

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

Department of Computer Engineering

Course, Subject & Experiment Details

Practical No:	
Title:	To study and Implement Infrastructure as a Service using AWS/Microsoft Azure
Name of the Student:	Warren Fernandes
Roll No:	8940
Date of Performance:	28/03/2022
Date of Submission:	28/03/2022

Evaluation:

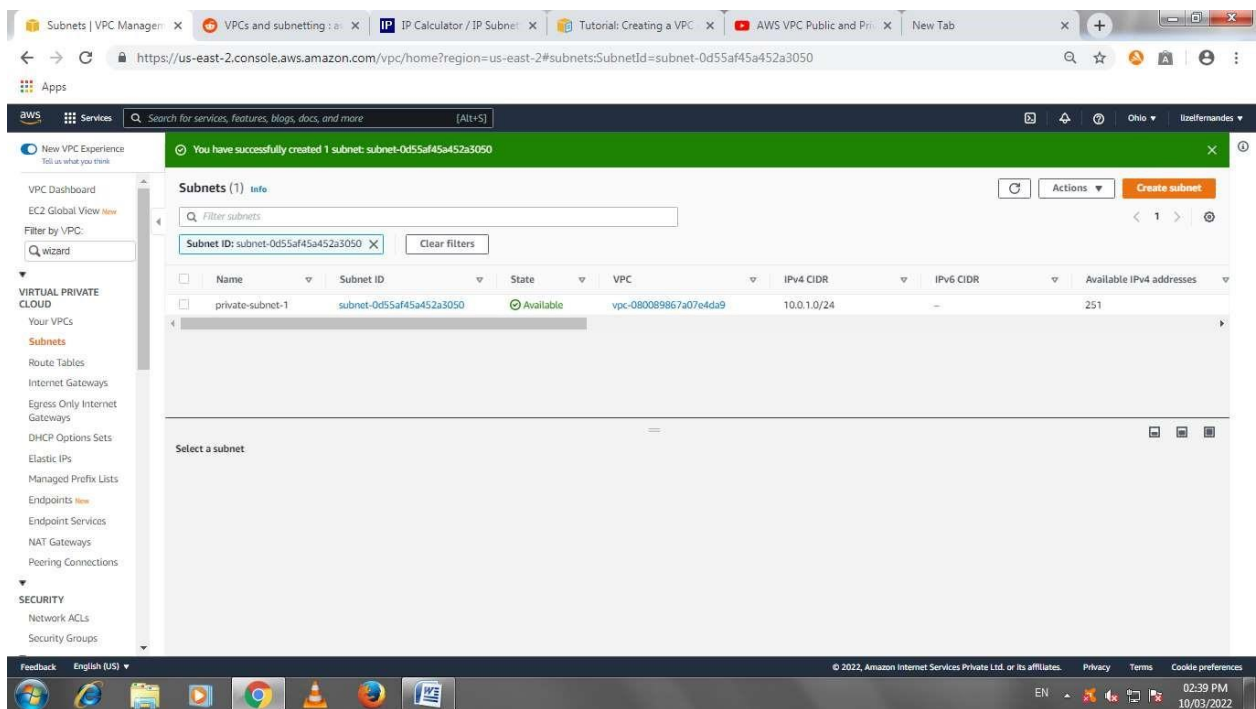
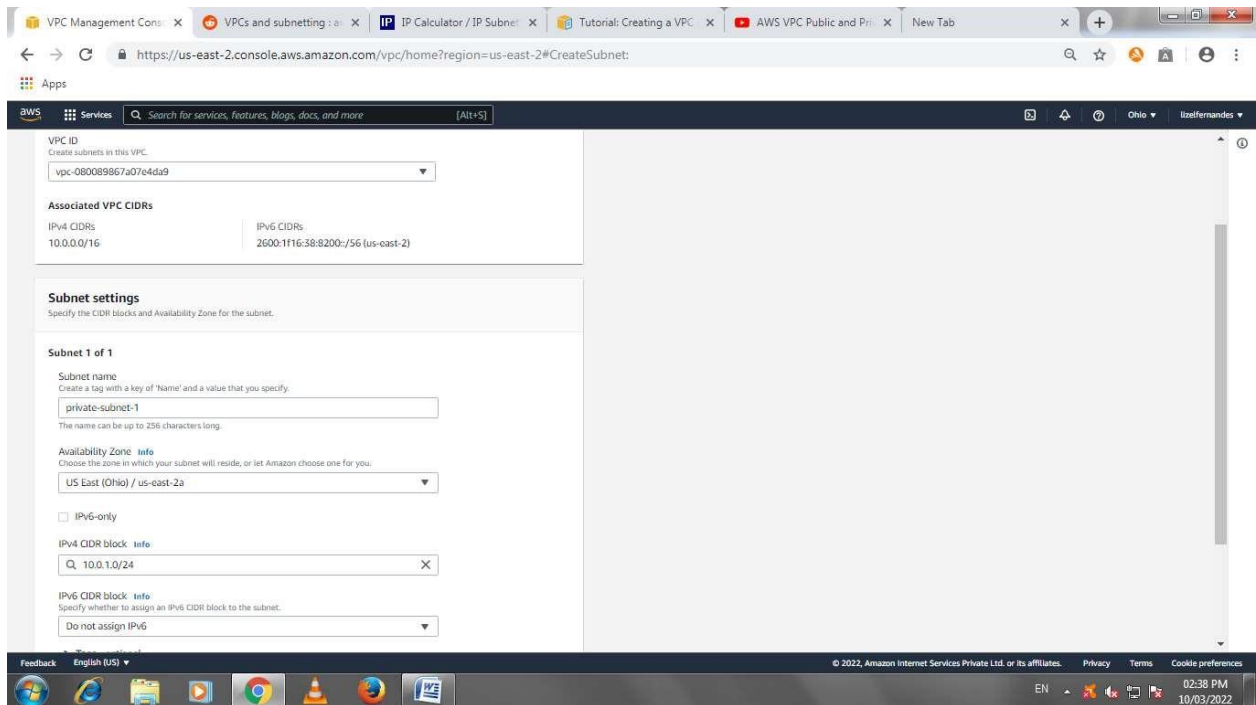
Sr. No.	Rubric	Grade
1	On time submission/completion (2)	
2	Preparedness (2)	
3	Skill (4)	
4	Output (2)	

