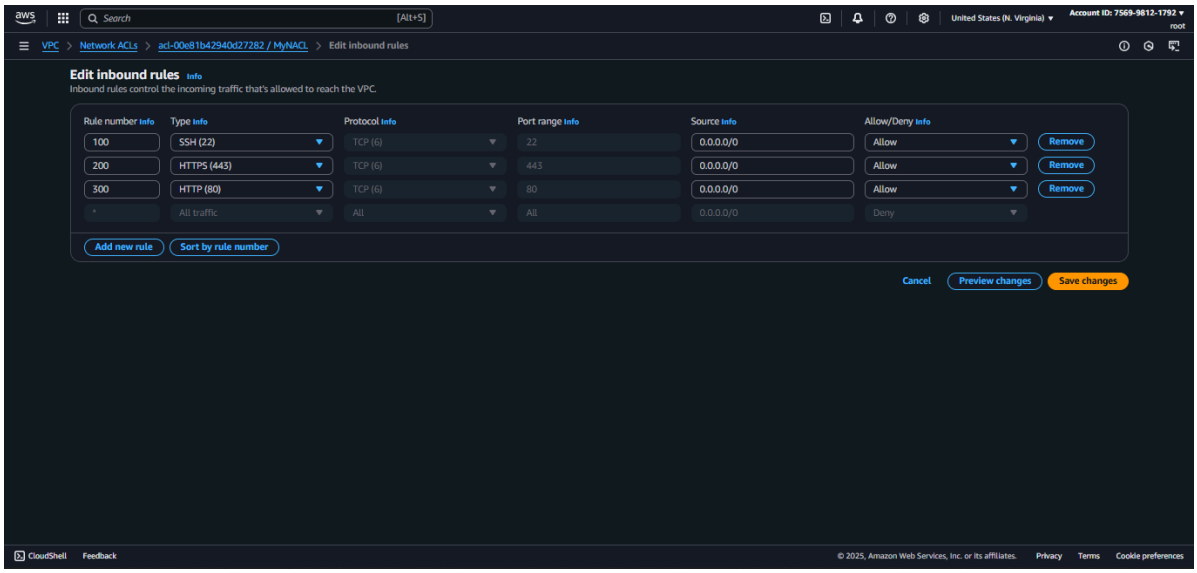
- Instance launched in AZ-B private subnet
- Private IP confirmation

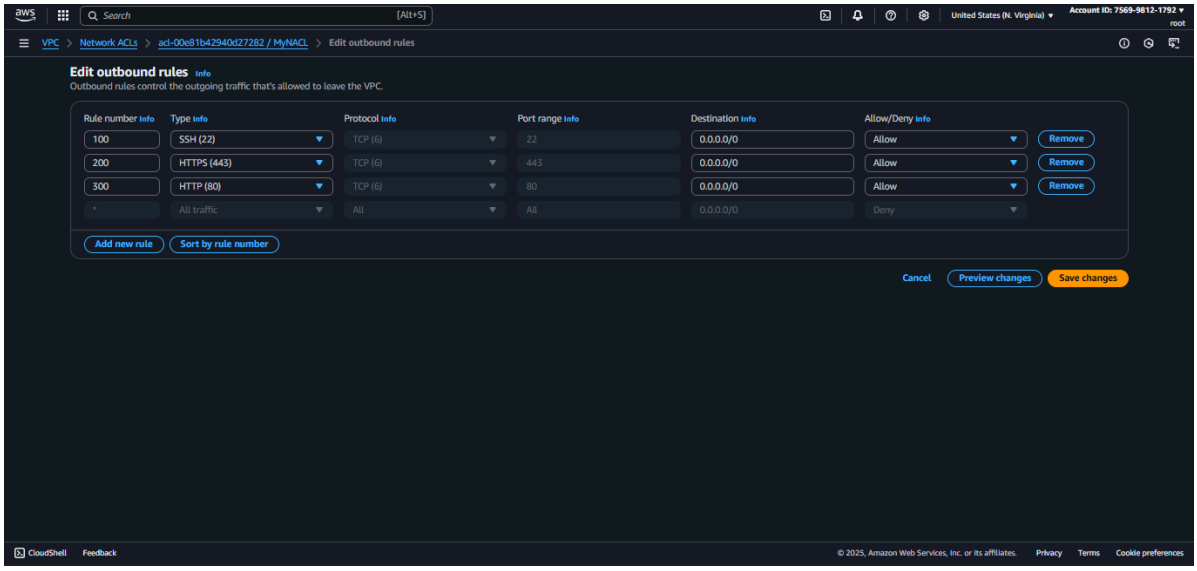
🔐 Step 4: NACL Setup (3+ Screenshots)

What We Did

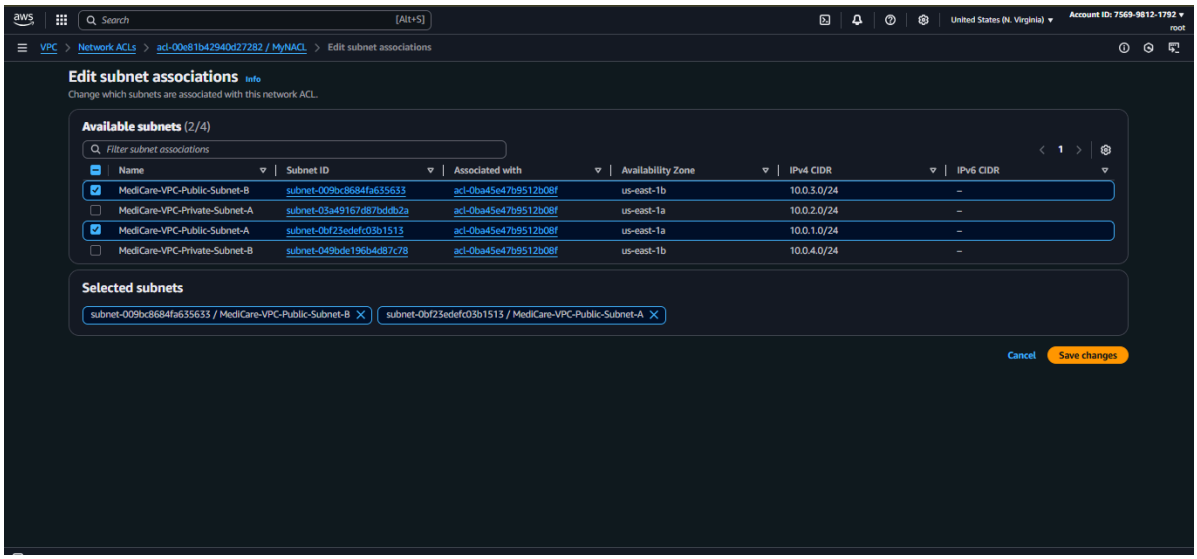
We secured our EC2 instances using **shared security groups** and a **common NACL**, applied to both public subnets.

- Network ACL:
  - Allow ports 22 and 80 for inbound and outbound





- Associated with both public subnets

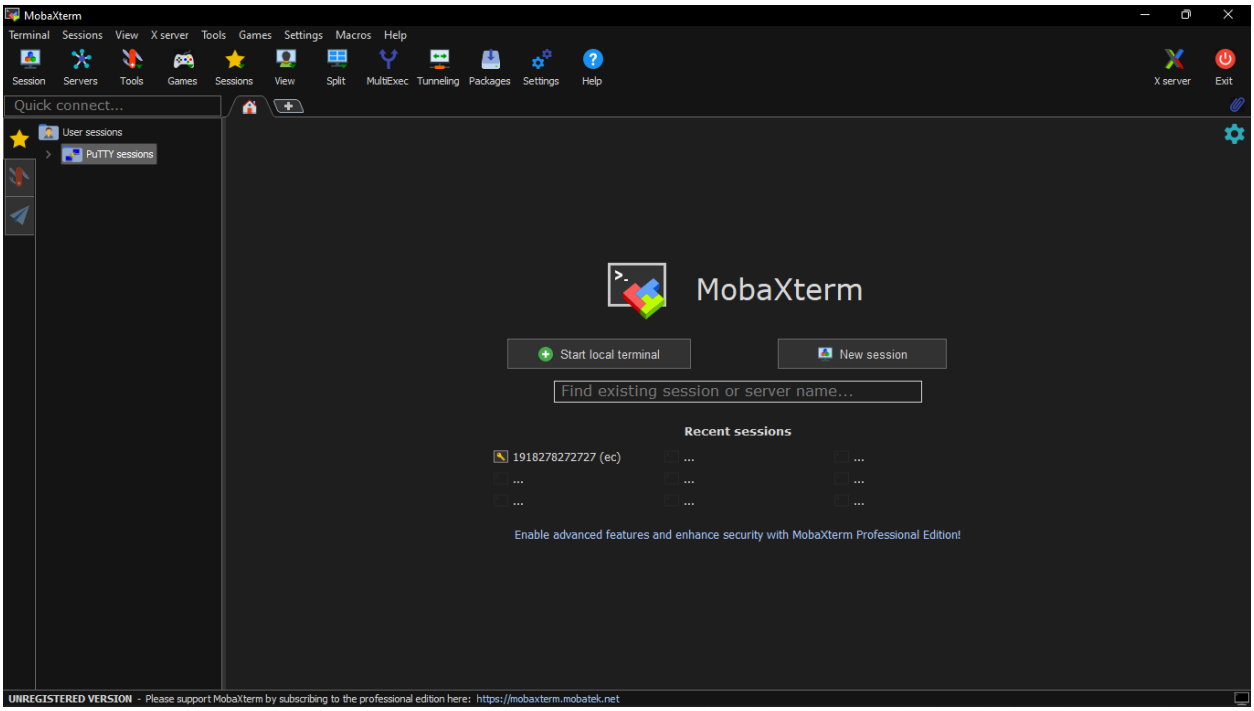


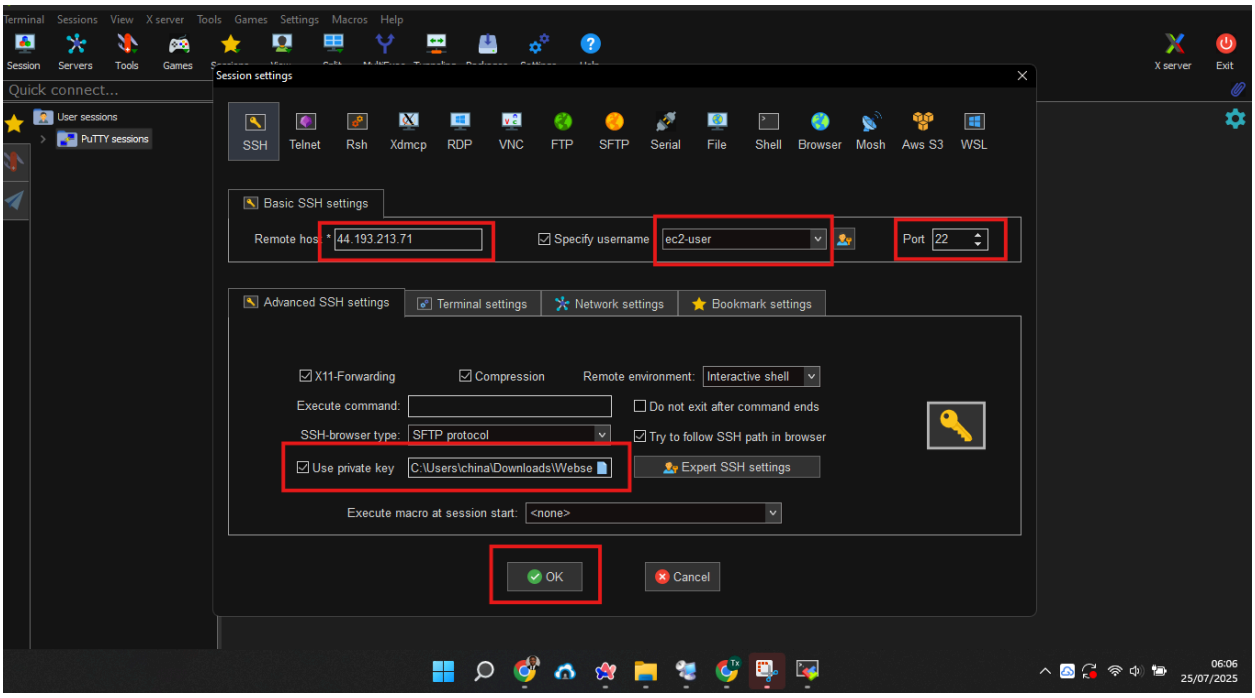
💻 Step 5: SSH Access and Web Server Setup

