VPC Peering & Cross-VPC Connectivity

By Haroon Zaman | November 2025

Introduction

In this project, I learned how to connect two separate VPCs using **VPC Peering**. Each VPC is normally isolated and cannot communicate with other networks unless we explicitly allow it. By setting up VPC peering, I enabled private, secure communication between two VPCs without sending any data over the public internet.

This project helped me understand multi-VPC architectures, private routing, and how cloud resources communicate across isolated networks safely.

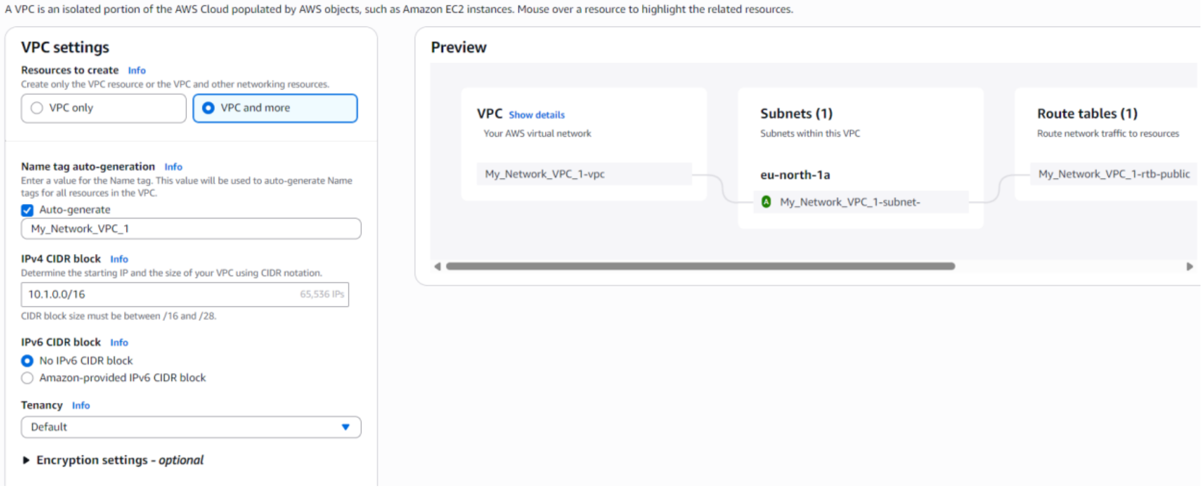
In this project, I completed the following tasks:

- **Set up multiple VPCs** – I created two different VPCs, each with its own CIDR range, subnets, route tables, and resources.
- **Created a VPC Peering connection** – I established a private network link between both VPCs so they could communicate.
- **Tested VPC peering with connectivity checks** – I verified communication using private IP addresses, confirming that traffic stayed inside AWS's private backbone network.

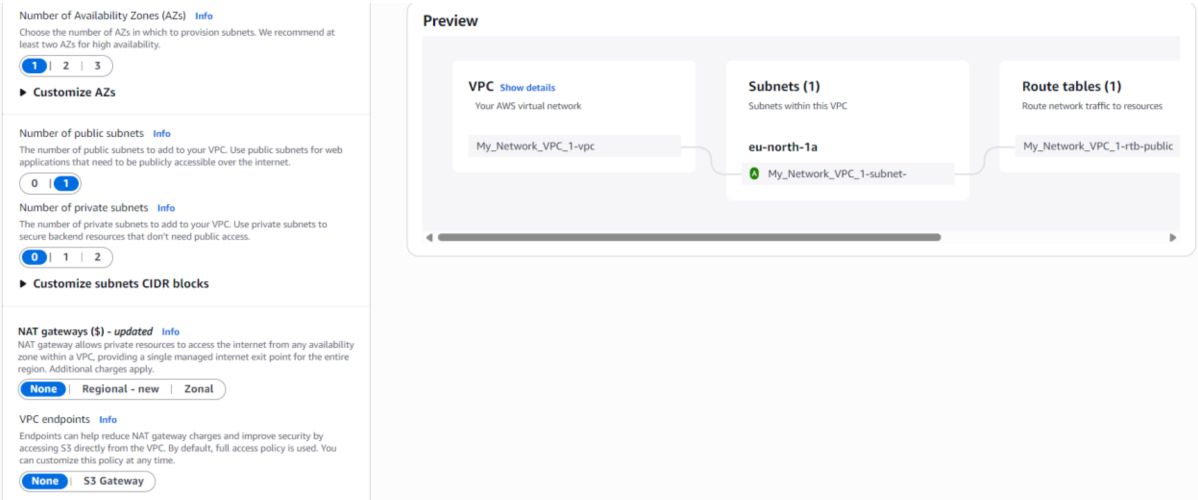
VPC peering ensures that data travels **privately**, directly between VPCs.
Without peering, traffic would need to go through the **public internet**, which is less secure and not ideal for internal workloads.

Creating the First VPC

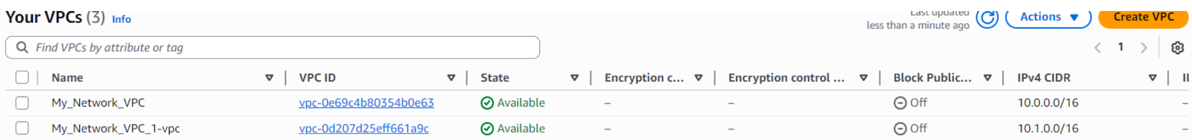
- First, I created a new VPC using the **VPC and More** option.
- I named this VPC **My_Network_VPC1** so it's easy to identify later.



- I declared the IPv4 CIDR block as **10.1.0.0/16**, giving the VPC plenty of private IP space.
- I chose **No IPv6**, since this project focuses only on IPv4 connectivity.
- I set **Tenancy** to **Default**, as I did not need dedicated hardware for this setup.



