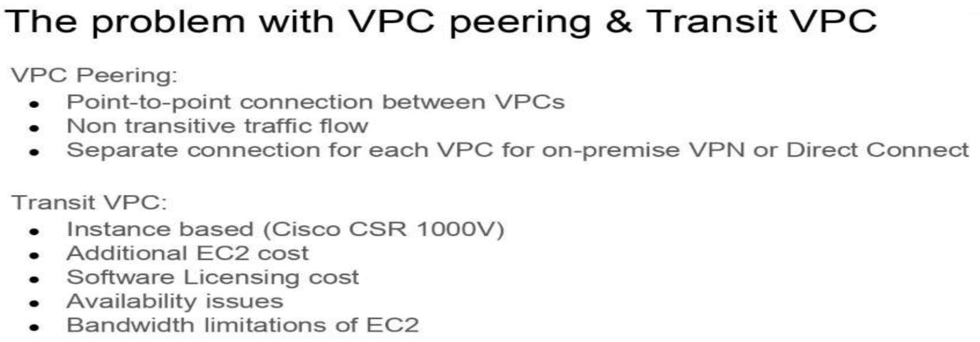
Transit Gateway

A *transit gateway* is a network transit hub that you can use to interconnect your virtual private clouds (VPCs) and on-premises networks. As your cloud infrastructure expands globally, inter-Region peering connects transit gateways together using the AWS Global Infrastructure. All network traffic between AWS data centers is automatically encrypted at the physical layer.



The problem with VPC peering & Transit VPC

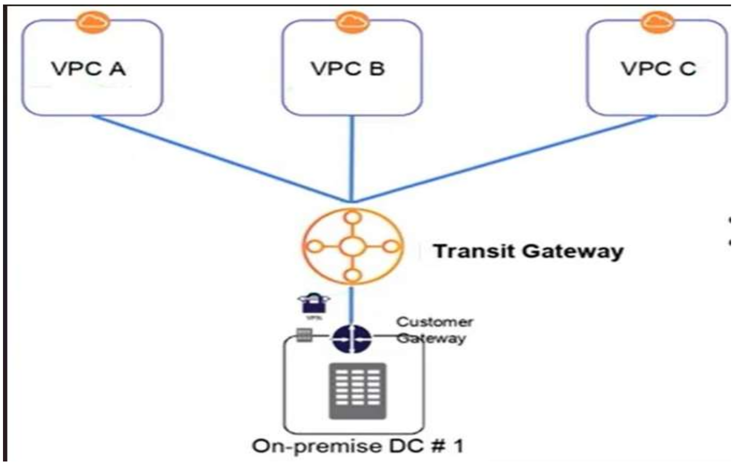
VPC Peering:

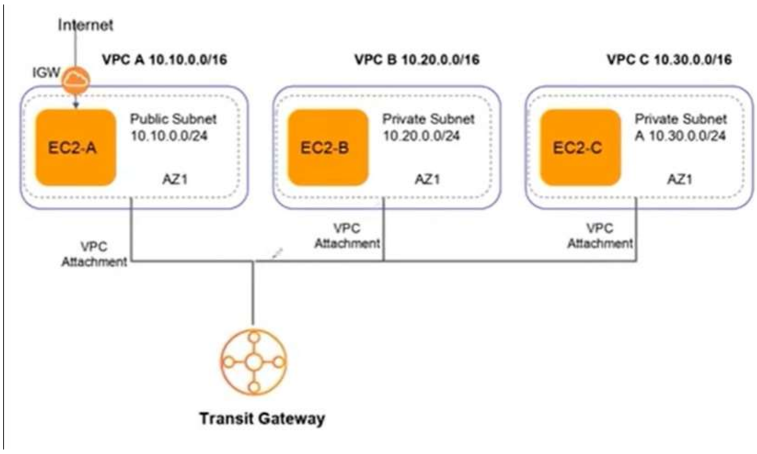
- Point-to-point connection between VPCs
- Non transitive traffic flow
- Separate connection for each VPC for on-premise VPN or Direct Connect

Transit VPC:

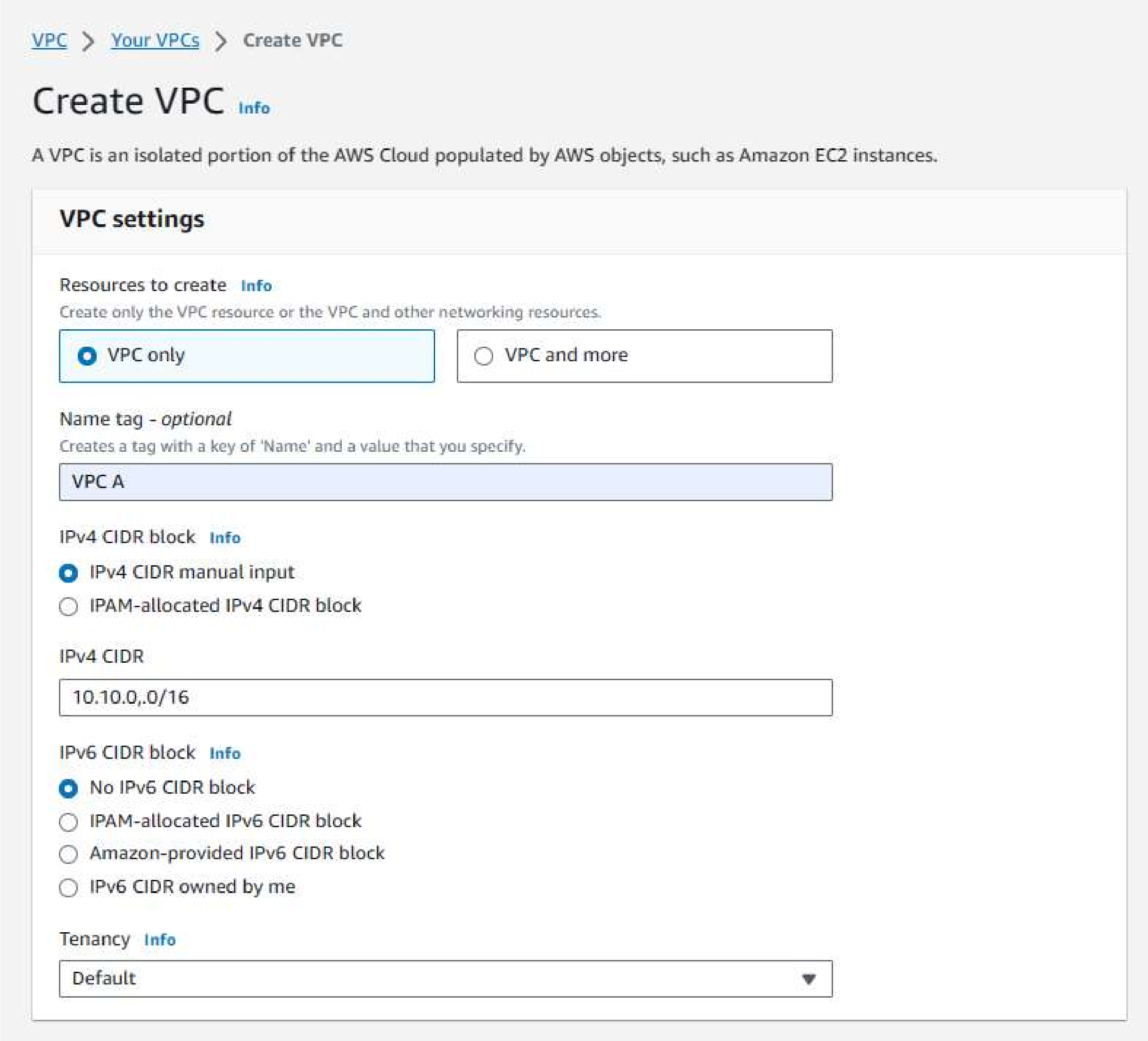
- Instance based (Cisco CSR 1000V)
- Additional EC2 cost
- Software Licensing cost
- Availability issues
- Bandwidth limitations of EC2

Here we’re doing hands-on based on the below diagrams:





Select VPC from AWS console and Create VPC



VPC > Your VPCs > Create VPC

Create VPC Info

A VPC is an isolated portion of the AWS Cloud populated by AWS objects, such as Amazon EC2 instances.

VPC settings

Resources to create Info
Create only the VPC resource or the VPC and other networking resources.