We installed a web server and deployed the MediCare site on each EC2.

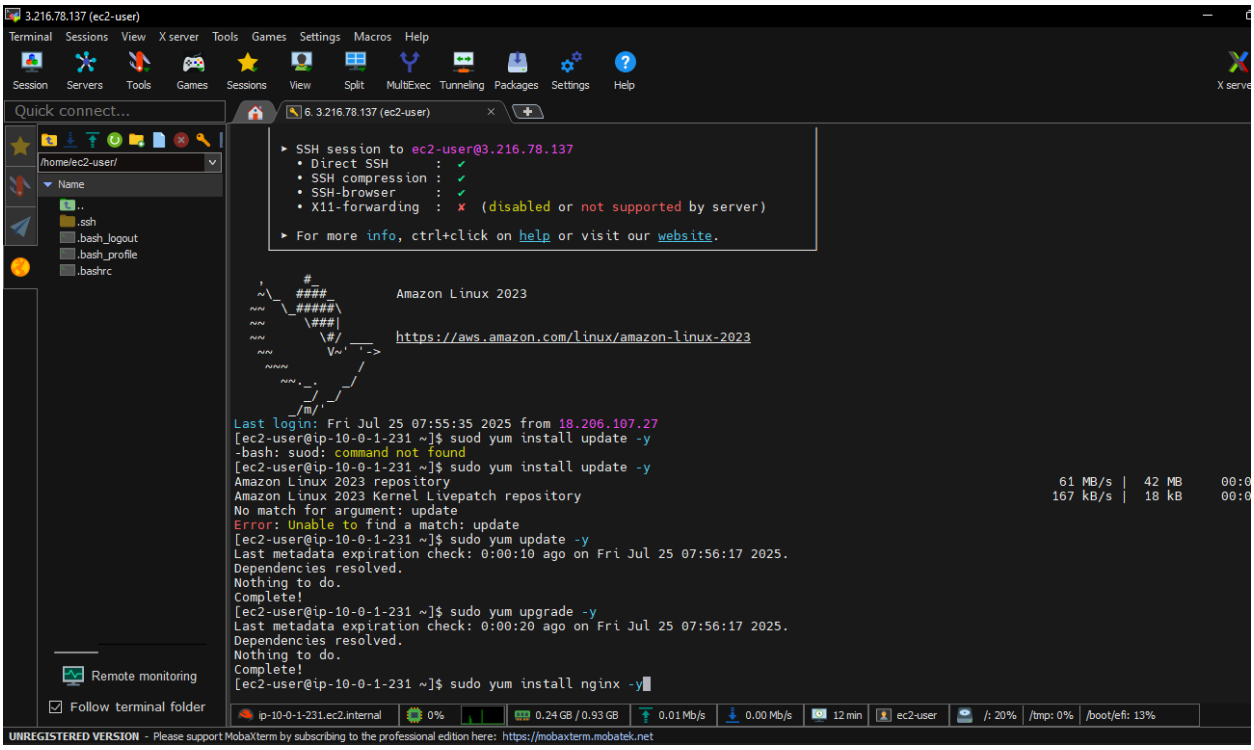
5.1 SSH into EC2 Instances

- Used MobaXterm and .pem key to SSH intoMedicare-EC2-A andMedicare-Webserver-B





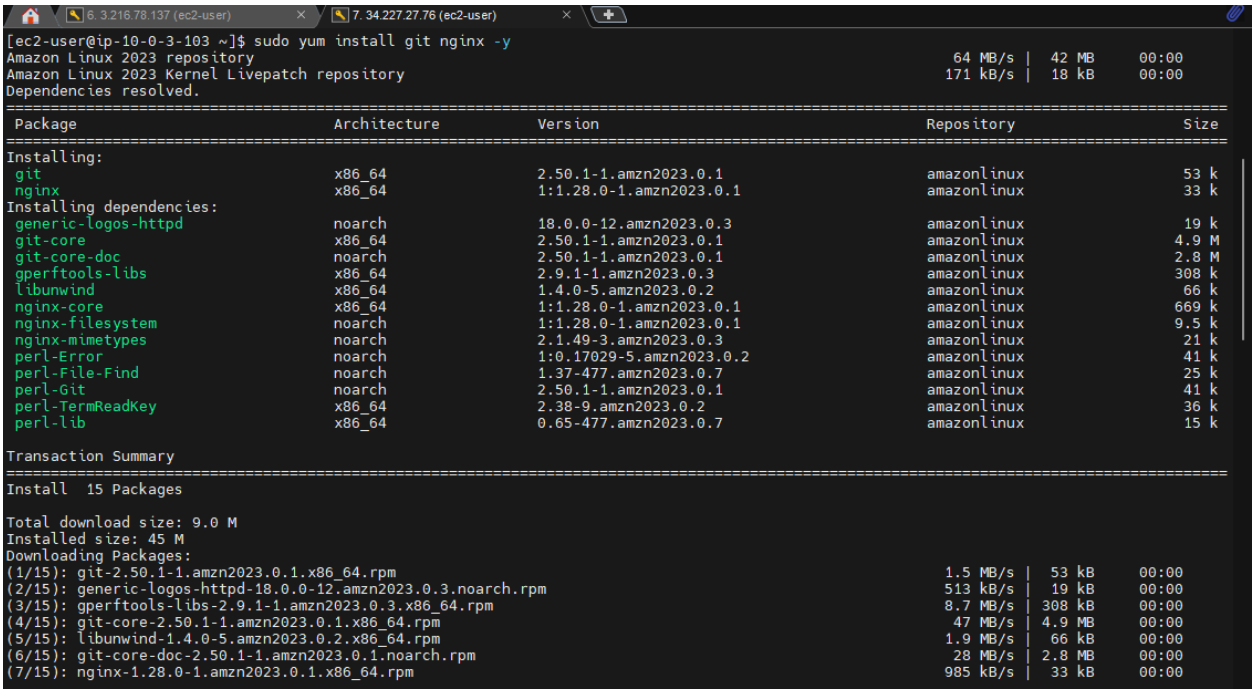
- MobaXterm SSH session for Medicare-EC2-A



- Terminal connected confirmation

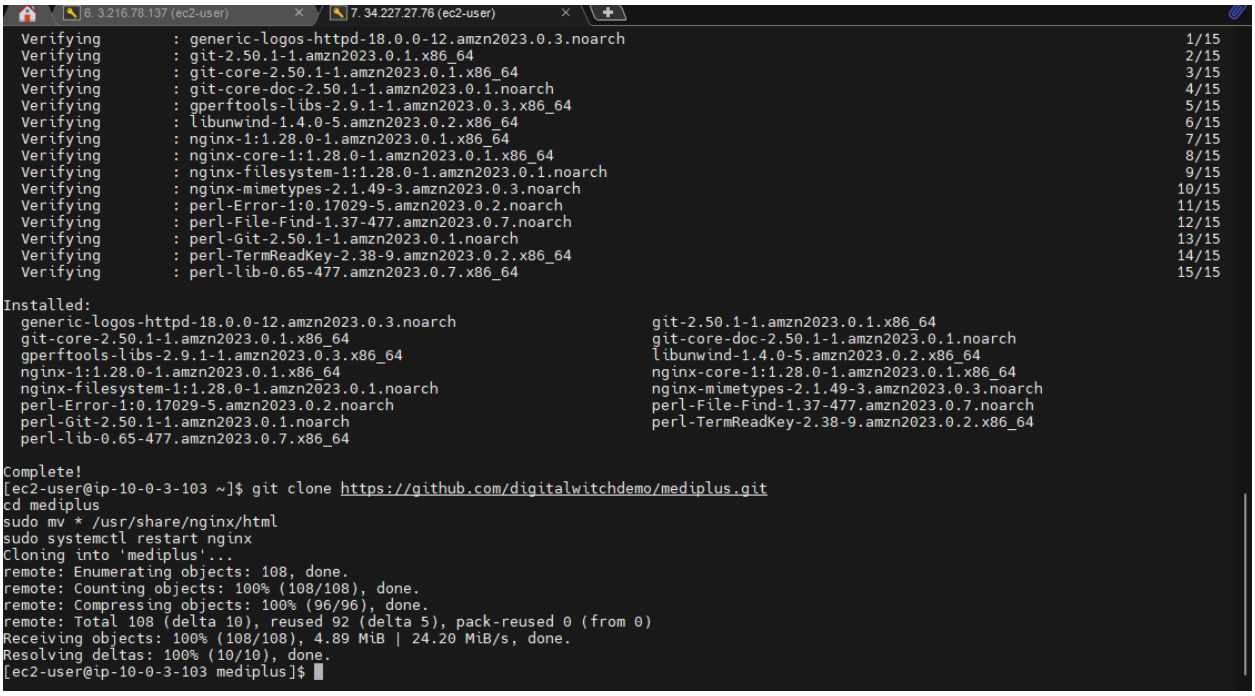
5.2 Install Nginx and Git

```
sudo yum update -y
sudo yum install nginx git -y
```