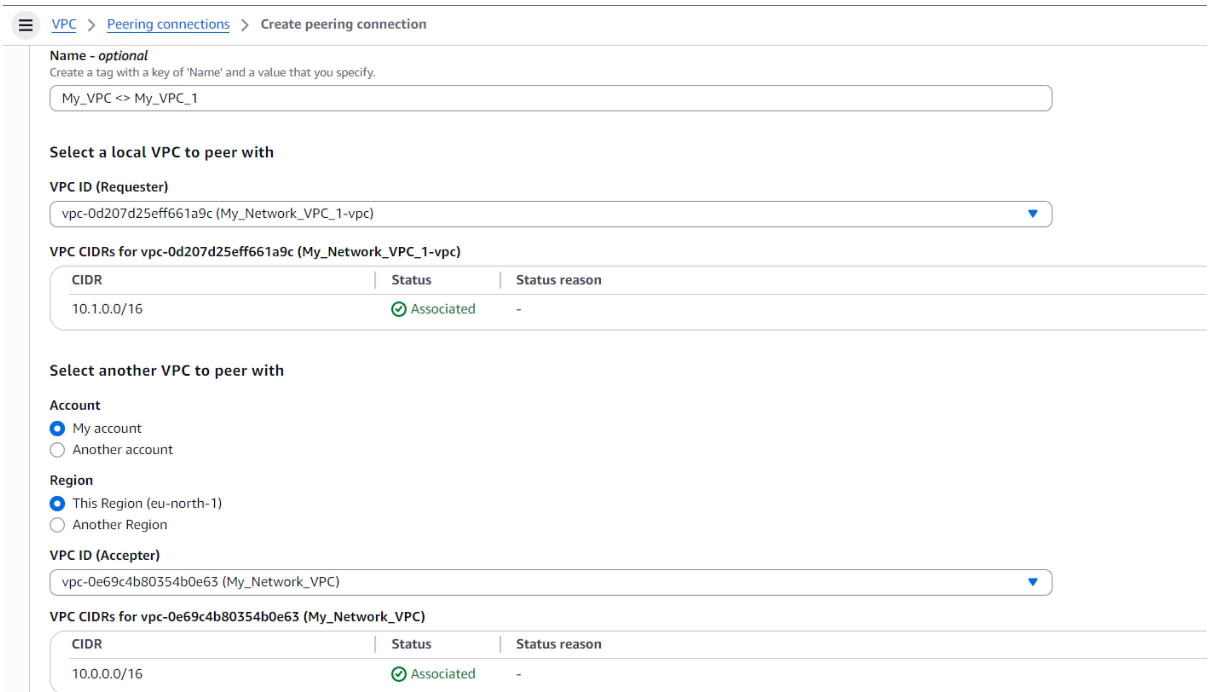
- I selected **1 Availability Zone** with **one public subnet** and **no private subnet**.
  This is because this VPC will only be used for testing VPC peering, and I only needed a simple network structure with one public subnet.
- I selected **No NAT Gateway**.
  NAT gateways are only needed when *private subnets* require outbound internet access. Since I did not create a private subnet and didn't need internet access from inside the VPC, a NAT gateway wasn't necessary.
- I also selected **No VPC Endpoints**.
  VPC endpoints are used when you want to privately connect your VPC to AWS services like S3 or DynamoDB.
  Since this project focuses only on VPC-to-VPC connectivity, and not on private access to AWS services, VPC endpoints were not required.



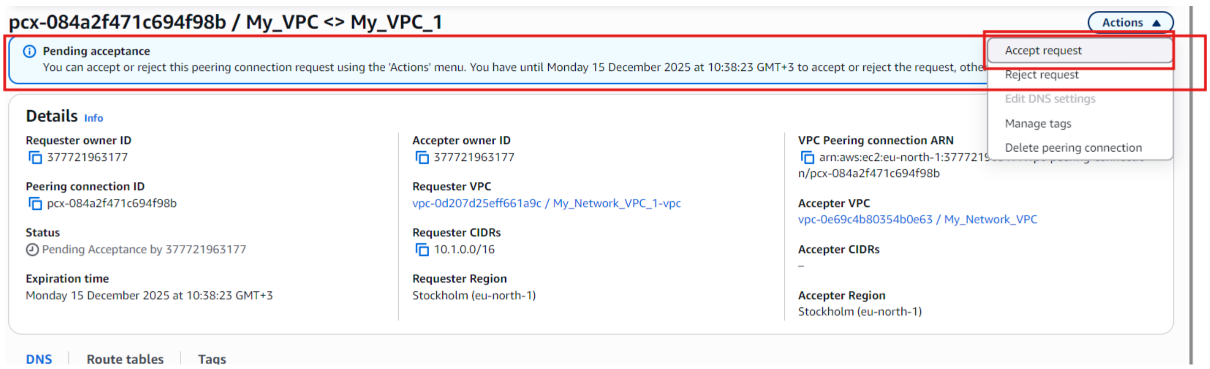
- After I created both VPCs, I verified their CIDR ranges:
  - **My_Network_VPC1:** 10.1.0.0/16
  - **My_Network_VPC:** 10.0.0.0/16
- Each VPC had its own unique CIDR block, which is required for VPC peering. VPCs **cannot** overlap in IP ranges if they need to communicate, so using different CIDR blocks made them compatible for peering.
- With both VPCs fully created and isolated from each other, it was now time to **connect them using a VPC peering connection** so they could communicate privately.

Creating the VPC Peering Connection

- Next, I went to **Peering Connections** from the left-side panel of the VPC console.
- I clicked on **Create Peering Connection** to start setting up the link between my two VPCs.