● VPC only ○ VPC and more

Name tag - *optional*
Creates a tag with a key of 'Name' and a value that you specify.
VPC A

IPv4 CIDR block Info
● IPv4 CIDR manual input
○ IPAM-allocated IPv4 CIDR block

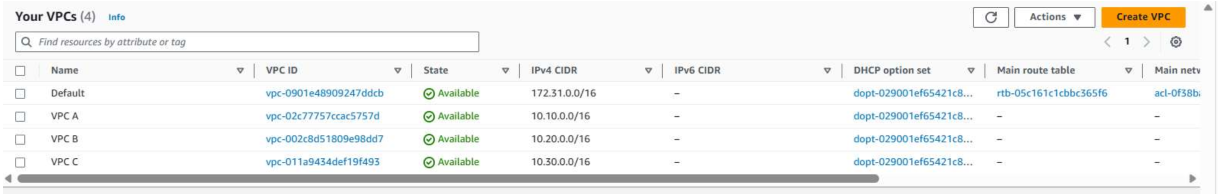
IPv4 CIDR
10.10.0,.0/16

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

Then click on Create VPC.

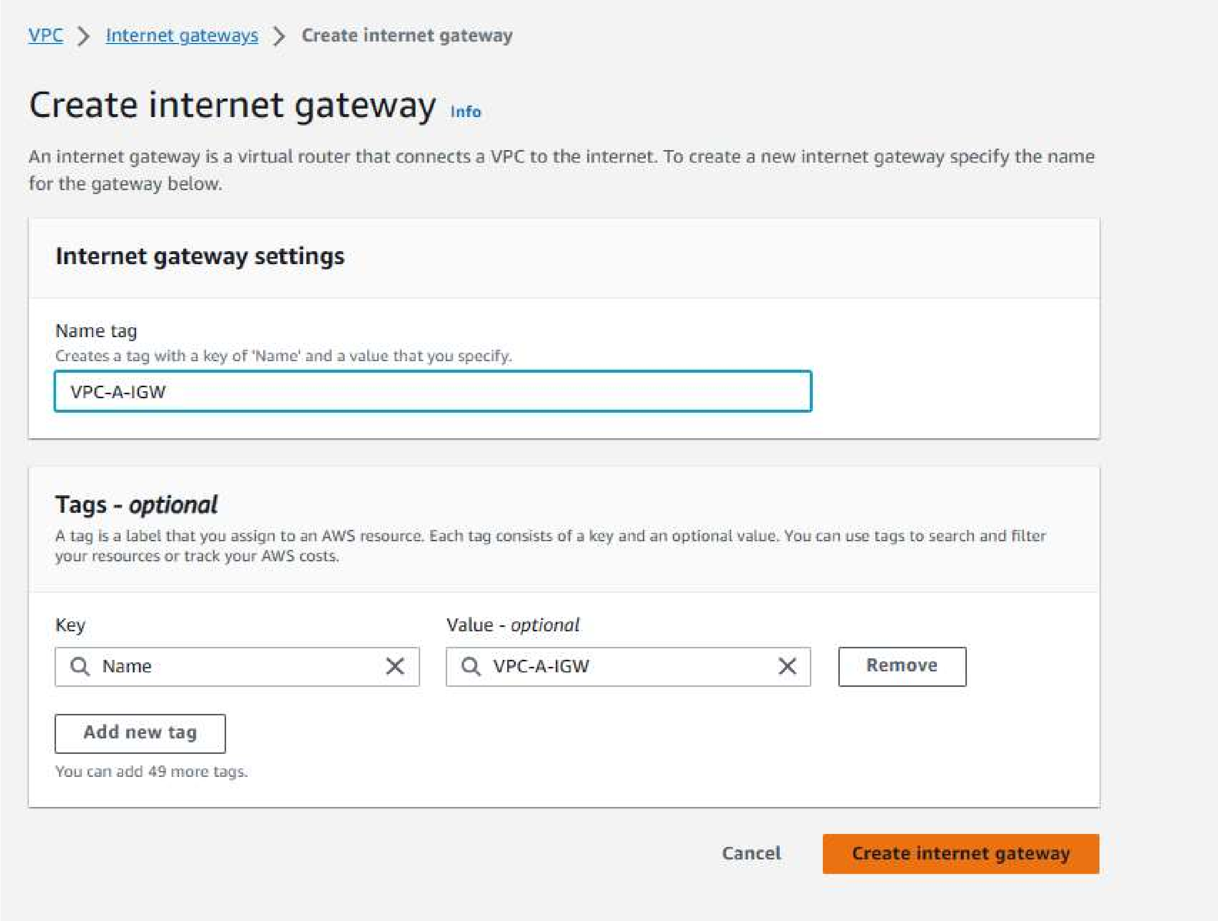
In a similar way , create other 2 CPCs naming VPC B and VPC C with 10.20.0.0/16 . 10.30.0.0/16 as IP addresses respectively.



☐	Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP option set	Main route table	Main netv
☐	Default	vpc-0901e48909247ddcb	✓ Available	172.31.0.0/16	–	dopt-029001ef65421c8...	rtb-05c161c1cbbc365f6	acl-0f38b
☐	VPC A	vpc-02c77757ccac5757d	✓ Available	10.10.0.0/16	–	dopt-029001ef65421c8...	–	–
☐	VPC B	vpc-002c8d51809e98dd7	✓ Available	10.20.0.0/16	–	dopt-029001ef65421c8...	–	–
☐	VPC C	vpc-011a9434def19f493	✓ Available	10.30.0.0/16	–	dopt-029001ef65421c8...	–	–

From the diagram , we can see VPC A is public and VPC B & C are private. So we need to configure Internet GateWay for VPC A.

Click on Internet Gateway from the LHS panel and click on create Internet Gateway.



Create internet gateway Info

An internet gateway is a virtual router that connects a VPC to the internet. To create a new internet gateway specify the name for the gateway below.

Internet gateway settings

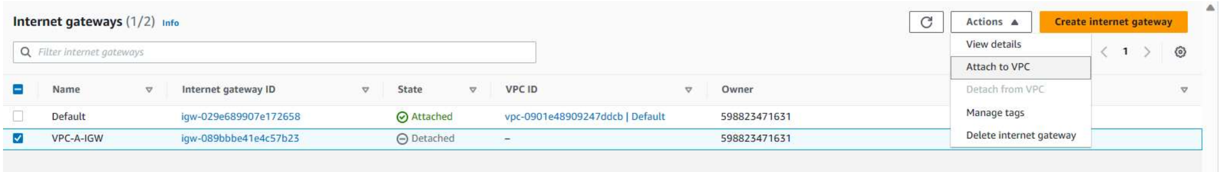
Name tag
Creates a tag with a key of 'Name' and a value that you specify.
VPC-A-IGW

Tags - *optional*
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	VPC-A-IGW

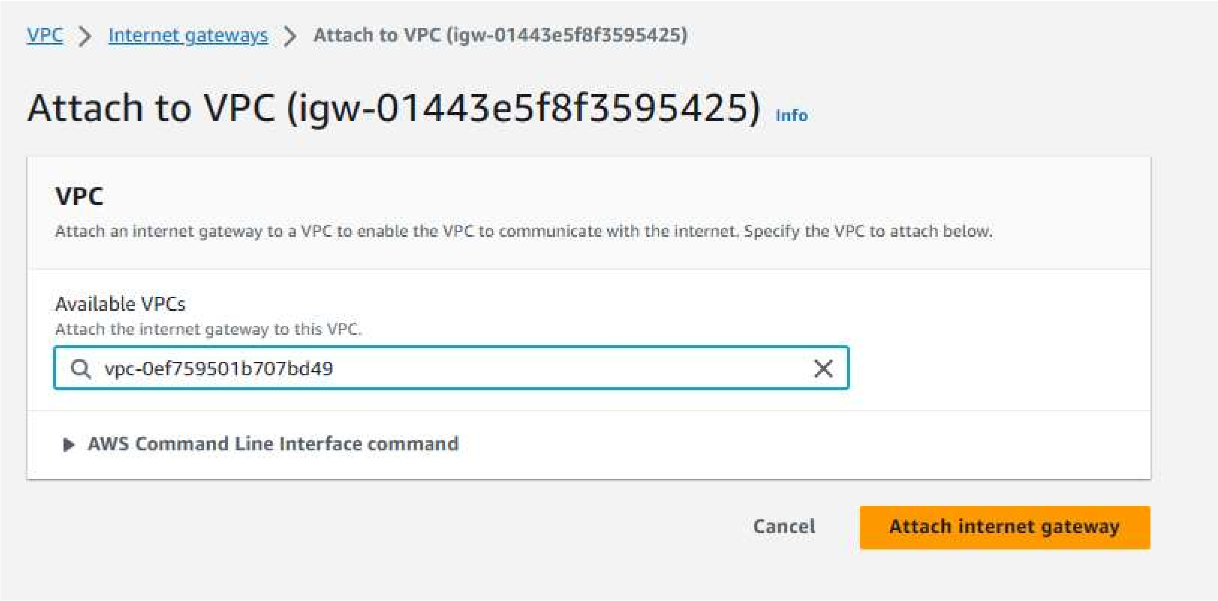
You can add 49 more tags.