5.3 Deploy Website

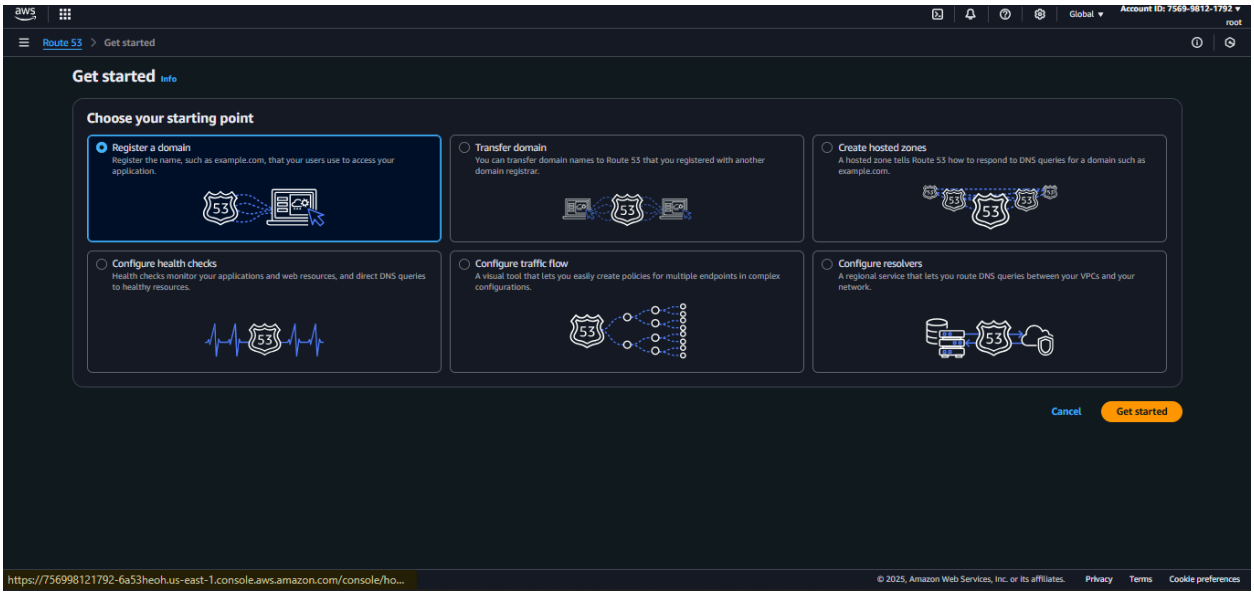
git clone https://github.com/digitalwitchdemo/mediplus.git
cd mediplus
sudo mv * /usr/share/nginx/html
sudo systemctl restart nginx

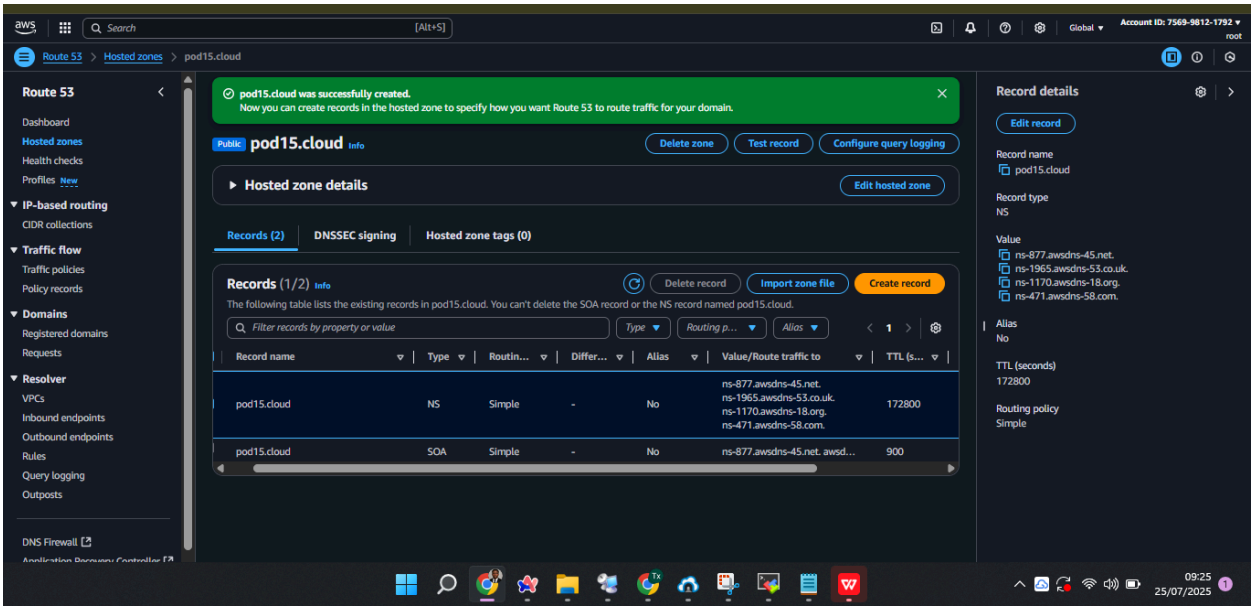


🌍 Step 6: Domain Purchase and Route 53 Setup (3+ Screenshots)

What We Did

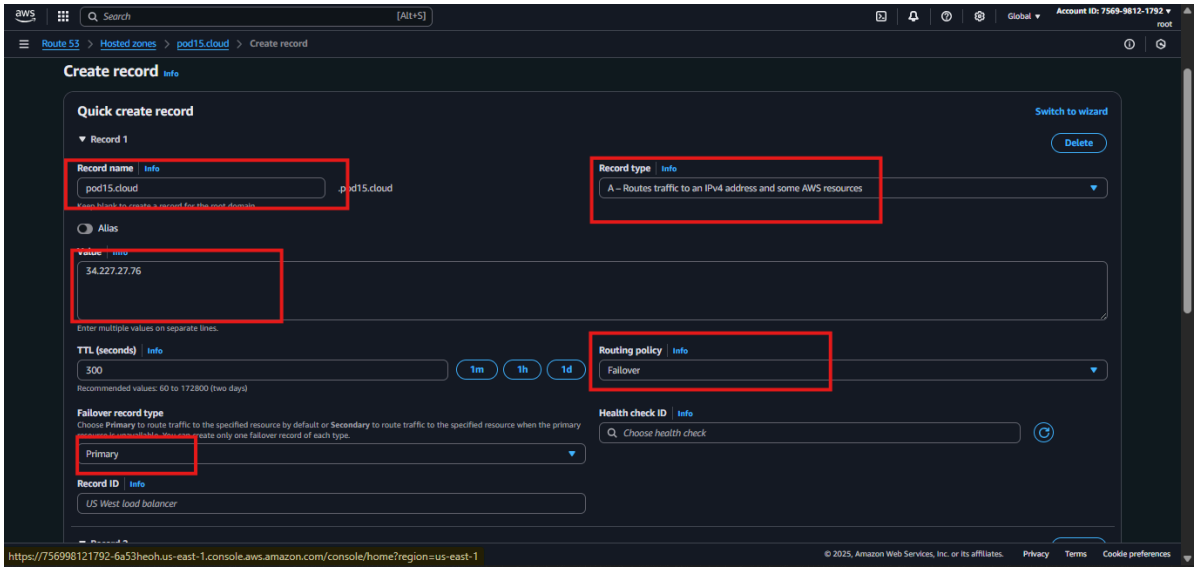
We purchased `medicare.pod15.cloud` from GoDaddy and set up **Amazon Route 53** to manage DNS, enabling automatic failover betweenMedicare-EC2-A andMedicare-Webserver-B.



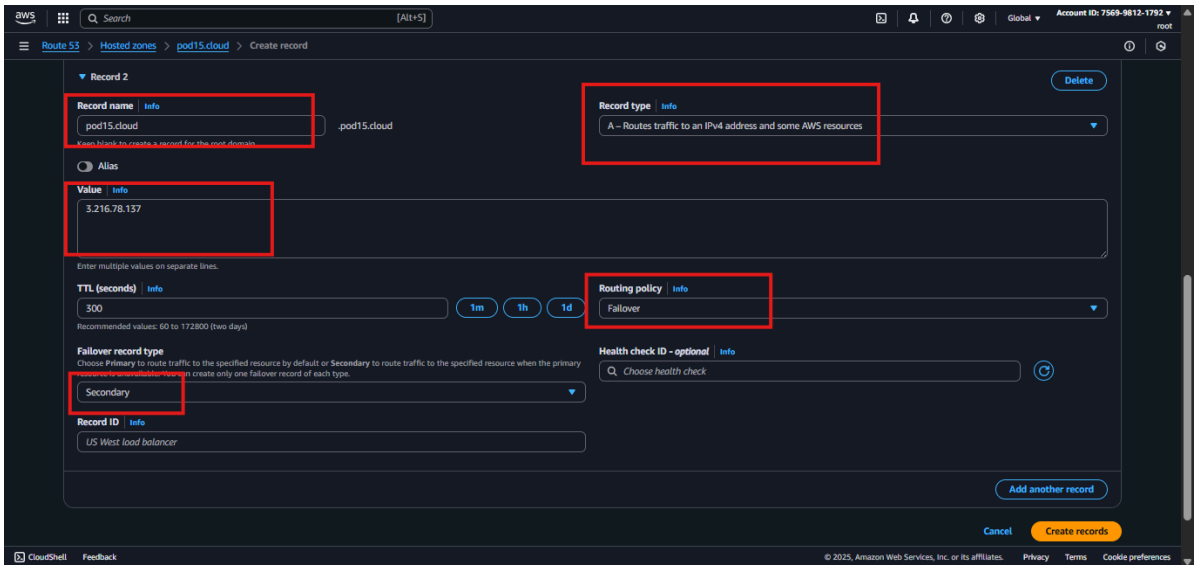


✅ Actions Taken:

- Purchased domain
- Created Route 53 Hosted Zone for `medicare.pod15.cloud`
- Added **two A records**:
  - Primary →Medicare-EC2-A public IP



- Secondary →Medicare-Webserver-B public IP

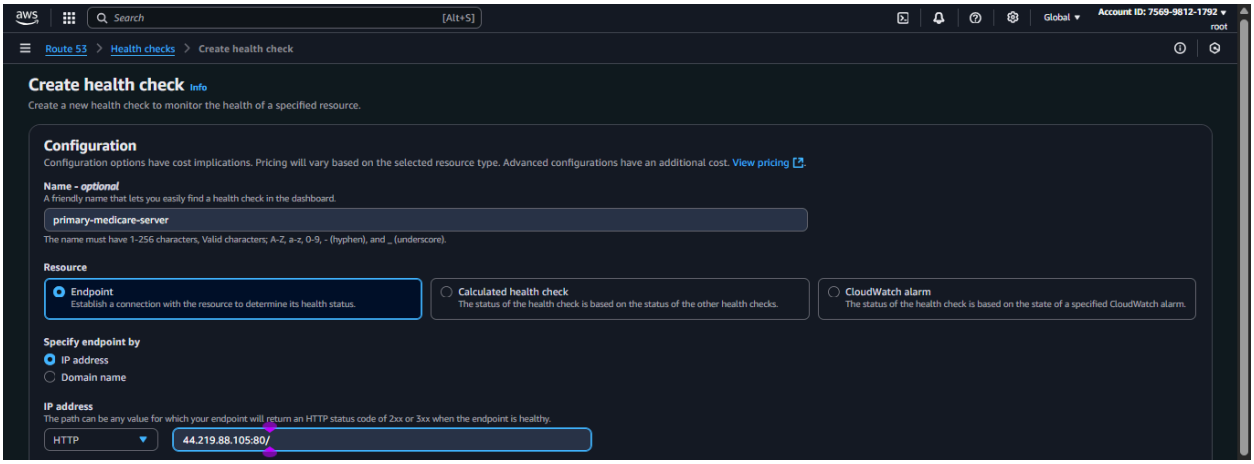


❤️ Step 7: Health Check and DNS Failover Testing (3+ Screenshots)