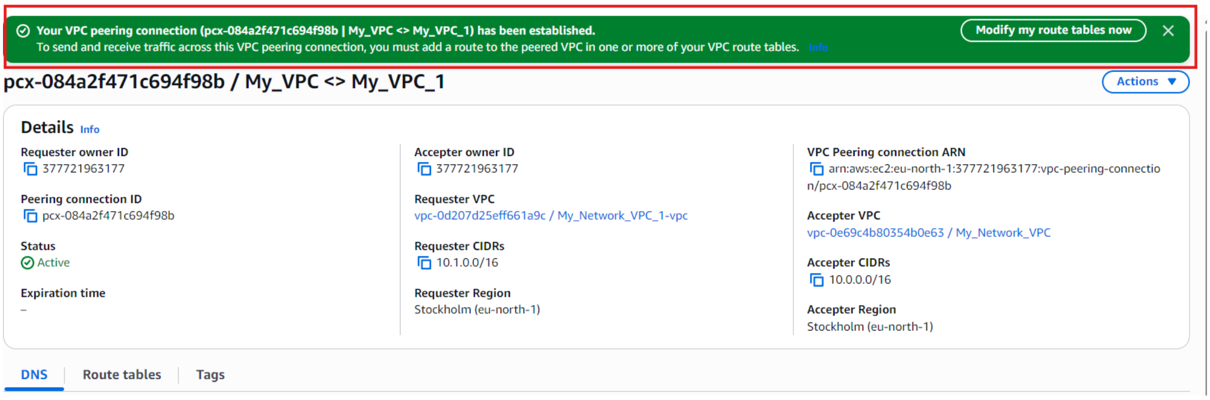
- I named the peering connection **My_VPC <> My_VPC1** so it was easy to recognize.
- First, I selected the **Requestor VPC**, which was **My_Network_VPC1**.
  The *requestor* is simply the VPC that **initiates** the peering request.
- Then I selected the **Acceptor VPC**, which was **My_Network_VPC**.
  The *acceptor* is the VPC that **receives** the request and must approve it.
- In the acceptor settings, I noticed AWS allows peering with **other accounts** and even **other regions**, making cross-account or cross-region peering possible.
  But for this project, I selected my second VPC in the **same region**.
- After selecting both sides, I clicked **Create Peering Connection** to create the request.



Accepting the Peering Request

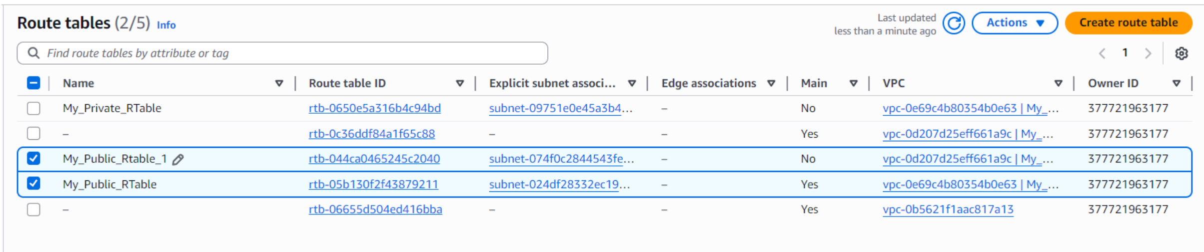
- After creating the peering connection, it was still in the **Pending Acceptance** state.

- Because both VPCs are in the **same AWS account**, I had full permission to approve the request myself.
- I selected the peering connection, went to **Actions**, and clicked **Accept Request**.
- Once accepted, the peering status changed to **Active**, meaning both VPCs were now allowed to communicate privately.



Updating Route Tables for VPC Peering

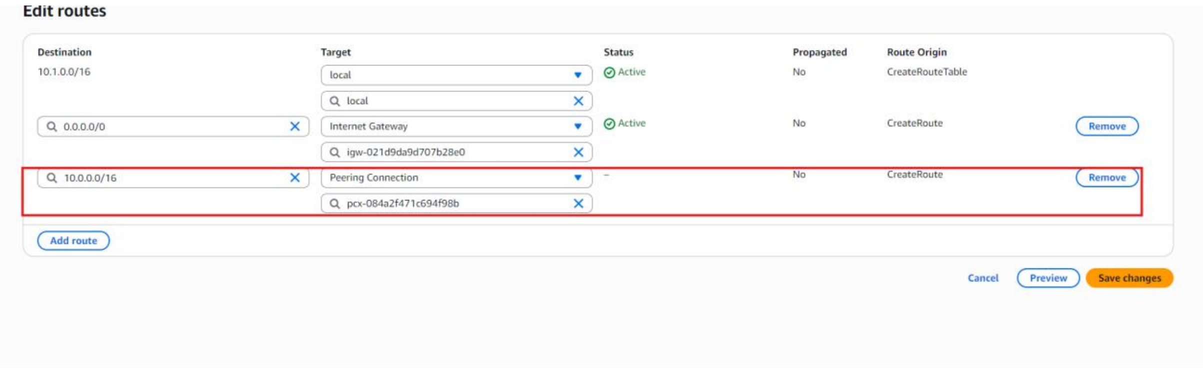
- After activating the peering connection, the two VPCs were *allowed* to communicate — but they still **could not send traffic to each other yet**.
- This is because **VPC peering does NOT automatically update route tables**. Each VPC must be told *where* to send traffic intended for the other VPC.
- In simple words:
  Peering creates the link.
  Route tables decide the path.
  Without adding routes, the instances inside the VPCs do not know how to reach each other's IP ranges.
- To fix this, I opened **Route Tables** in the VPC console and selected the route table for my first VPC.
- Then I clicked **Edit Routes** to add a new entry pointing to the peering connection.