Now select the newly created IGW and select Attach to VPC from Actions.


Internet gateways (1/2) Info

	Name	Internet gateway ID	State	VPC ID	Owner
□	Default	igw-029e689907e172658	✓ Attached	vpc-0901e48909247ddcb | Default	598823471631
☑	VPC-A-IGW	igw-089bbbe41e4c57b23	⊖ Detached	–	598823471631

Select VPC A from drop down and click on Attach internet gateway


VPC > Internet gateways > Attach to VPC (igw-01443e5f8f3595425)

Attach to VPC (igw-01443e5f8f3595425) Info

VPC

Attach an internet gateway to a VPC to enable the VPC to communicate with the internet. Specify the VPC to attach below.

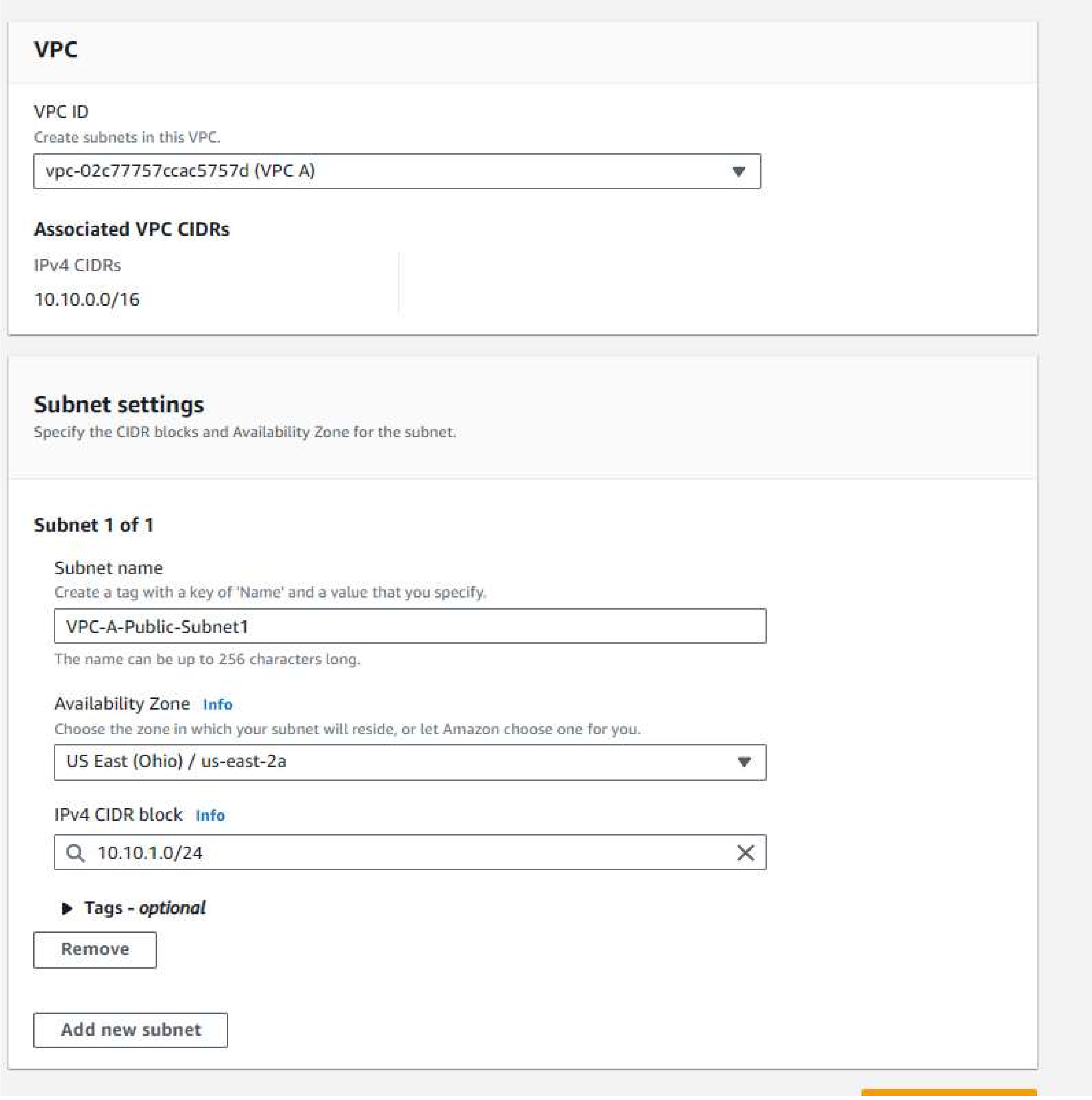
Available VPCs

Attach the internet gateway to this VPC.

vpc-0ef759501b707bd49

▶ AWS Command Line Interface command

Next we need to create Subnets, for that click on Subnets from the LHS panel and click on create subnet for VPC A as per below:



VPC

VPC ID

Create subnets in this VPC.

vpc-02c77757ccac5757d (VPC A)

Associated VPC CIDRs

IPv4 CIDRs

10.10.0.0/16

Subnet settings

Specify the CIDR blocks and Availability Zone for the subnet.

Subnet 1 of 1

Subnet name

Create a tag with a key of 'Name' and a value that you specify.

VPC-A-Public-Subnet1

The name can be up to 256 characters long.

Availability Zone Info

Choose the zone in which your subnet will reside, or let Amazon choose one for you.

US East (Ohio) / us-east-2a

IPv4 CIDR block Info

10.10.1.0/24

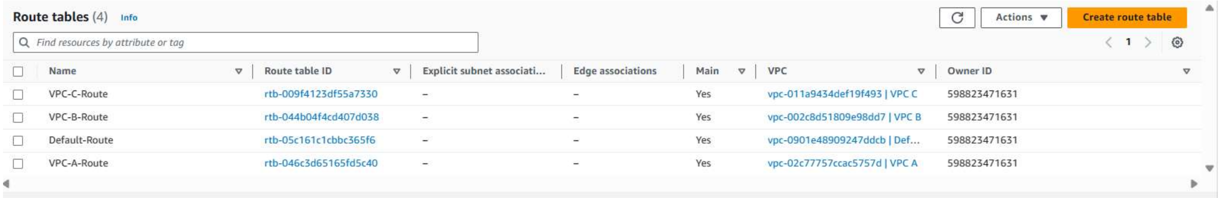
Likewise , we have to create 3 subnets for each VPC. I have created with the info below:

VPC-A-Public-Subnet1
10.10.1.0/24

VPC-B-Private-Subnet1
10.20.1.0/24

VPC-C-Private-Subnet1
10.30.1.0/24

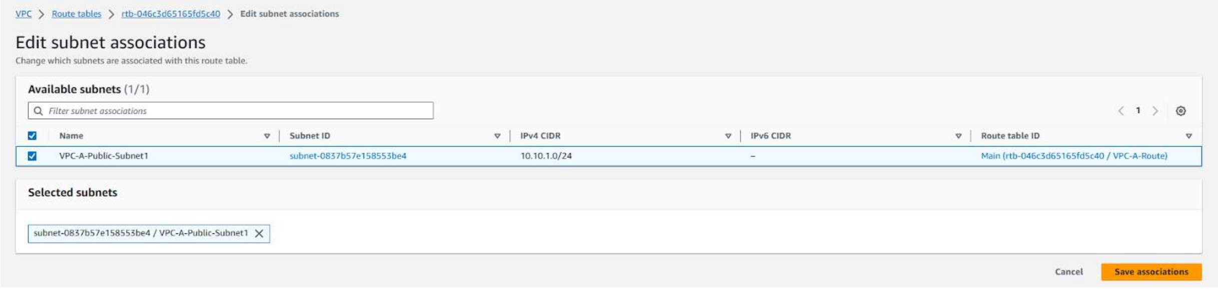
Now we need to add the route tables , Click on Route Tables from the LHS panel and click on create route table.