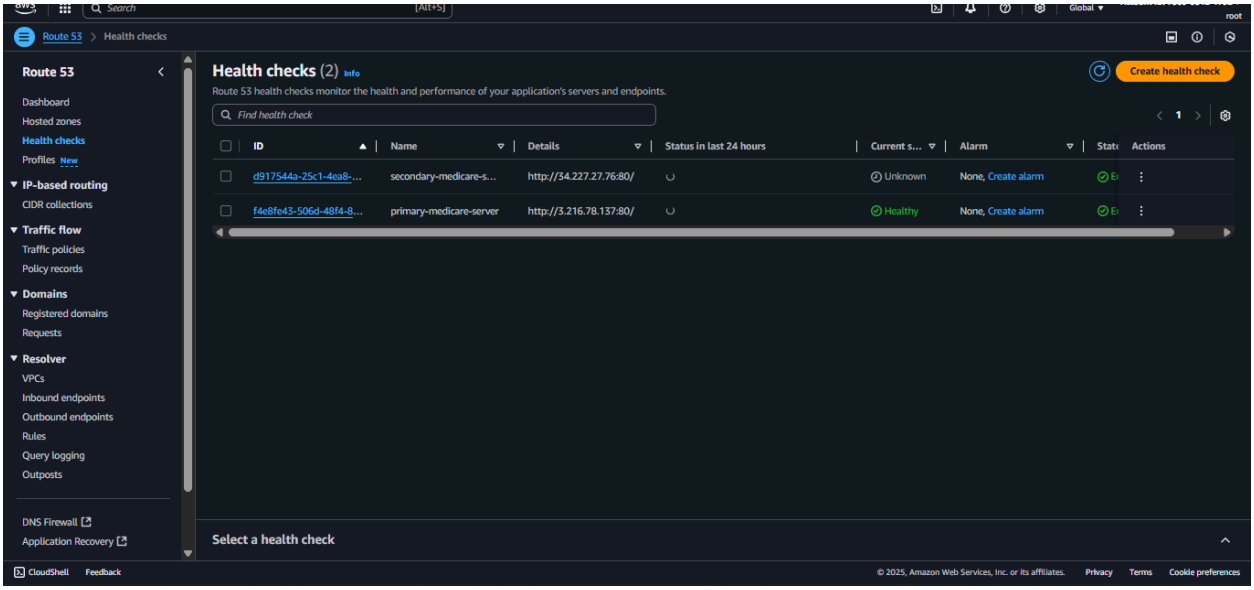
What We Did

We configured a **Route 53 health check** onMedicare-EC2-A so that if it becomes unhealthy, traffic is automatically routed toMedicare-Webserver-B.

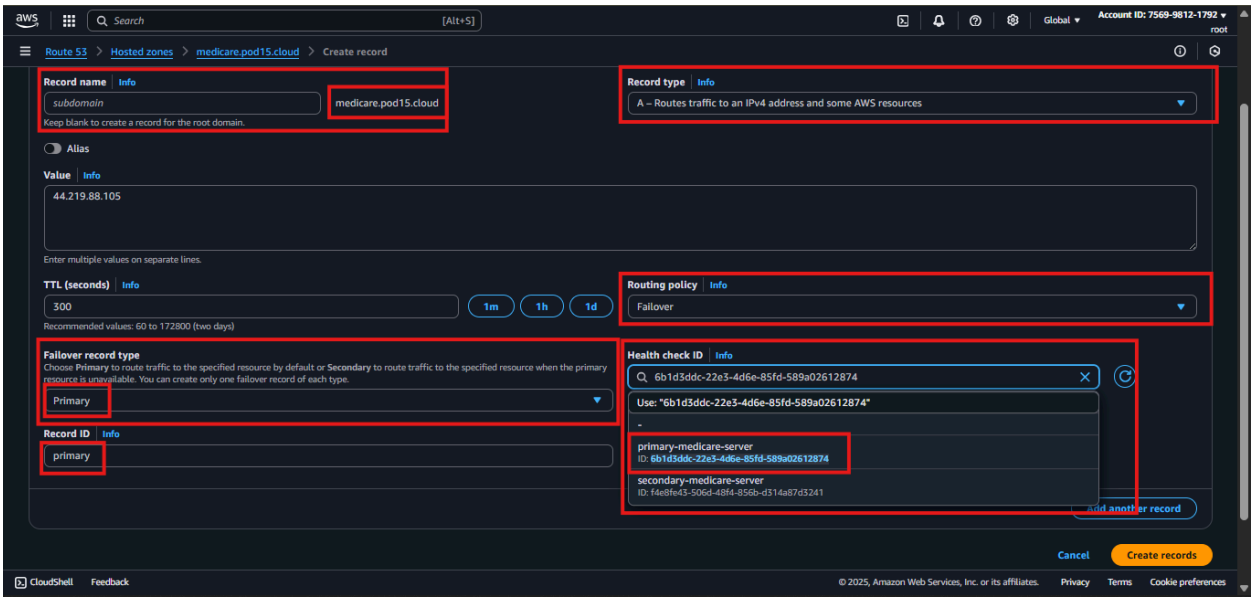
- Created health check onMedicare-EC2-A using port 80 and `/` path

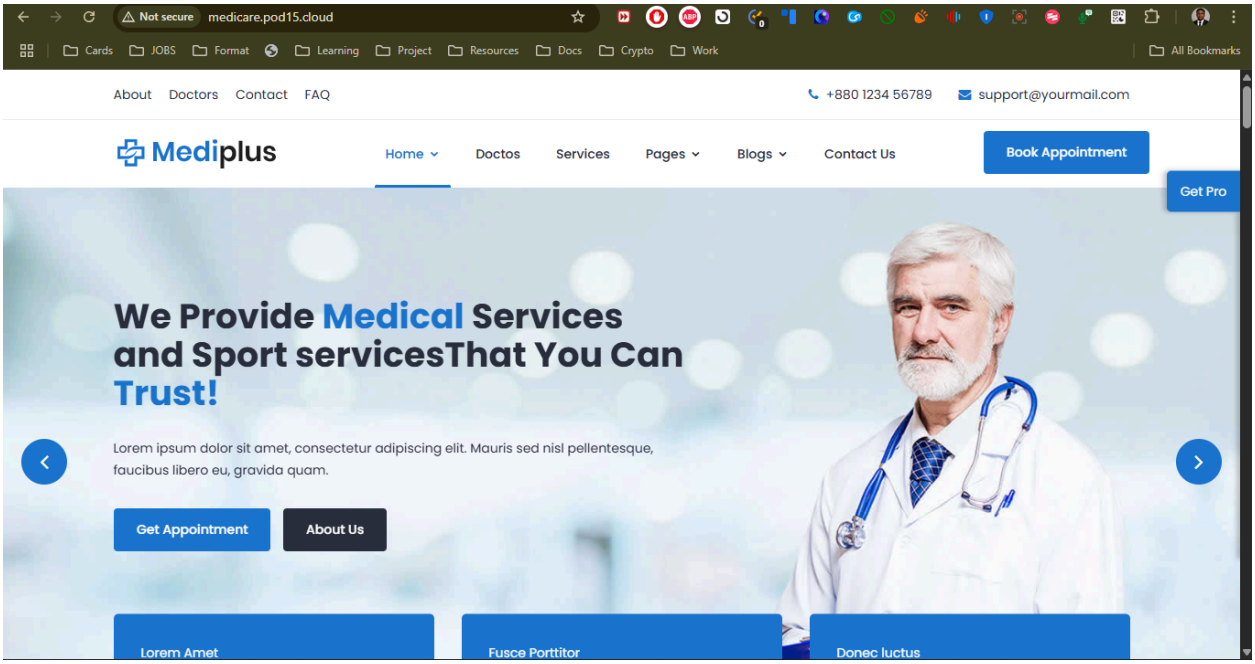


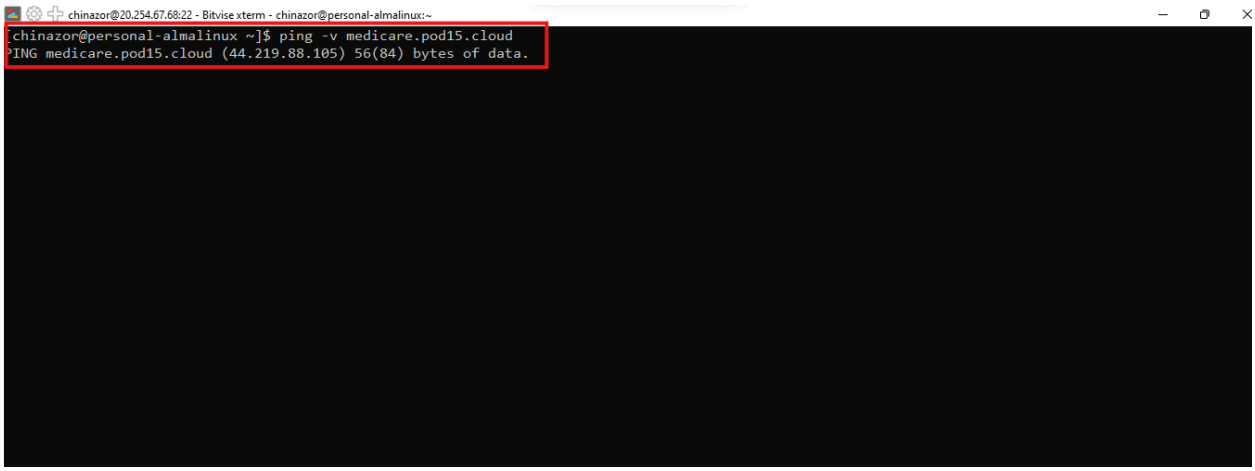
- repeated the same steps and created for `econdary-medicare-server`