Setting Routes for Cross-VPC Communication

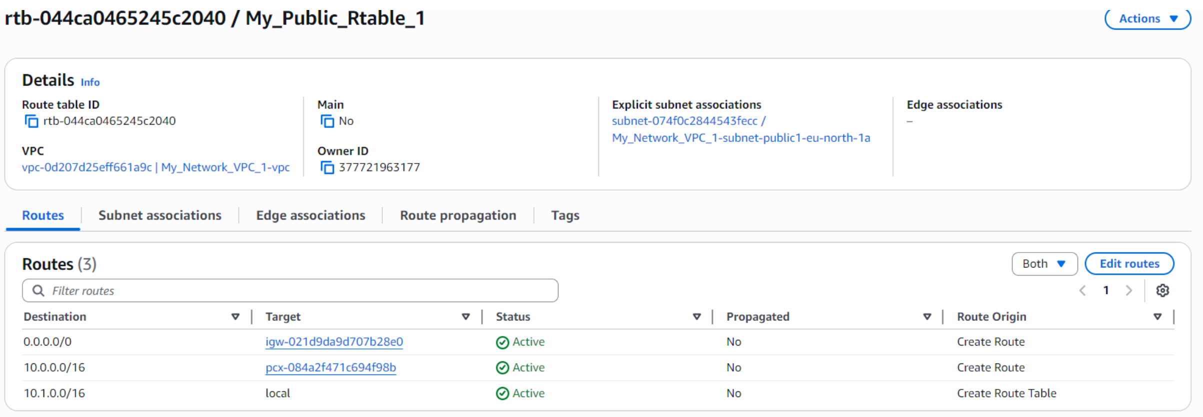
- Each route table belongs to a different VPC, which means they control traffic **inside** their own VPC only.
- To make both VPCs talk to each other, I had to **manually create a path** in each route table that points to the peering connection.
- Without these routes, even though the peering link exists, the instances won't know how to reach the other VPC's IP range.

- So I opened the route table for the first VPC and prepared to add a route that sends traffic to the **other VPC's CIDR block** through the **peering connection**.



Adding Routes to Both VPCs

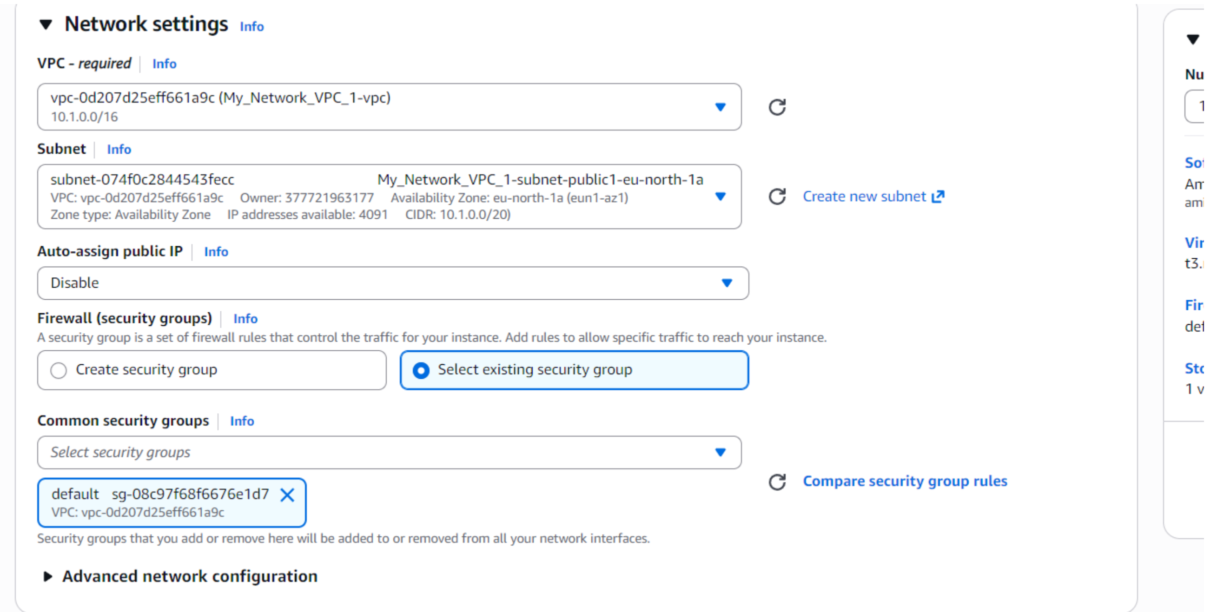
- My **My_Public_RTable1** belonged to **My_Network_VPC1**, which uses the CIDR block **10.1.0.0/16**.
- My **My_Public_RTable** belonged to **My_Network_VPC**, which uses the CIDR block **10.0.0.0/16**.
- I opened **My_Public_RTable1** first and added a new route.
  - **Destination:** 10.0.0.0/16 (the CIDR block of the second VPC)
  - **Target:** the VPC peering connection
    This tells VPC1 that any traffic meant for 10.0.0.0/16 should be sent through the peering link.
- Then I opened **My_Public_RTable** and did the exact same thing in reverse.
  - **Destination:** 10.1.0.0/16 (the CIDR block of the first VPC)
  - **Target:** the same peering connection
    This allows VPC2 to send traffic back to VPC1.
- After adding these routes, both VPCs now had a **two-way private path** for communication through the peering connection.



Why We Must Add the Other VPC's CIDR Block (Even Though the Route Table Already Has 0.0.0.0/0)

- Even though the public route table already had the route **0.0.0.0/0 → Internet Gateway**, that only sends traffic **to the internet**, not to another VPC.