Route tables (4) Info

☐	Name	Route table ID	Explicit subnet associati...	Edge associations	Main	VPC	Owner ID
☐	VPC-C-Route	rtb-009f4123df55a7330	–	–	Yes	vpc-011a9434def19f493 | VPC C	598823471631
☐	VPC-B-Route	rtb-044b04f4cd407d038	–	–	Yes	vpc-002c8d51809e98dd7 | VPC B	598823471631
☐	Default-Route	rtb-05c161c1cbbc365f6	–	–	Yes	vpc-0901e48909247ddcb | Def...	598823471631
☐	VPC-A-Route	rtb-046c3d65165fd5c40	–	–	Yes	vpc-02c77757ccac5757d | VPC A	598823471631

Next we have to associate the subnet with routing table. For that select VPC-A-Route -> Click on Subnet associations -> Edit subnet associations , then select VPC-A-Public-Subnet1 ->Save associations.



VPC > Route tables > rtb-046c3d65165fd5c40 > Edit subnet associations

Edit subnet associations

Change which subnets are associated with this route table.

Available subnets (1/1)

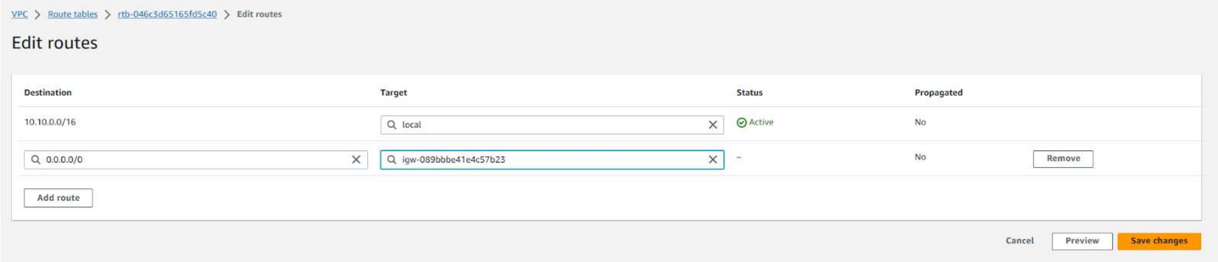
☑	Name	Subnet ID	IPv4 CIDR	IPv6 CIDR	Route table ID
☑	VPC-A-Public-Subnet1	subnet-0837b57e158553be4	10.10.1.0/24	–	Main (rtb-046c3d65165fd5c40 / VPC-A-Route)

Selected subnets

subnet-0837b57e158553be4 / VPC-A-Public-Subnet1 ✕

Do the same for VPC-B-Route and VPC-C-Route.

Select the VPC-A-Route and go to Routes->Edit routes and add as per below , then click on save changes.

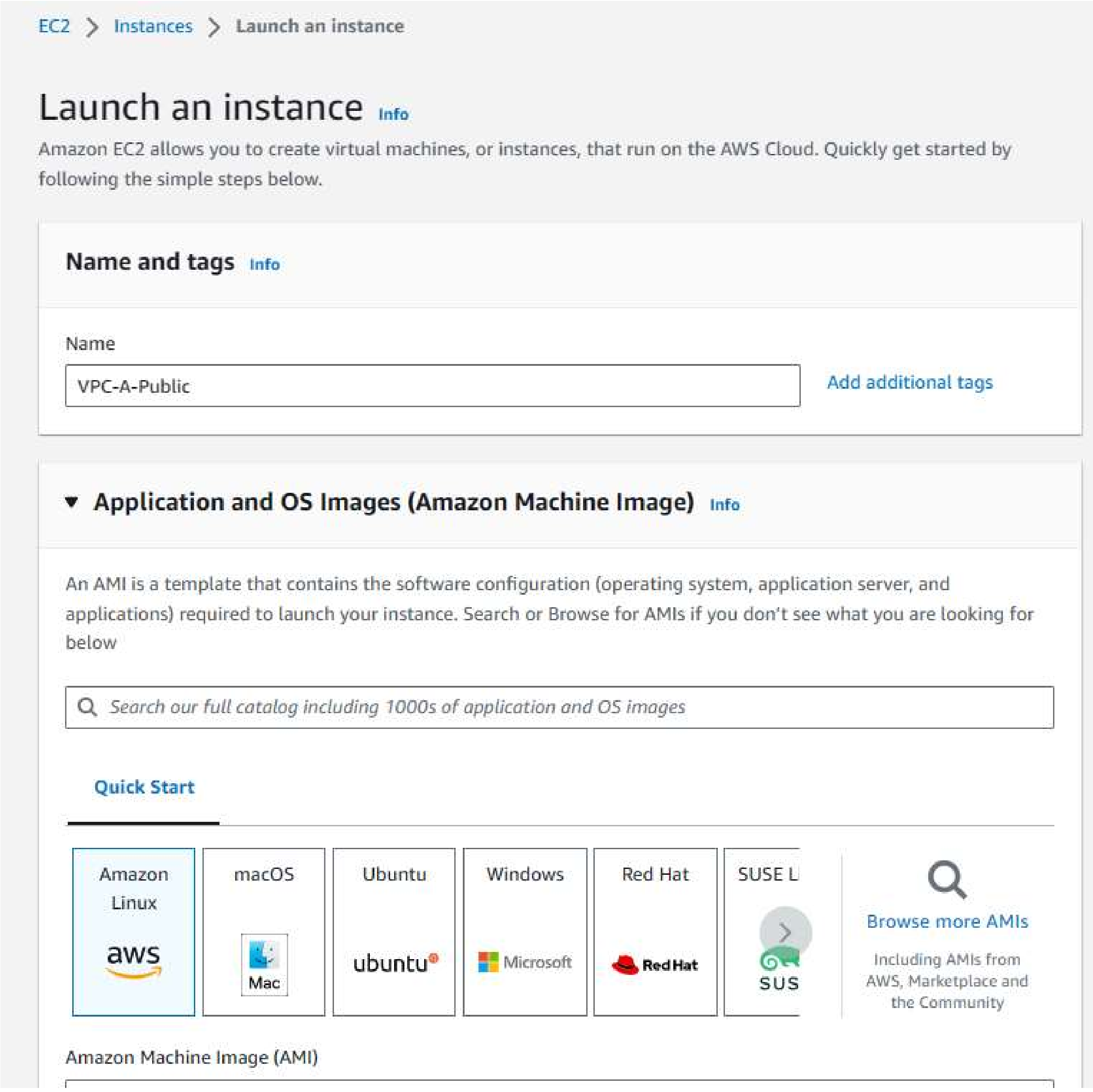


VPC > Route tables > rtb-046c3d65165fd5c40 > Edit routes

Edit routes

Destination	Target	Status	Propagated	
10.10.0.0/16	local	Active	No	
0.0.0.0/0	igw-089bbbe41e4c57b23	-	No	Remove

We’re all set in the VPC part , Now select EC2 from AWS console and create 2 instances as per above diagram.