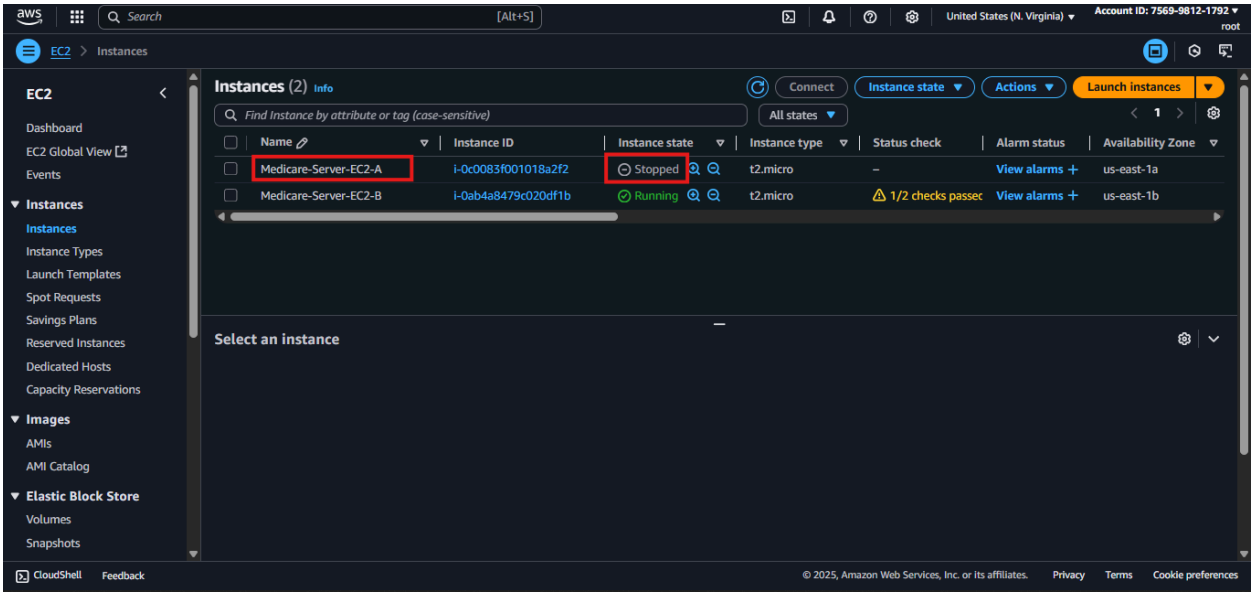


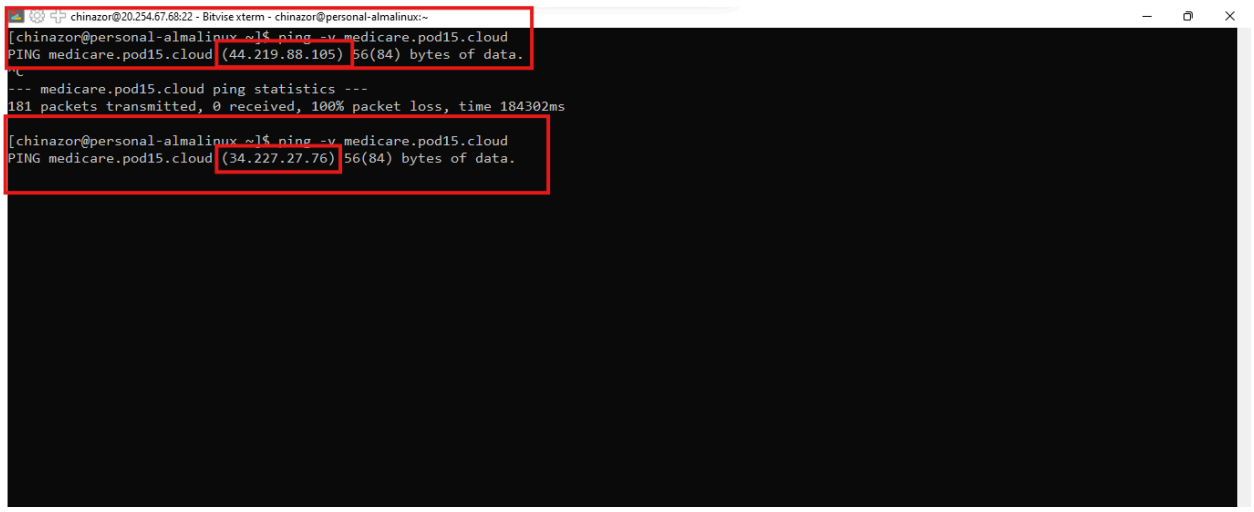
- Linked health check to primary A record

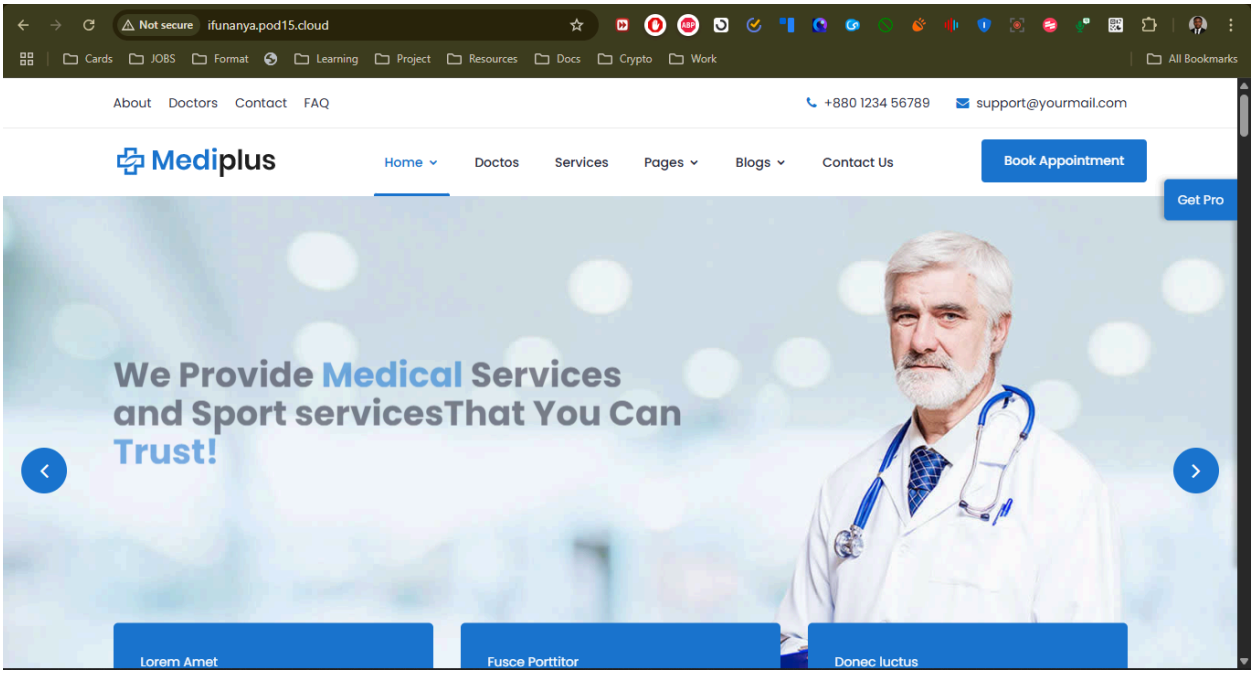

Route 53 > Hosted zones > medicare.pod15.cloud > Create record
Record name | Info
subdomain
medicare.pod15.cloud
Keep blank to create a record for the root domain.
Record type | Info
A – Routes traffic to an IPv4 address and some AWS resources
Alias
Value | Info
44.219.88.105
Enter multiple values on separate lines.
TTL (seconds) | Info
300
1m
1h
1d
Recommended values: 60 to 172800 (two days)
Routing policy | Info
Failover
Failover record type
Choose Primary to route traffic to the specified resource by default or Secondary to route traffic to the specified resource when the primary resource is unavailable. You can create only one failover record of each type.
Primary
Record ID | Info
primary
Health check ID | Info
6b1d3ddc-22e3-4d6e-85fd-589a02612874
Use: "6b1d3ddc-22e3-4d6e-85fd-589a02612874"
primary-medicare-server
ID: 6b1d3ddc-22e3-4d6e-85fd-589a02612874
secondary-medicare-server
ID: f4e8fe43-506d-48f4-856b-d314a87d3241
Cancel
Create records
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences


Not secure
medicare.pod15.cloud
About
Doctors
Contact
FAQ
+880 1234 56789
support@yourmail.com
Mediplus
Home
Doctos
Services
Pages
Blogs
Contact Us
Book Appointment
Get Pro
We Provide Medical Services and Sport servicesThat You Can Trust!
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Mauris sed nisl pellentesque, faucibus libero eu, gravida quam.
Get Appointment
About Us
Lorem Amet
Fusce Porttitor
Donec luctus


chinazor@20.254.67.68:22 - Bitvise xterm - chinazor@personal-almalinux:~
[chinazor@personal-almalinux ~]$ ping -v medicare.pod15.cloud
PING medicare.pod15.cloud (44.219.88.105) 56(84) bytes of data.


Search
[Alt+S]
United States (N. Virginia)
Account ID: 7569-9812-1792
root
EC2 > Instances
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Instances (2) Info
Connect
Instance state
Actions
Launch instances
Find Instance by attribute or tag (case-sensitive)
All states
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
Medicare-Server-EC2-A
i-0c0083f001018a2f2
Stopped
t2.micro
–
View alarms
us-east-1a
Medicare-Server-EC2-B
i-0ab4a8479c020df1b
Running
t2.micro
1/2 checks passec
View alarms
us-east-1b
Select an instance
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences





✅ Actions Taken:

- Shut down Medicare-EC2-A to test failover
- Route 53 failed over to Medicare-Webserver-B

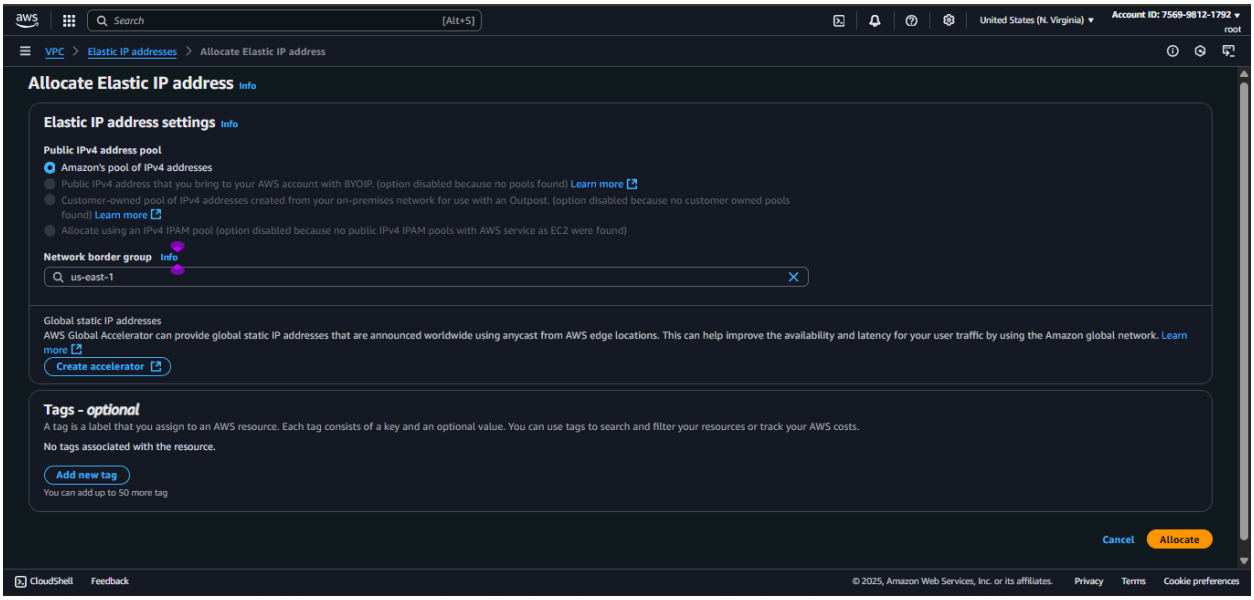
- Restarted Medicare-EC2-A to watch traffic switch back