- The CIDR block **0.0.0.0/0** means "send all *unknown* traffic to the internet," but the other VPC's IP range (10.x.x.x) is *not* on the public internet.
  It exists **inside AWS's private network**, not outside.
- Because of this, the route table needs a **specific rule** telling it:
  "If the destination is the *other* VPC's private CIDR block, send it through the *peering connection*, not the Internet Gateway."
- Without adding the other VPC's CIDR block, the instance would try to send that traffic to the **Internet Gateway**, which cannot reach private AWS networks.
  The traffic would simply get lost.
- By adding the correct CIDR block and pointing it to the **peering connection**, we are telling AWS:
  "This traffic is meant for another private network — send it through the private link, not the internet."
- This is why **every VPC peering setup requires explicit route entries** for both VPCs, even when using public route tables.

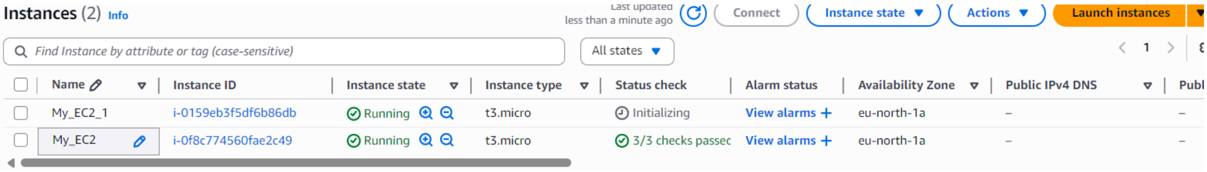


Creating EC2 Instances in Both VPCs for Peering Tests

- To test VPC peering, I needed to run an EC2 instance **inside each VPC**.
  This allows me to send traffic from one VPC to the other using private IP addresses.
- First, I created an EC2 instance and named it **My_EC2_1**.
  - I selected **My_Network_VPC1** as the VPC.
  - I chose the **public subnet** of that VPC.
  - I **disabled Auto-assign Public IP**, because for peering tests we only want **private-to-private** communication.
  - For the security group, I selected the **default SG** that was automatically created when the VPC was created.
- Then I created another EC2 instance in the **second VPC** and named it **My_EC2**.
  - I placed it inside **My_Network_VPC**.
  - I used the public subnet of this VPC as well.

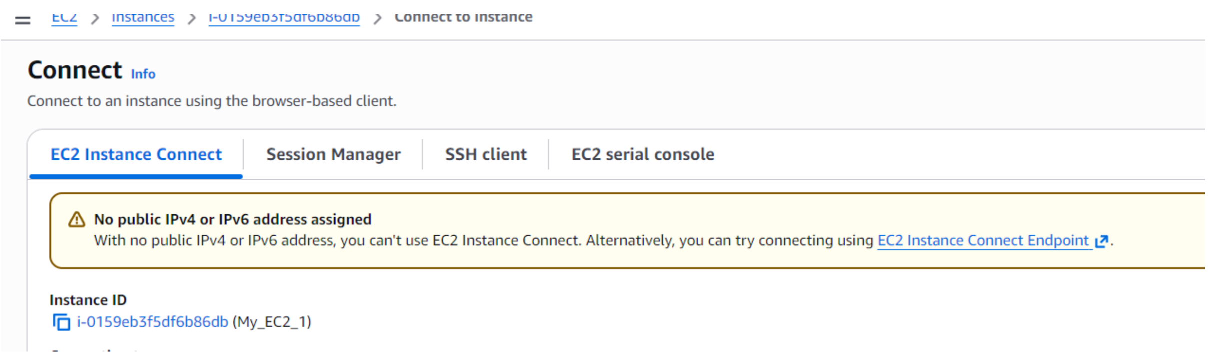
- I applied the **same settings**: no public IP and the **default Security Group** of its VPC.

- At this point, each VPC had its own EC2 instance, ready to test **cross-VPC communication** through the peering connection.



Connection Error – No Public IP

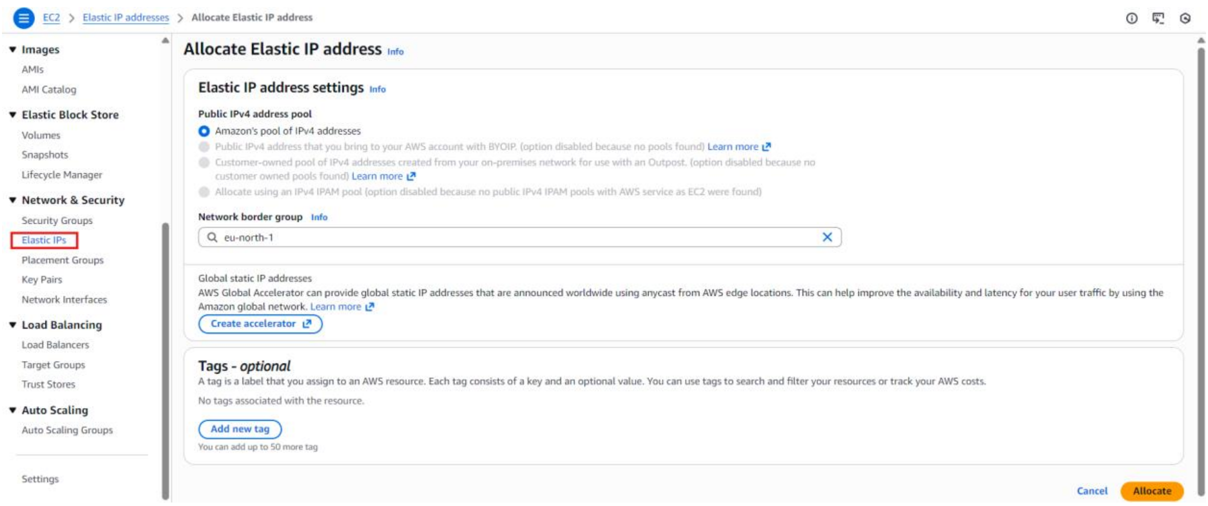
- After both instances were created, I selected one of them and tried to connect using the AWS **Connect** button.
- However, I received an error saying that the instance has **no public IP address**.