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

VPC-A-Public

Add additional tags

▼ Application and OS Images (Amazon Machine Image) Info

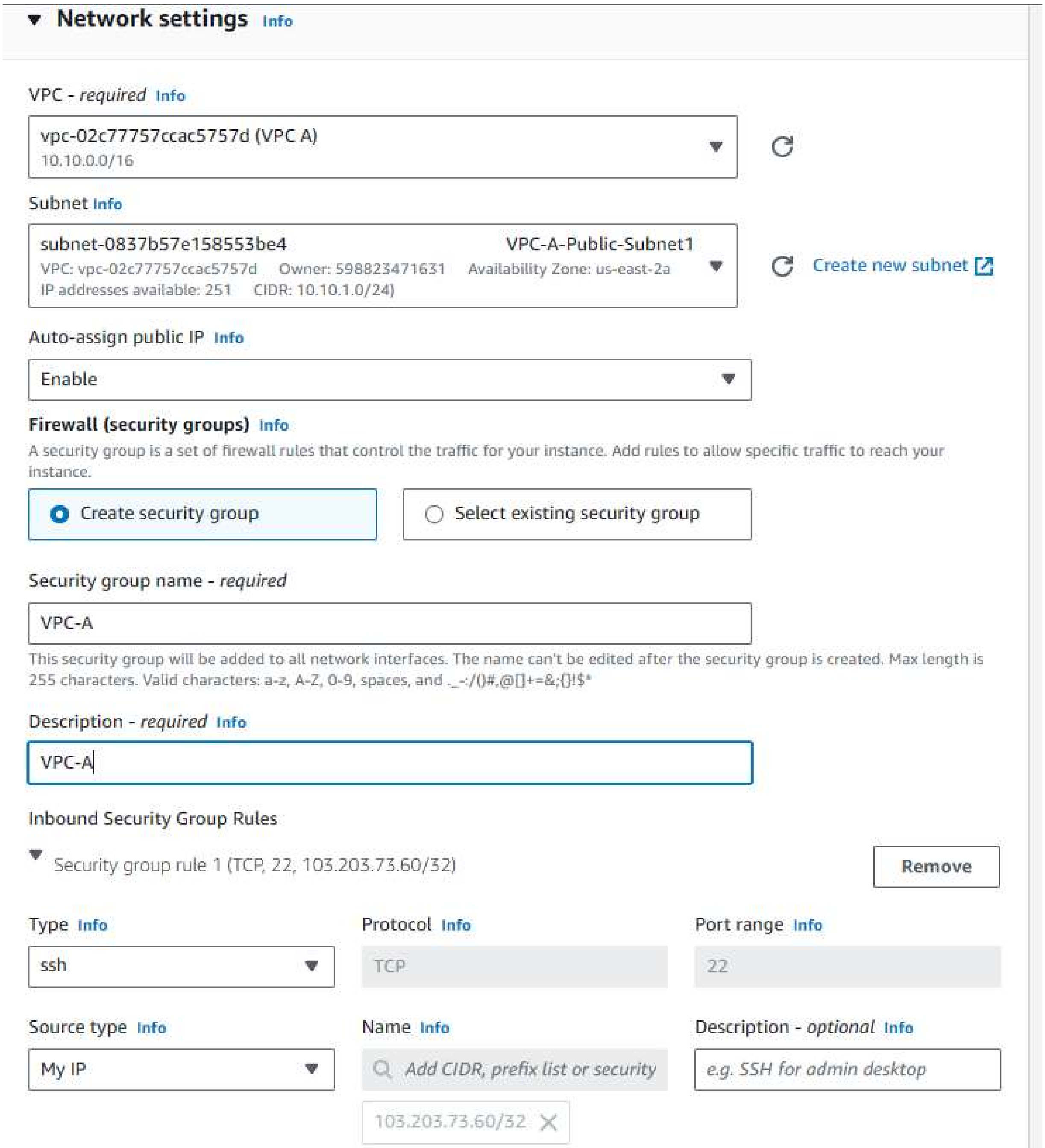
An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

Quick Start

Amazon Machine Image (AMI)

Configure Network Settings as below:



▾ **Network settings** Info

VPC - *required* Info

vpc-02c77757ccac5757d (VPC A)
10.10.0.0/16

Subnet Info

subnet-0837b57e158553be4 VPC-A-Public-Subnet1
VPC: vpc-02c77757ccac5757d Owner: 598823471631 Availability Zone: us-east-2a
IP addresses available: 251 CIDR: 10.10.1.0/24)

Create new subnet

Auto-assign public IP Info

Enable

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

Security group name - *required*

VPC-A

This security group will be added to all network interfaces. The name can't be edited after the security group is created. Max length is 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and ._-:/()#,@[]+=&;{}!$*

Description - *required* Info

VPC-A

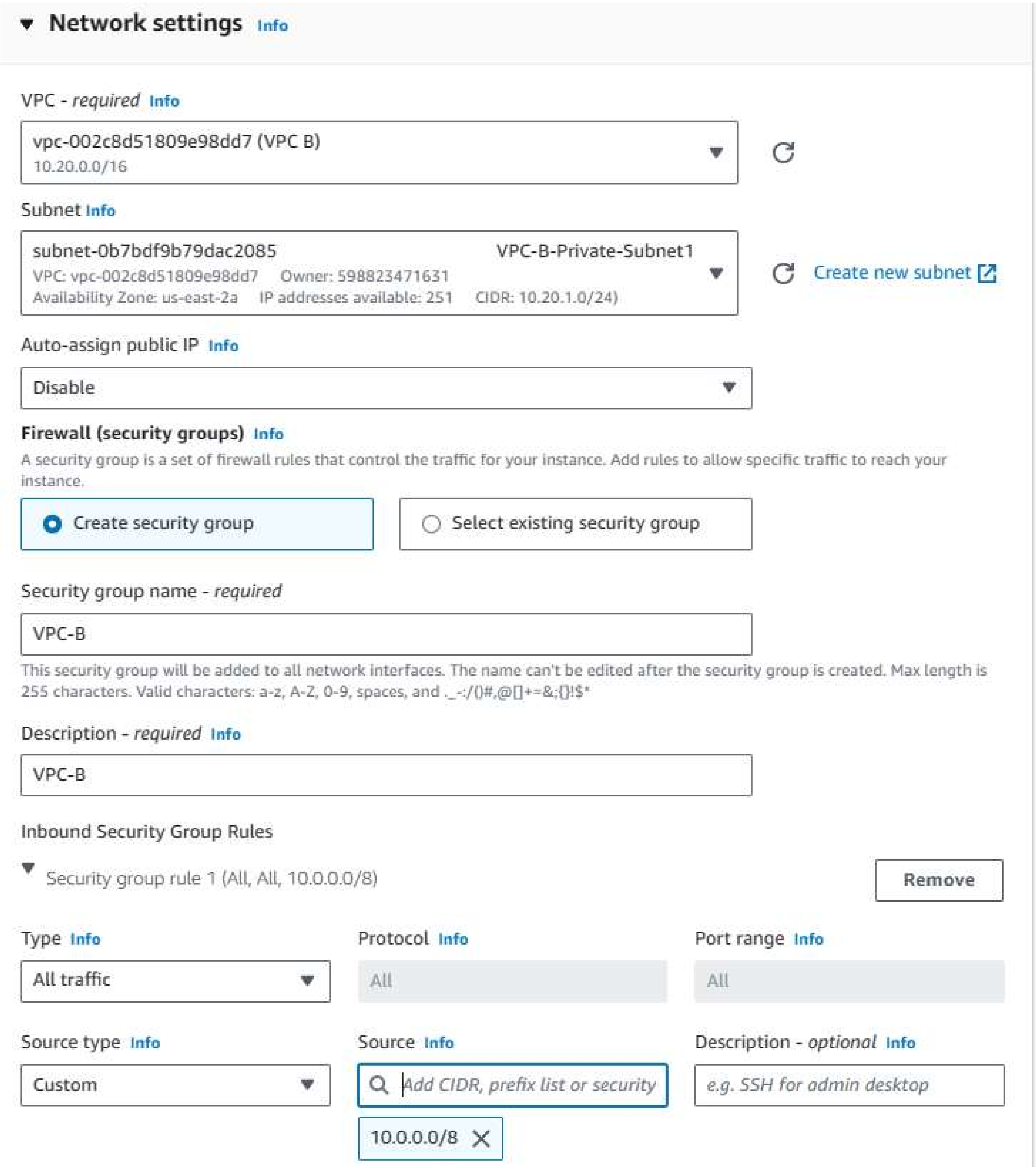
Inbound Security Group Rules

▾ Security group rule 1 (TCP, 22, 103.203.73.60/32) Remove

Type Info	Protocol Info	Port range Info
ssh	TCP	22

Source type Info	Name Info	Description - *optional* Info
My IP	*Add CIDR, prefix list or security* 103.203.73.60/32 ✕	*e.g. SSH for admin desktop*

And launch the instance.
Now create VPC-B-Private as below:



▼ Network settings Info

VPC - *required* Info

vpc-002c8d51809e98dd7 (VPC B)
10.20.0.0/16

Subnet Info

subnet-0b7bdf9b79dac2085 VPC-B-Private-Subnet1
VPC: vpc-002c8d51809e98dd7 Owner: 598823471631
Availability Zone: us-east-2a IP addresses available: 251 CIDR: 10.20.1.0/24)

Auto-assign public IP Info

Disable

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

Security group name - *required*

VPC-B

This security group will be added to all network interfaces. The name can't be edited after the security group is created. Max length is 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and ._-:/()#,@[]+=&;{}!$*