Step 8: NAT Gateway & Bastion Host Configuration

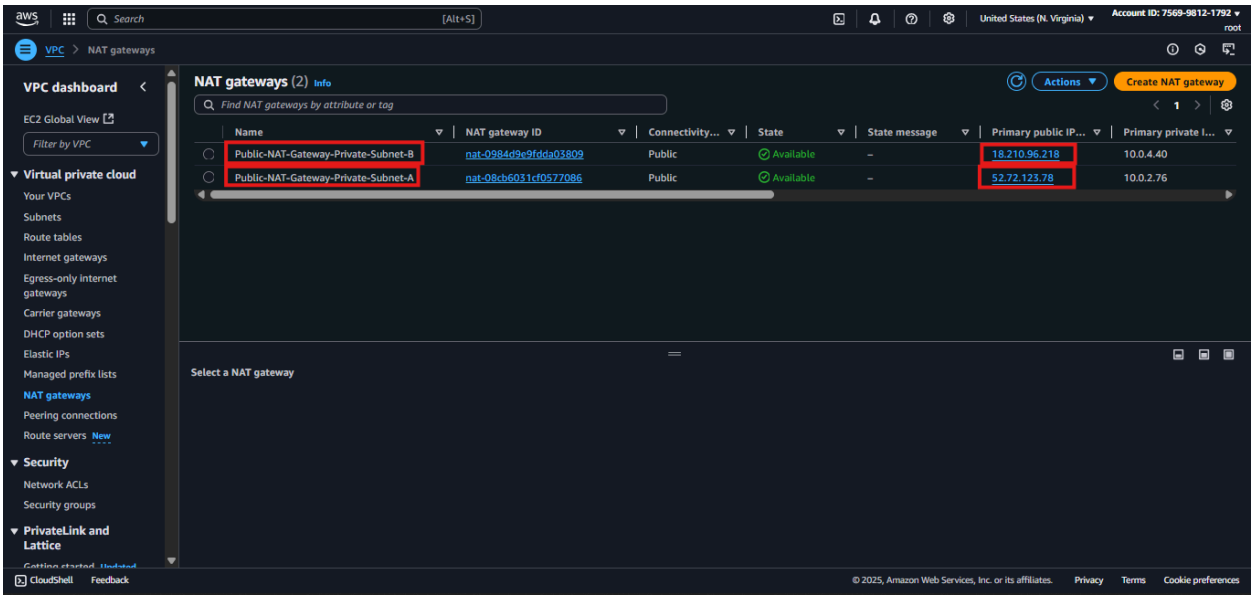
To allow EC2 instances in **private subnets** to access the internet (for updates, packages, etc.), we configured a **NAT Gateway** in the public subnet. After that, we set up a **Bastion Host** to securely SSH into the private EC2s.

8.1 Create Elastic IP for NAT Gateway

- Navigate to **VPC → Elastic IPs → Allocate**

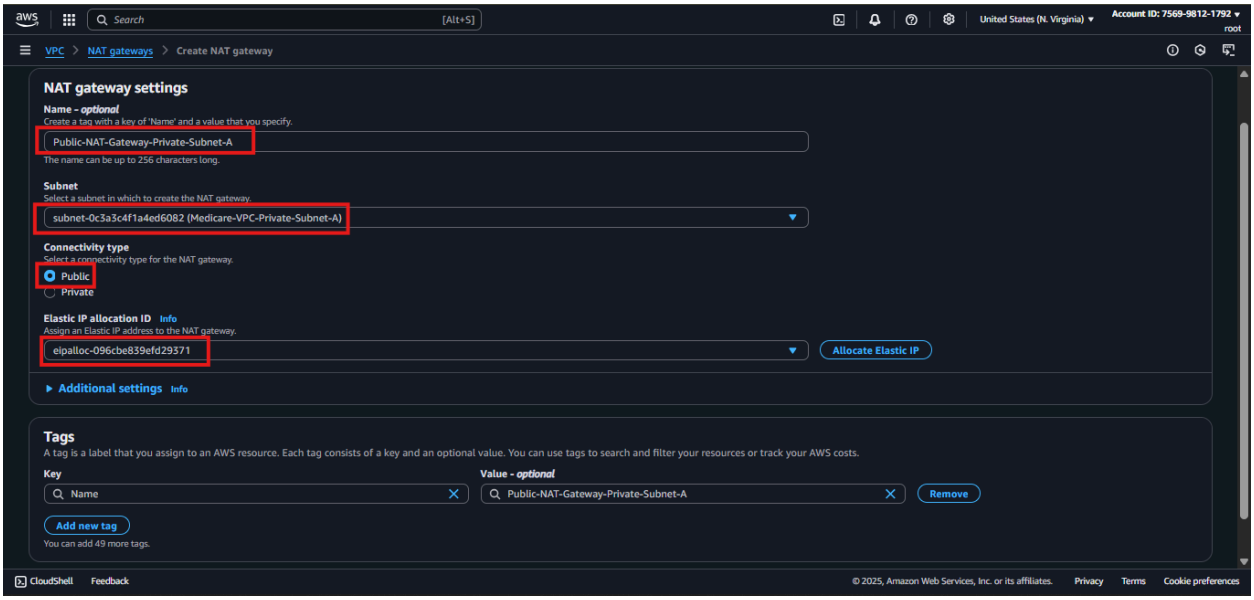


- Allocate a new Elastic IP (EIP) for the NAT Gateway
- Elastic IP allocation confirmation
- EIP listed under the allocated addresses

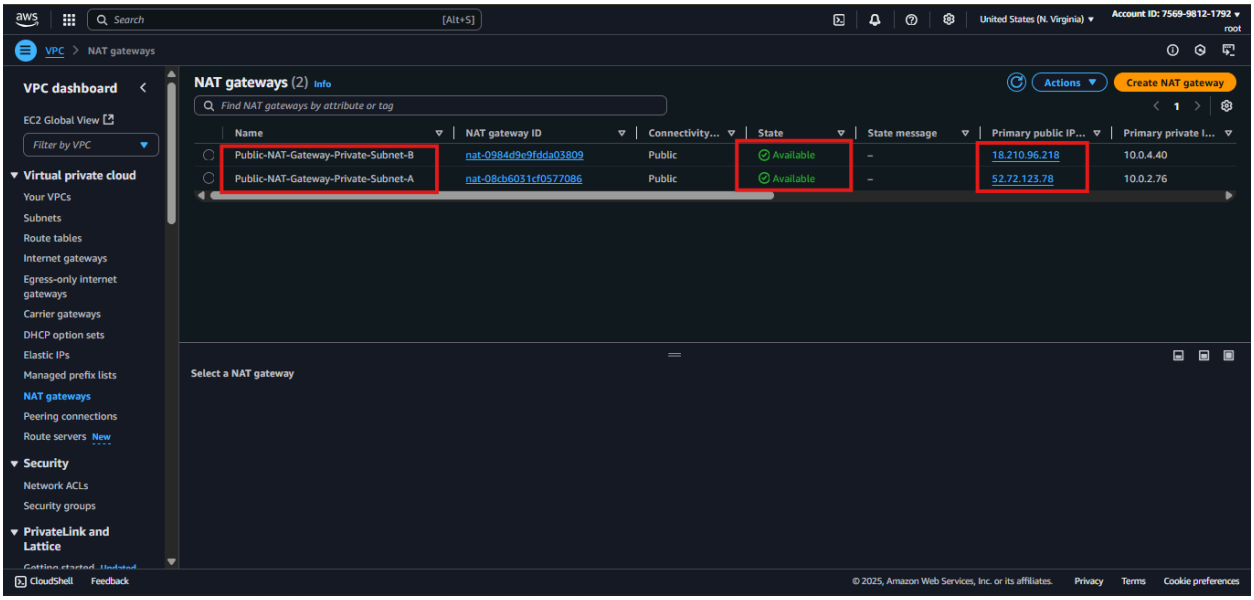


8.2 Create and Attach NAT Gateway

- Go to **VPC → NAT Gateways → Create**
- Select **Public Subnet A (10.0.1.0/24)**
- Use the previously allocated Elastic IP

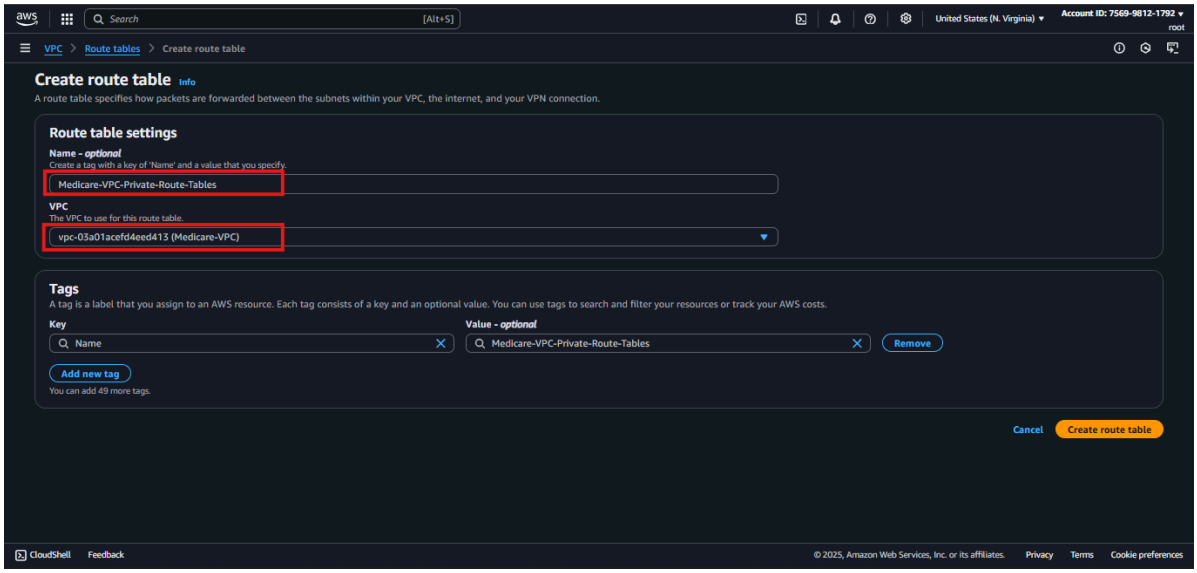


- NAT Gateway creation screen with correct subnet and EIP
- NAT Gateway status: `Available`