- The reason is simple:
  The AWS browser-based **EC2 Connect** method requires a **public IP** so AWS can reach the instance over the internet.
  Without a public IP, the instance cannot be accessed directly from the AWS console or the outside world.
- Since I purposely **disabled Auto-assign Public IP** on both instances (because peering tests use only private IPs), the console connection method could not work.

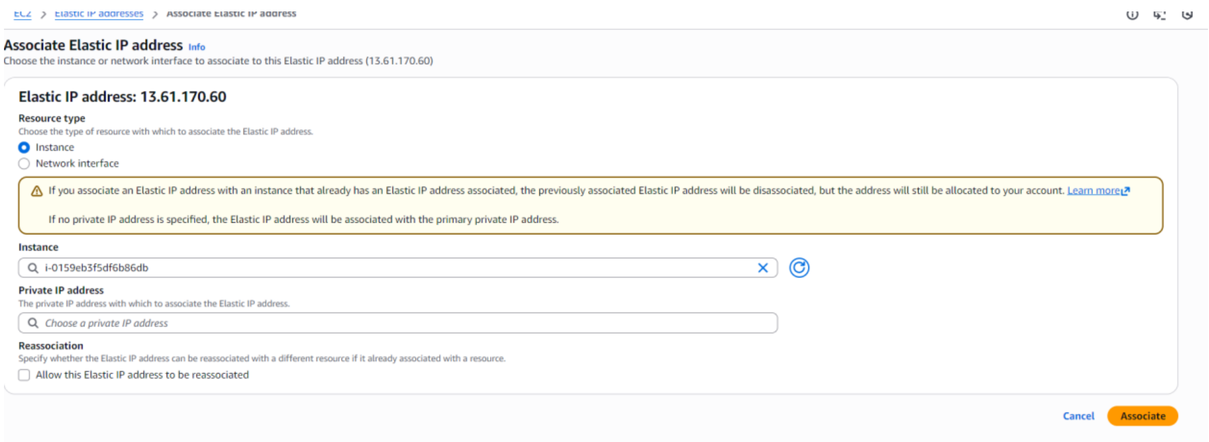
What Are Elastic IPs?

- **Elastic IPs are static IPv4 addresses** that AWS allocates to your account.
- “Static” means the IP stays the **same**, unlike the **dynamic public IPs** that EC2 instances normally get.
- When an EC2 instance restarts, its normal public IP changes — but an Elastic IP **does not**.
- Having an Elastic IP is like having a **permanent address**, instead of moving to a new house every time the instance restarts.



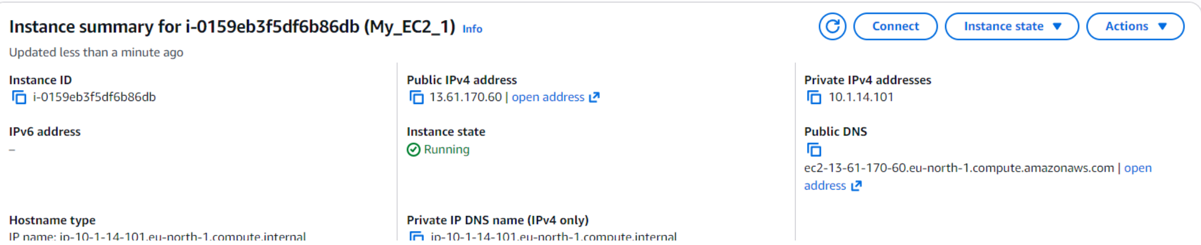
Allocating an Elastic IP

- In the EC2 console, under **Network & Security**, I selected **Elastic IPs**.
- Then I clicked **Allocate Elastic IP address**.
- I confirmed the **correct border group** (this ensures the IP is allocated in the right AWS network location).
- Finally, I selected **Amazon's IPv4 address pool** and allocated the IP.



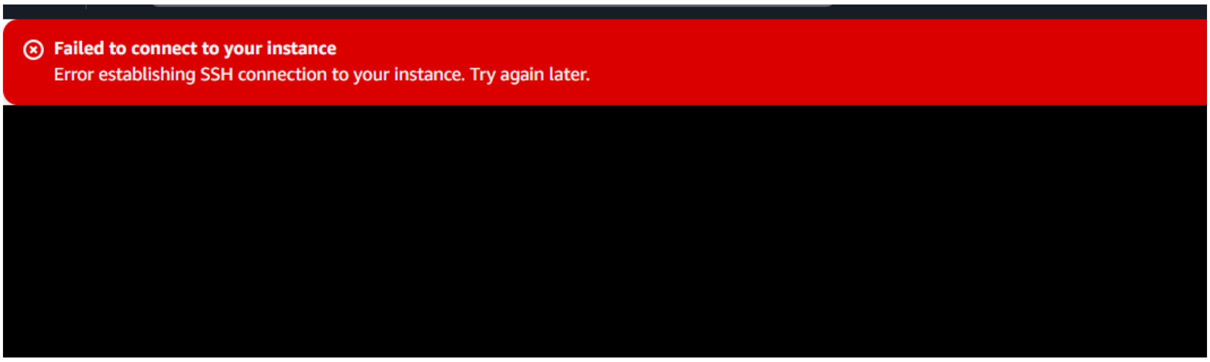
Associating the Elastic IP

- After allocating the Elastic IP, the next step was to **associate** it with the EC2 instance I wanted to connect to.
- I selected the Elastic IP from the list and clicked **Actions → Associate Elastic IP address**.
- In the association window, I chose the instance **My_Instance_VPC1**, which was the instance that needed a public, static IP for connection.
- I confirmed the settings and completed the association.
- Once associated, **My_Instance_VPC1** instantly received the Elastic IP, making it reachable from the internet.