Description - *required* Info

VPC-B

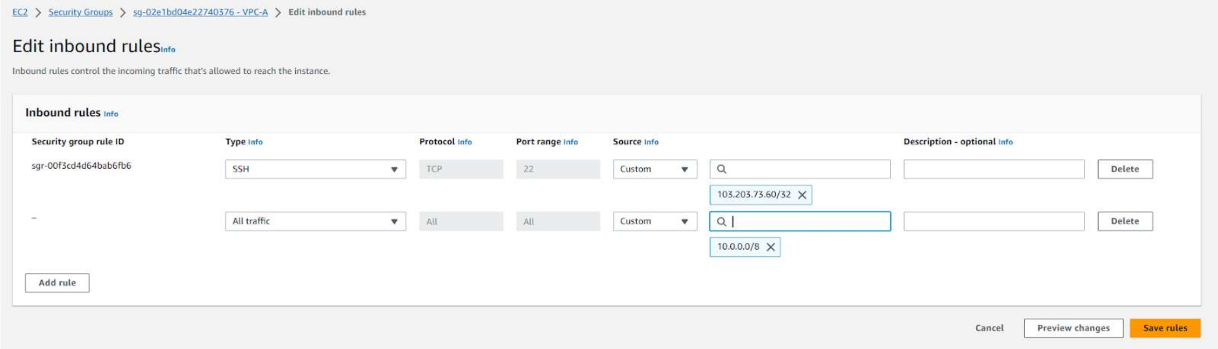
Inbound Security Group Rules

▼ Security group rule 1 (All, All, 10.0.0.0/8)

Type Info	Protocol Info	Port range Info
All traffic	All	All
Source type Info	Source Info	Description - *optional* Info
Custom	*Add CIDR, prefix list or security* 10.0.0.0/8 ✕	*e.g. SSH for admin desktop*

Rest all settings are default or same as VPC-A-Public. Then create one more instance same as VPC-B-Private.

Also create one more inbound rule in VPC-A-Public as shown below:



EC2 > Security Groups > sg-02e1bd04e22740376 - VPC-A > Edit inbound rules

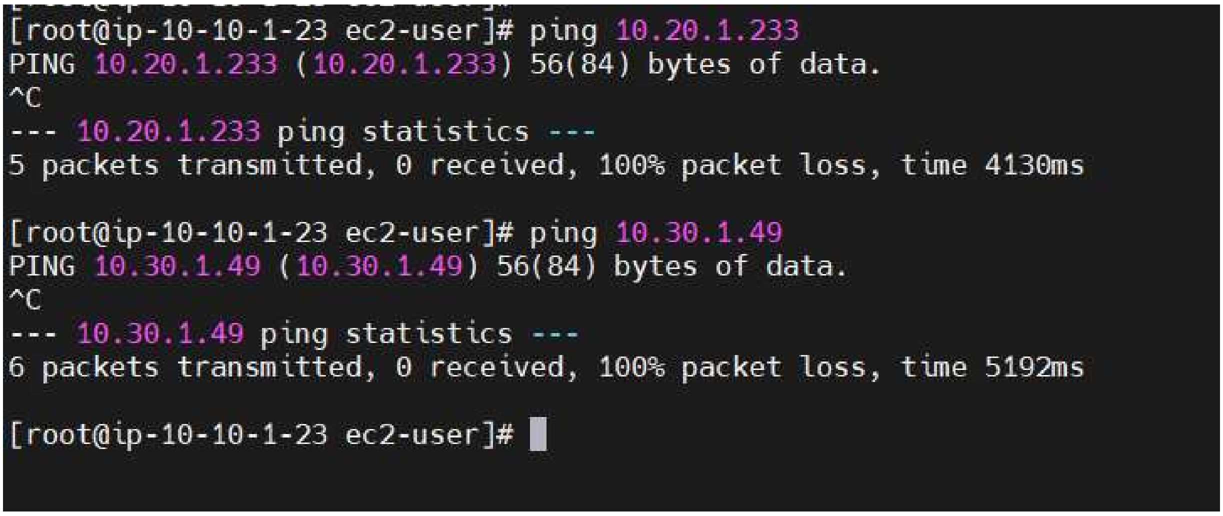
Edit inbound rules Info

Inbound rules control the incoming traffic that's allowed to reach the instance.

Inbound rules Info

Security group rule ID	Type Info	Protocol Info	Port range Info	Source Info		Description - optional Info	
sgr-00f3cd4d64bab6fb6	SSH	TCP	22	Custom	103.203.73.60/32		Delete
–	All traffic	All	All	Custom	10.0.0.0/8		Delete

Once the instances are up and running , take the ssh connection and login as root. Then from VPC-A-Public , check if the private IPs of VPC-B-Private and VPC-C-Private are reachable. It should not be reachable as below:

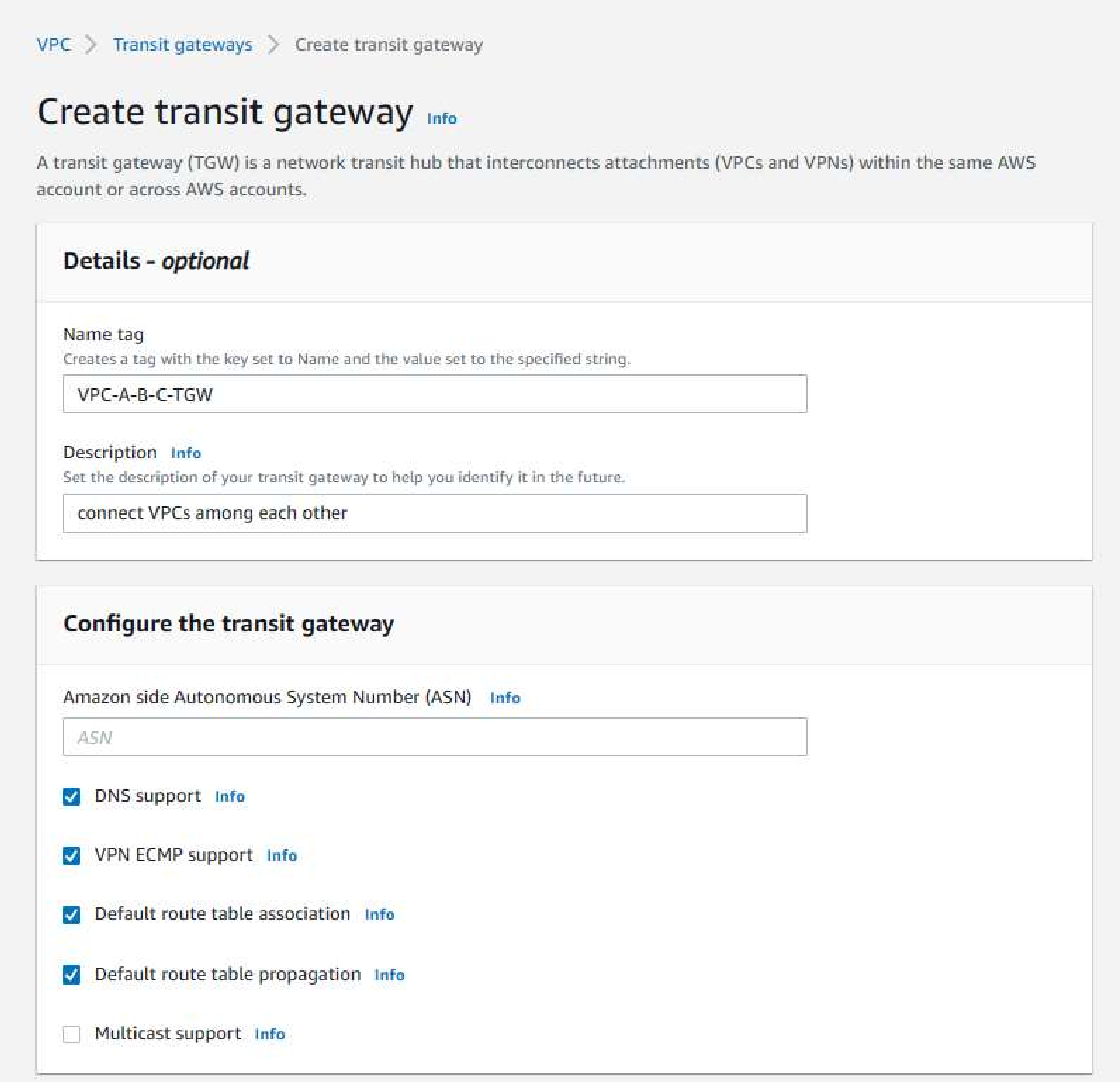


```
[root@ip-10-10-1-23 ec2-user]# ping 10.20.1.233
PING 10.20.1.233 (10.20.1.233) 56(84) bytes of data.
^C
--- 10.20.1.233 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4130ms

[root@ip-10-10-1-23 ec2-user]# ping 10.30.1.49
PING 10.30.1.49 (10.30.1.49) 56(84) bytes of data.
^C
--- 10.30.1.49 ping statistics ---
6 packets transmitted, 0 received, 100% packet loss, time 5192ms

[root@ip-10-10-1-23 ec2-user]#
```

Now we need to connect VPCs among each other.