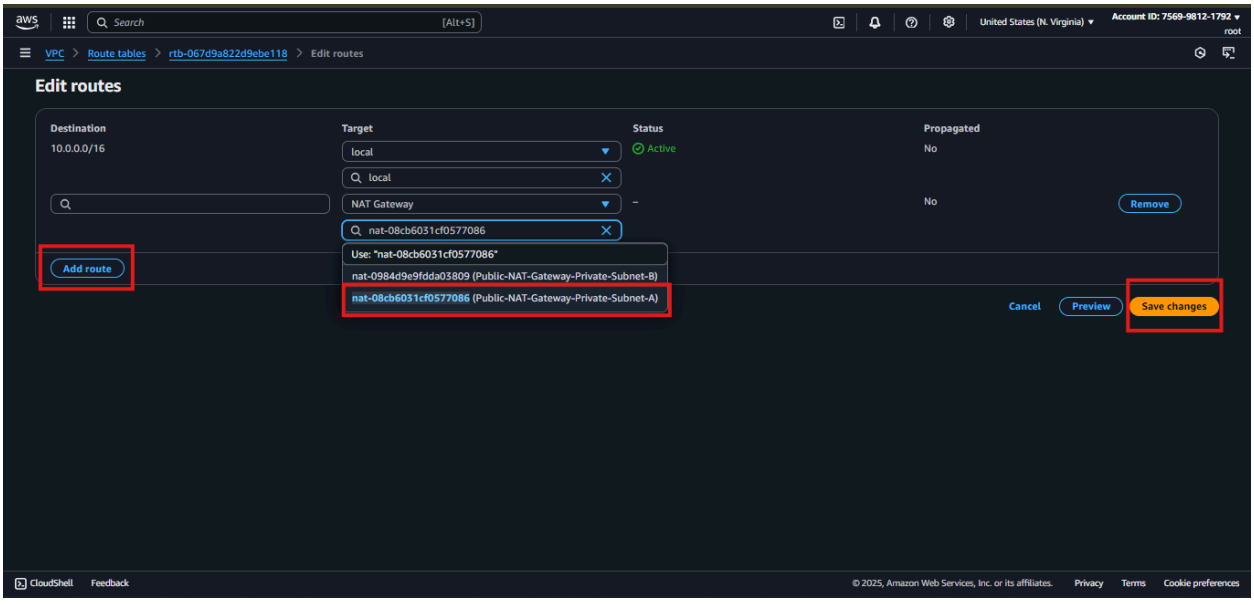


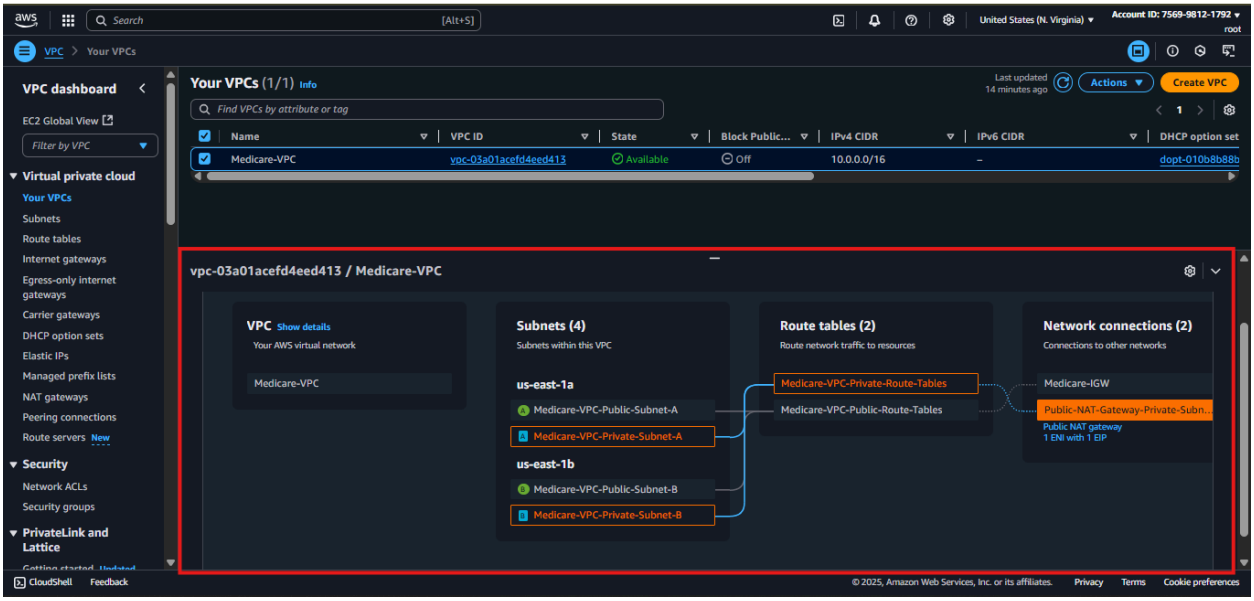
8.3 Create Route Tables for Private Subnets

- Navigate to **Route Tables**
- Select the **private route table**
- Add a route:
  - Destination: `0.0.0.0/0`
  - Target: NAT Gateway ID



- Private route table before and after editing
- Route to NAT Gateway confirmed





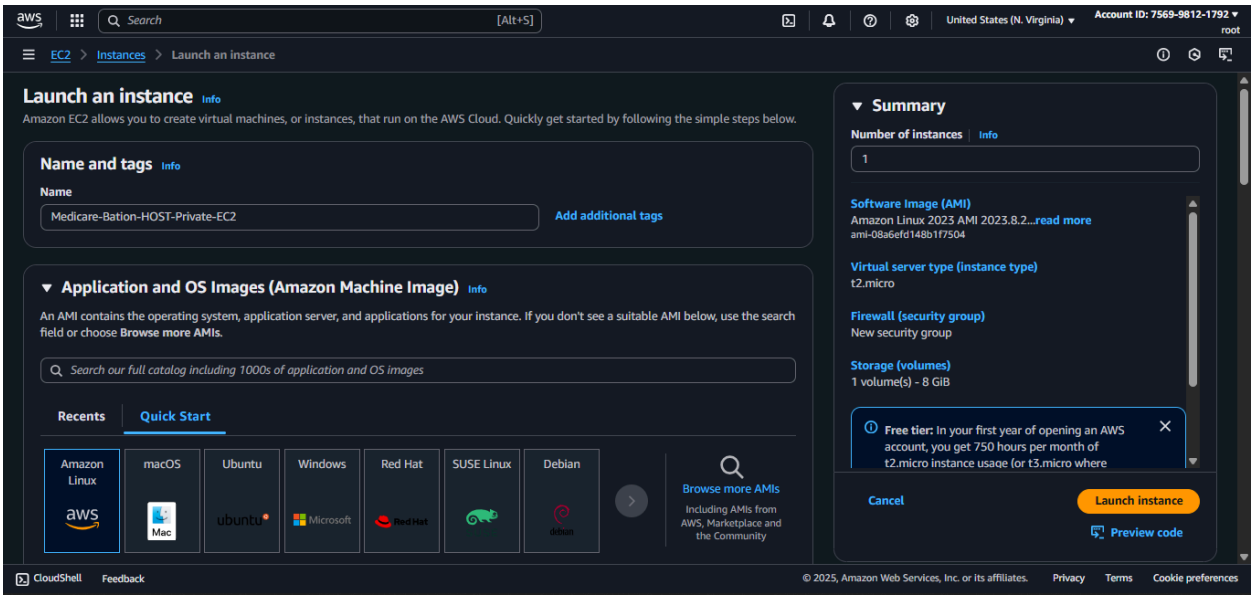
Step 9: Bastion Host Setup for Secure Private Access

To enable secure SSH access to EC2 instances in the **private subnets**, we configured a **Bastion Host** (also called a jump box) in a public subnet.

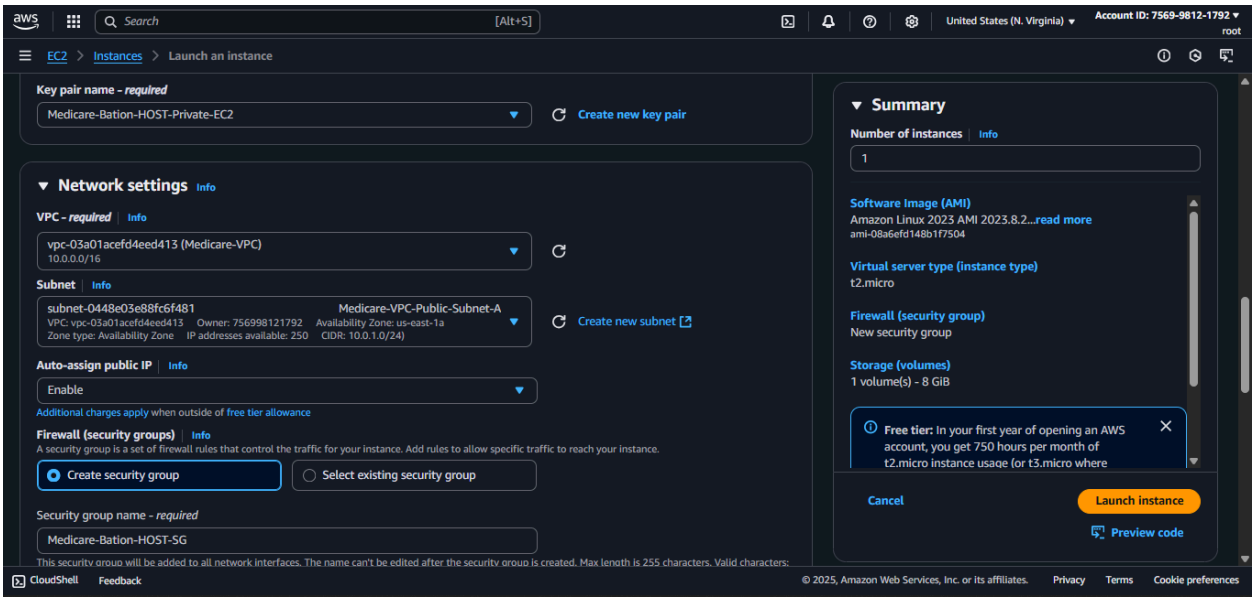
This host acts as an intermediary instead of giving public IPs to private EC2s, we connect to the Bastion and then hop into the private EC2s using internal IP addresses.