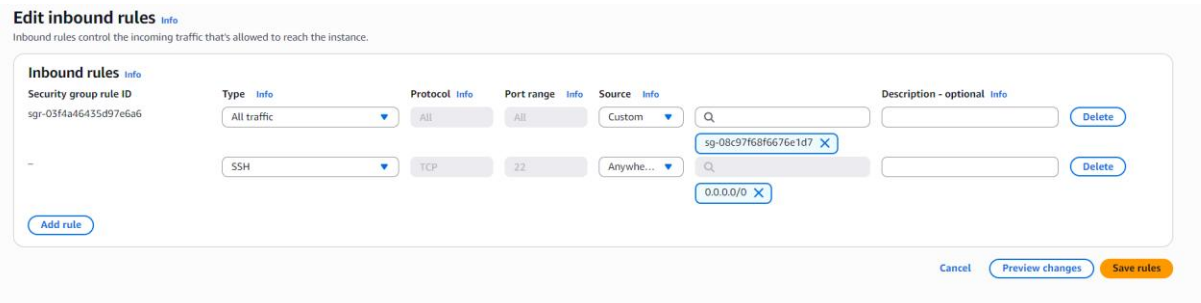
Elastic IP Successfully Assigned

- After associating the Elastic IP with **My_Instance_VPC1**, I checked the instance details.
- I could clearly see that the instance had now received a **public IP address**.
- This public IP is the **Elastic IP** that was assigned to me from the Amazon IP pool.
- Because it is an Elastic IP, it will **remain the same** even if the instance is stopped or restarted.
- With this public IP in place, the instance became fully reachable from the internet.



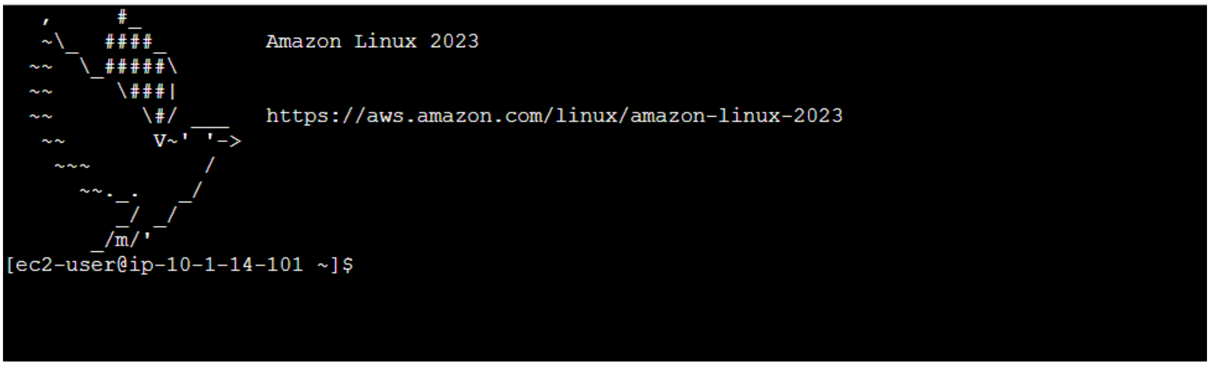
SSH Connection Issue

- After assigning the Elastic IP, I tried connecting to the instance again.
- This time, instead of the "no public IP" error, I ran into a **new SSH error**.
- The browser-based terminal couldn't establish an SSH connection with the instance.
- This meant the issue was no longer about the public IP — it was now related to **security group settings**, **firewall rules**, or **SSH ports** not being open.
- So I had to troubleshoot the SSH configuration to understand what was blocking the connection.



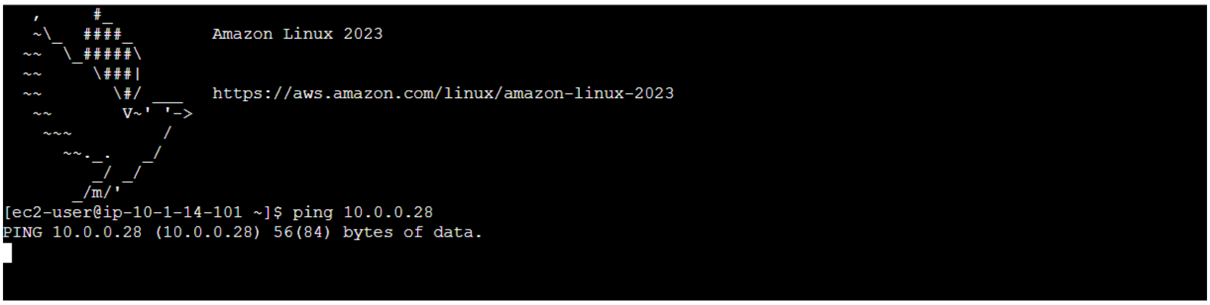
Fixing the SSH Connection Issue

- First, I checked the **Network ACL**, and everything looked correct.
  Both inbound and outbound rules allowed the traffic that SSH needs.
- Then I checked the **Security Group** attached to the instance.
  By default, the SG allowed all traffic **only from a specific security group**, not from the internet.
- Because of this, SSH (port 22) was **not accessible from my public IP** or from anywhere outside that SG.
- To fix it, I added a new **Inbound Rule**:
  - **Type:** SSH
  - **Port:** 22
  - **Source:** 0.0.0.0/0 (allows connection from anywhere for testing)
- After saving the rule, the instance became reachable again through SSH using the Elastic IP.



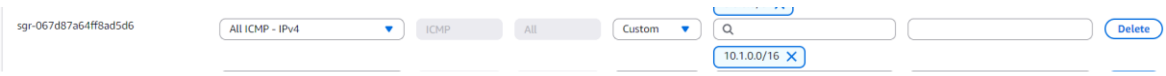
Connection Successfully Established

- After updating the security group and allowing SSH from anywhere, I retried the connection.
- This time, the SSH session opened successfully on **My_EC2_1**.
- The Elastic IP, route settings, NACL, and security group were now correctly configured, allowing the instance to be accessed without any issues.