Go to VPC and click on Transit Gateway.

Create Transit Gateway as shown below



VPC > Transit gateways > Create transit gateway

Create transit gateway Info

A transit gateway (TGW) is a network transit hub that interconnects attachments (VPCs and VPNs) within the same AWS account or across AWS accounts.

Details - *optional*

Name tag
Creates a tag with the key set to Name and the value set to the specified string.
VPC-A-B-C-TGW

Description Info
Set the description of your transit gateway to help you identify it in the future.
connect VPCs among each other

Configure the transit gateway

Amazon side Autonomous System Number (ASN) Info
ASN

☑ DNS support Info

☑ VPN ECMP support Info

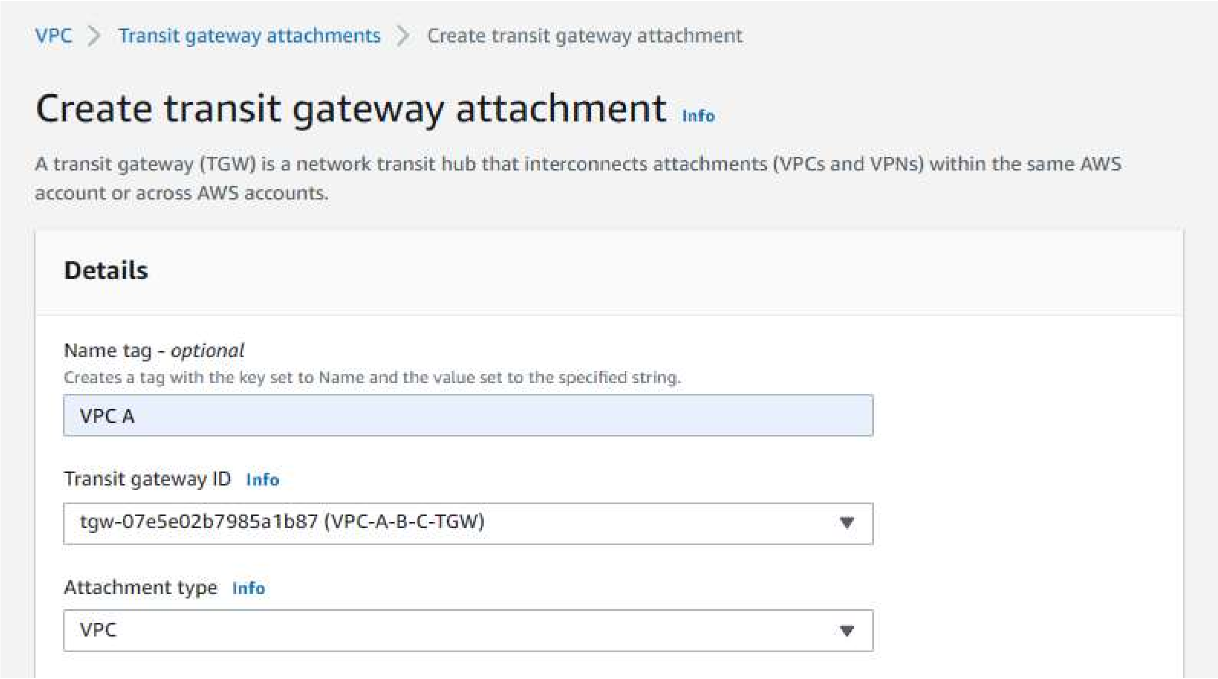
☑ Default route table association Info

☑ Default route table propagation Info

□ Multicast support Info

Select Transit gateway attachment from LHS panel and create Transit gateway attachment for every VPCs.

Give a name and select the transit gateway as shown below:



VPC > Transit gateway attachments > Create transit gateway attachment

Create transit gateway attachment Info

A transit gateway (TGW) is a network transit hub that interconnects attachments (VPCs and VPNs) within the same AWS account or across AWS accounts.

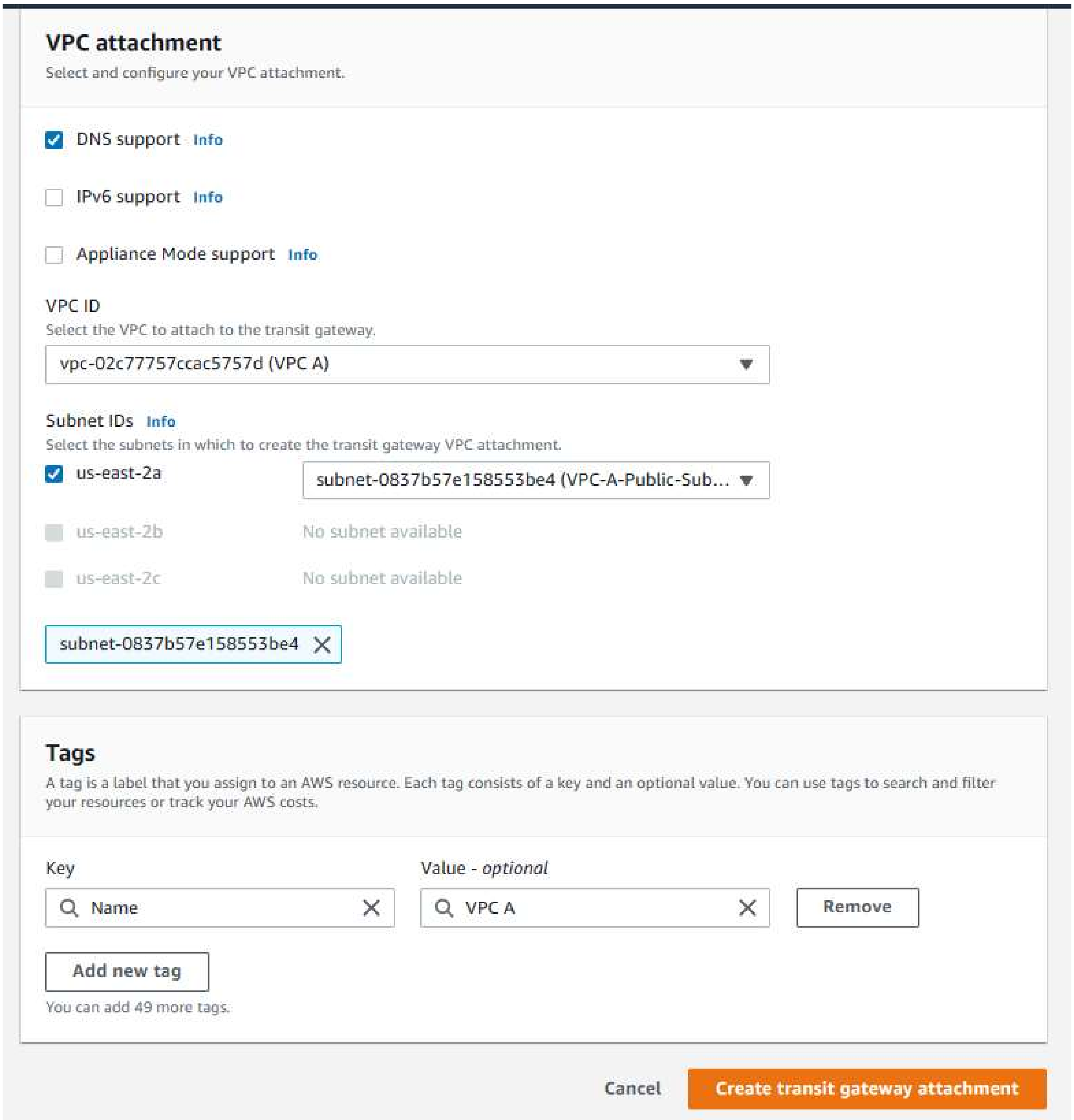
Details

Name tag - *optional*
Creates a tag with the key set to Name and the value set to the specified string.
VPC A

Transit gateway ID Info
tgw-07e5e02b7985a1b87 (VPC-A-B-C-TGW)

Attachment type Info
VPC

Then configure the attachment as below:



VPC attachment

Select and configure your VPC attachment.

☑ DNS support Info

☐ IPv6 support Info

☐ Appliance Mode support Info

VPC ID

Select the VPC to attach to the transit gateway.

vpc-02c77757ccac5757d (VPC A) ▼

Subnet IDs Info

Select the subnets in which to create the transit gateway VPC attachment.