9.1 Launch Bastion EC2 in Public Subnet

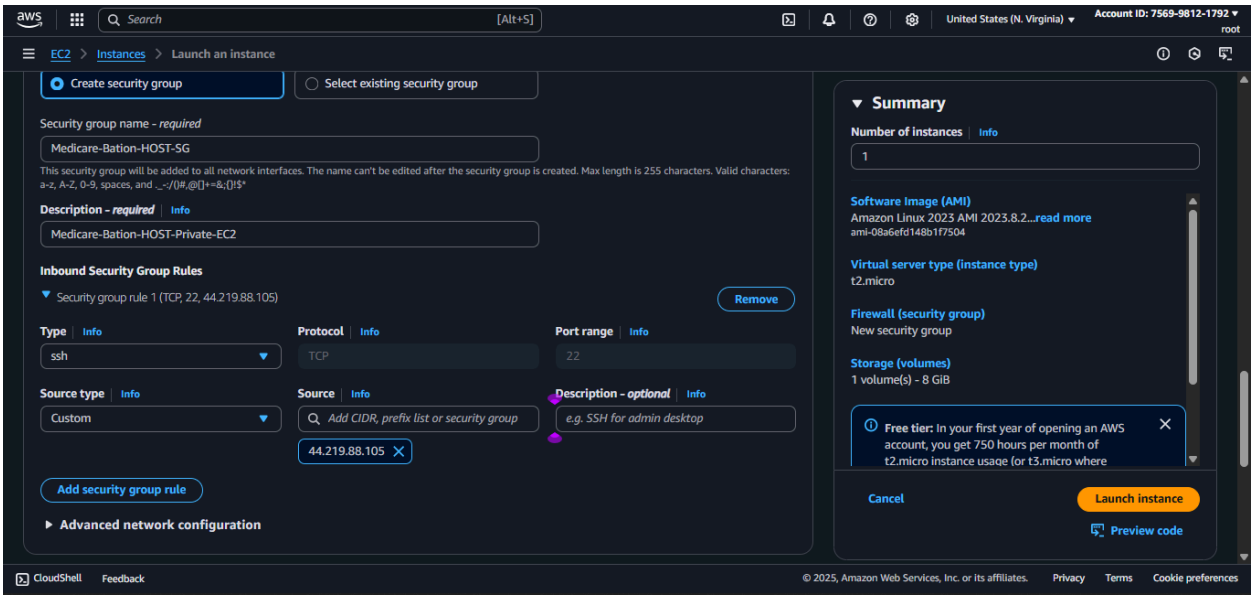
- Go to EC2 → Launch Instance
- Select Amazon Linux 2 (t2.micro for free tier)



- Place in **Public Subnet A**
- Enable **Auto-assign Public IP**
- Attach the same key pair used for your private EC2s



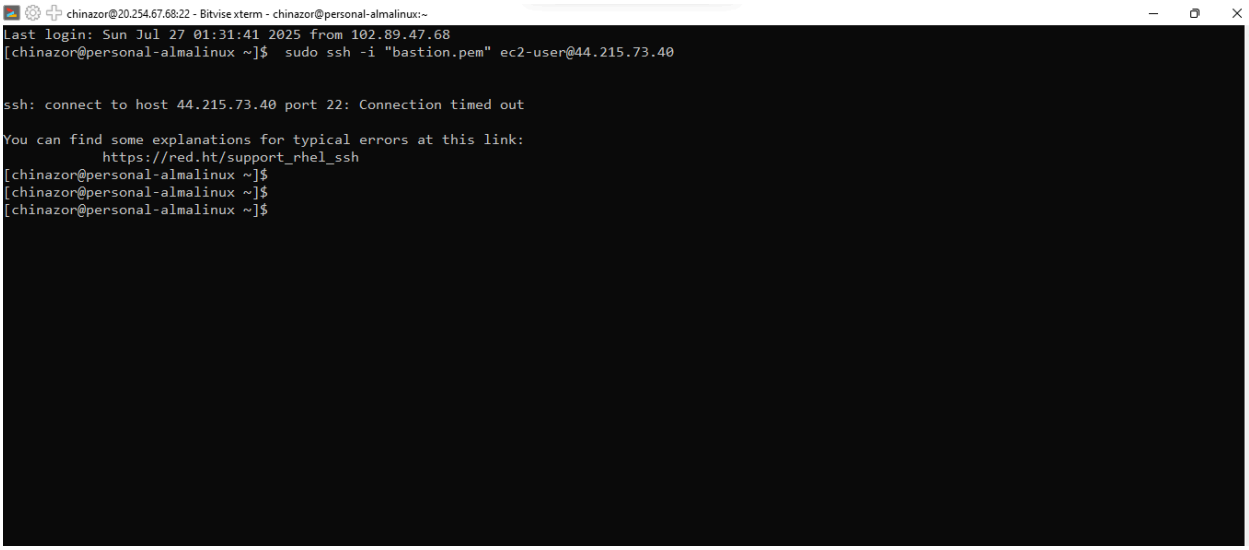
- EC2 launch config (with subnet and public IP enabled)



9.2 SSH into Bastion Host

From a Regular host to Test the security

- We got rejected when we tried to login from a host that was not specified in the security group even with the ssh key



From the Specified HOST in the Security Group

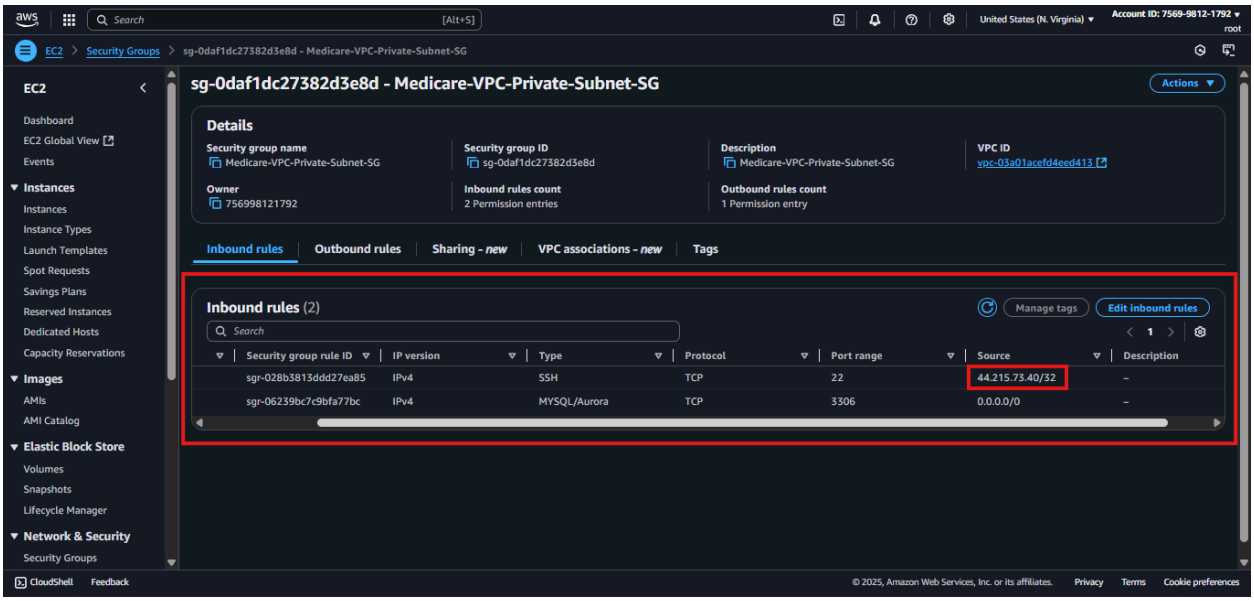
We use MobaXterm or SSH terminal with my `.pem` key:

```
sudo ssh -i "bastion.pem" ec2-user@44.215.73.40
```

Screenshots to Include:

- MobaXterm or terminal connected to Bastion
- Confirmed SSH session

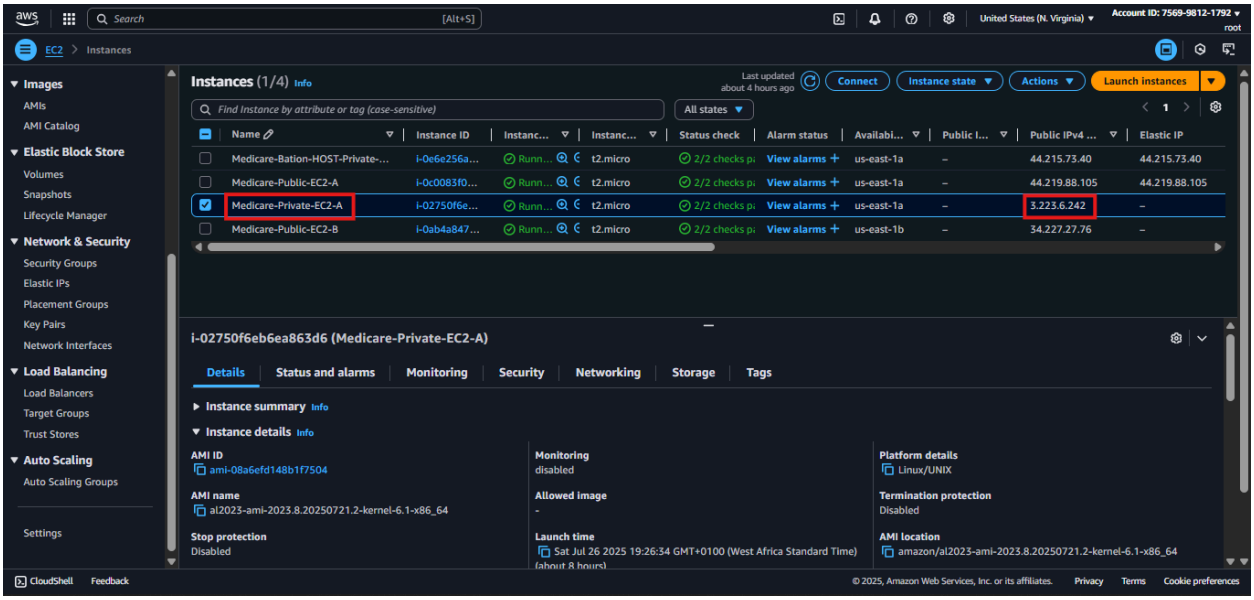
9.3 Allow SSH to Private EC2s from Bastion



Update the **Security Group** of the private EC2s:

- Allow inbound SSH (port 22) **only from the Bastion's SG** or IP (`44.215.73.40`)
- Private EC2 SG with SSH from Bastion's SG

9.4 SSH Into Private EC2 From Bastion Host



Once inside the Bastion:

```
ssh ec2-user@10.0.2.XX   # Private EC2-A
ssh ec2-user@10.0.4.XX   # Private EC2-B
```

📸 **Screenshots to Include:**

- Terminal inside Bastion connecting to private EC2s
- Success login prompt on private EC2

This setup ensures that no private EC2s are directly exposed to the internet, while still maintaining admin access when needed.

✅ Final Outcome

Goal	Status
Fully functional VPC with 2 AZs	✅ Completed
Redundant web servers in separate AZs	✅ Completed

Goal	Status
Secure networking with SGs and NACLs	✅ Completed
Live web server setup on both EC2s	✅ Completed
Domain mapped via Route 53 with failover	✅ Completed
DNS failover tested with shutdown event	✅ Completed

🗂️ Submission Checklist

Item	Status
`.drawio` VPC diagram	✅ Included
At least 3 screenshots/step	✅ Captured
DNS + Route 53 setup visuals	✅ Captured
PDF/Word doc of this file	✅ Ready
`.pem` key (not uploaded)	✅ Secured