Initial VPC Peering Ping Test

- After successfully connecting to **My_EC2_1**, I tested cross-VPC connectivity.
- I tried to **ping the private IP** of the second instance (**My_EC2**) located in the other VPC.
- Only **one ping was delivered**, and then the replies stopped completely.
- This meant that although the VPC peering connection existed, something was still **blocking the return traffic** between the two instances.
- I had to troubleshoot the security layers (SG + NACL) to find out what was preventing full communication across the VPCs.



Fixing the ICMP Issue in the Second VPC

- After checking the setup, I discovered that the **Security Group** of the EC2 instance in the second VPC had **no ICMP rules** at all.
- This meant the instance was **not allowing ping (ICMP) traffic in or out**, which explained why only one ping was delivered and no replies were sent back.
- To fix this, I added a new **Inbound Rule**:
  - **Type:** ICMP – IPv4
  - **Source: 10.1.0.0/16** (the CIDR block of VPC1)
- This ensured that only traffic **coming from the first VPC** was allowed, keeping the setup secure while still enabling cross-VPC communication.
- After saving the changes, the instance in the second VPC was now able to receive and respond to ICMP traffic from the first VPC.

```
64 bytes from 10.0.0.28: icmp_seq=326 ttl=127 time=0.184 ms
64 bytes from 10.0.0.28: icmp_seq=327 ttl=127 time=0.182 ms
64 bytes from 10.0.0.28: icmp_seq=328 ttl=127 time=0.174 ms
64 bytes from 10.0.0.28: icmp_seq=329 ttl=127 time=0.155 ms
64 bytes from 10.0.0.28: icmp_seq=330 ttl=127 time=0.181 ms
64 bytes from 10.0.0.28: icmp_seq=331 ttl=127 time=0.190 ms
64 bytes from 10.0.0.28: icmp_seq=332 ttl=127 time=0.174 ms
64 bytes from 10.0.0.28: icmp_seq=333 ttl=127 time=0.180 ms
64 bytes from 10.0.0.28: icmp_seq=334 ttl=127 time=0.223 ms
64 bytes from 10.0.0.28: icmp_seq=335 ttl=127 time=0.175 ms
64 bytes from 10.0.0.28: icmp_seq=336 ttl=127 time=0.194 ms
64 bytes from 10.0.0.28: icmp_seq=337 ttl=127 time=0.172 ms
64 bytes from 10.0.0.28: icmp_seq=338 ttl=127 time=0.158 ms
64 bytes from 10.0.0.28: icmp_seq=339 ttl=127 time=0.174 ms
64 bytes from 10.0.0.28: icmp_seq=340 ttl=127 time=0.181 ms
64 bytes from 10.0.0.28: icmp_seq=341 ttl=127 time=0.171 ms
64 bytes from 10.0.0.28: icmp_seq=342 ttl=127 time=0.186 ms
64 bytes from 10.0.0.28: icmp_seq=343 ttl=127 time=0.177 ms
64 bytes from 10.0.0.28: icmp_seq=344 ttl=127 time=0.186 ms
64 bytes from 10.0.0.28: icmp_seq=345 ttl=127 time=0.175 ms
64 bytes from 10.0.0.28: icmp_seq=346 ttl=127 time=0.168 ms
64 bytes from 10.0.0.28: icmp_seq=347 ttl=127 time=0.239 ms
64 bytes from 10.0.0.28: icmp_seq=348 ttl=127 time=0.168 ms
64 bytes from 10.0.0.28: icmp_seq=349 ttl=127 time=0.167 ms
64 bytes from 10.0.0.28: icmp_seq=350 ttl=127 time=0.170 ms
64 bytes from 10.0.0.28: icmp_seq=351 ttl=127 time=0.161 ms
64 bytes from 10.0.0.28: icmp_seq=352 ttl=127 time=0.191 ms
64 bytes from 10.0.0.28: icmp_seq=353 ttl=127 time=0.202 ms
64 bytes from 10.0.0.28: icmp_seq=354 ttl=127 time=0.167 ms
64 bytes from 10.0.0.28: icmp_seq=355 ttl=127 time=0.180 ms
64 bytes from 10.0.0.28: icmp_seq=356 ttl=127 time=0.170 ms
64 bytes from 10.0.0.28: icmp_seq=357 ttl=127 time=0.169 ms
```

i-0159eb3f5df6b86db (My_EC2_1)

PublicIPs: 13.61.170.60 PrivateIPs: 10.1.14.101

Successful VPC Peering Connectivity

- After updating the Security Group in the second VPC to allow ICMP traffic from **10.1.0.0/16**, I tested the ping again from **My_EC2_1**.
- This time, the ping replies started coming through continuously without stopping.
- This confirmed that the instances in both VPCs were now able to **communicate privately** using the VPC peering connection.
- With this, the cross-VPC connectivity was successfully established and verified.

Conclusion

This project helped me understand how to design and troubleshoot communication between multiple VPCs using **VPC Peering**. I learned how to set up two isolated VPCs, connect them through a private peering link, configure routing paths, and adjust security layers like NACLs and Security Groups to allow cross-VPC traffic.

By launching EC2 instances in each VPC and testing connectivity with private IPs, I saw first-hand how traffic flows through the peering connection and how AWS keeps this communication entirely **private**, without using the public internet.

Overall, this project strengthened my understanding of:

- Multi-VPC architectures
- Route table configuration for private paths
- Security controls that affect cross-VPC traffic
- Troubleshooting network issues across isolated environments

This hands-on experience gave me a deeper understanding of how real-world cloud networks communicate securely inside AWS.