☑ us-east-2a	subnet-0837b57e158553be4 (VPC-A-Public-Sub... ▼
☐ us-east-2b	No subnet available
☐ us-east-2c	No subnet available

subnet-0837b57e158553be4 ✕

Tags

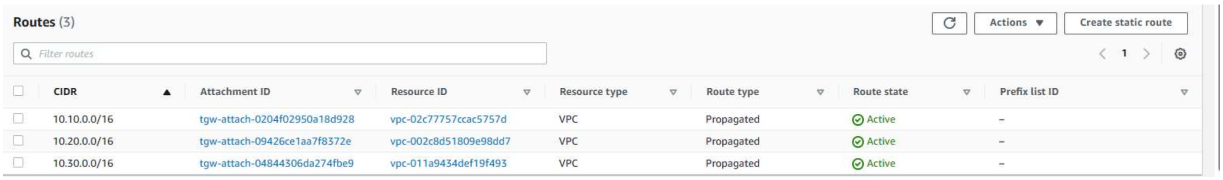
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

Key	Value - *optional*
Name	VPC A

You can add 49 more tags.

Sameway create another 2 attachments for VPC B and VPC C.

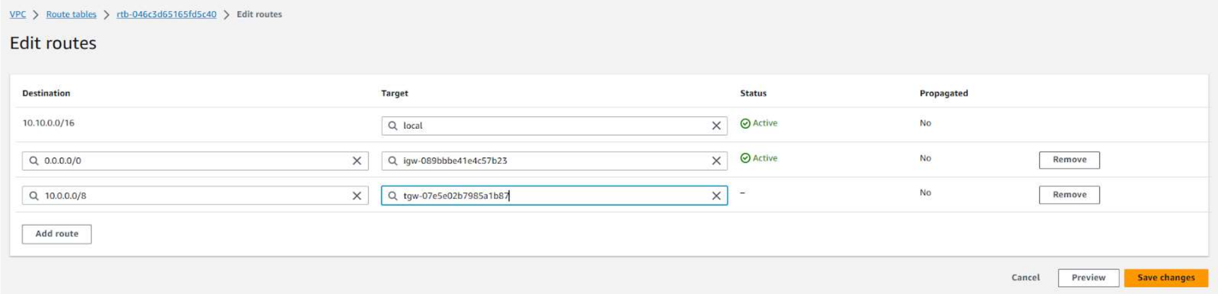
Select Transit gateway route tables from the LHS panel and go to the routes , we can see the VPC CIDR have been listed there.



Routes (3)

☐	CIDR ▲	Attachment ID	Resource ID	Resource type	Route type	Route state	Prefix list ID
☐	10.10.0.0/16	tgw-attach-0204f02950a18d928	vpc-02c77757ccac5757d	VPC	Propagated	✓ Active	–
☐	10.20.0.0/16	tgw-attach-09426ce1aa7f8372e	vpc-002c8d51809e98dd7	VPC	Propagated	✓ Active	–
☐	10.30.0.0/16	tgw-attach-04844306da274fbe9	vpc-011a9434def19f493	VPC	Propagated	✓ Active	–

Now go to Route Tables, select VPC A and add route as shown below:

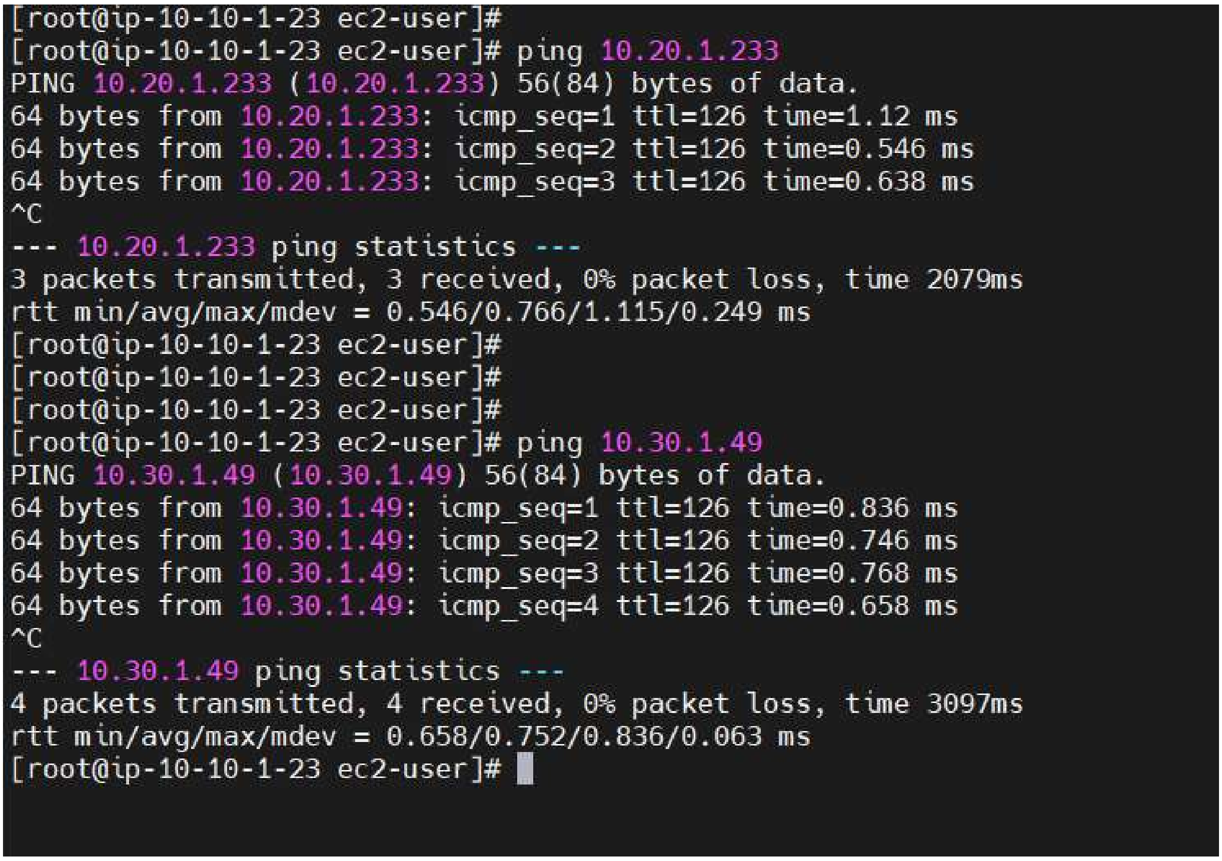


Edit routes

Destination	Target	Status	Propagated	
10.10.0.0/16	local	✓ Active	No	
0.0.0.0/0	igw-089bbbe41e4c57b23	✓ Active	No	Remove
10.0.0.0/8	tgw-07e5e02b7985a1b87	-	No	Remove

Update the same for VPC B and VPC C.

Now check the connectivity from VPC-A-Public , check if the private IPs of VPC-B-Private and VPC-C-Private are reachable.



```
[root@ip-10-10-1-23 ec2-user]#
[root@ip-10-10-1-23 ec2-user]# ping 10.20.1.233
PING 10.20.1.233 (10.20.1.233) 56(84) bytes of data.
64 bytes from 10.20.1.233: icmp_seq=1 ttl=126 time=1.12 ms
64 bytes from 10.20.1.233: icmp_seq=2 ttl=126 time=0.546 ms
64 bytes from 10.20.1.233: icmp_seq=3 ttl=126 time=0.638 ms
^C
--- 10.20.1.233 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2079ms
rtt min/avg/max/mdev = 0.546/0.766/1.115/0.249 ms
[root@ip-10-10-1-23 ec2-user]#
[root@ip-10-10-1-23 ec2-user]#
[root@ip-10-10-1-23 ec2-user]#
[root@ip-10-10-1-23 ec2-user]# ping 10.30.1.49
PING 10.30.1.49 (10.30.1.49) 56(84) bytes of data.
64 bytes from 10.30.1.49: icmp_seq=1 ttl=126 time=0.836 ms
64 bytes from 10.30.1.49: icmp_seq=2 ttl=126 time=0.746 ms
64 bytes from 10.30.1.49: icmp_seq=3 ttl=126 time=0.768 ms
64 bytes from 10.30.1.49: icmp_seq=4 ttl=126 time=0.658 ms
^C
--- 10.30.1.49 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3097ms
rtt min/avg/max/mdev = 0.658/0.752/0.836/0.063 ms
[root@ip-10-10-1-23 ec2-user]#
```

We can see it is reachable. This is how the Transit gateway works..!!!!