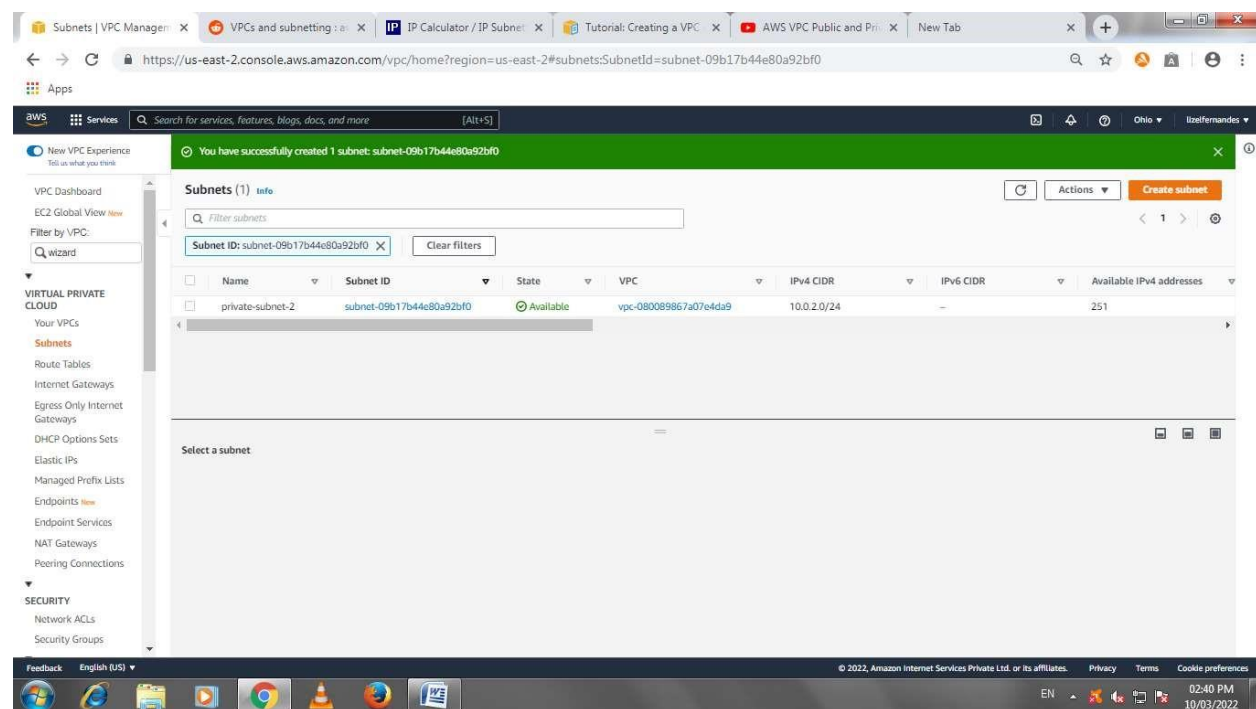
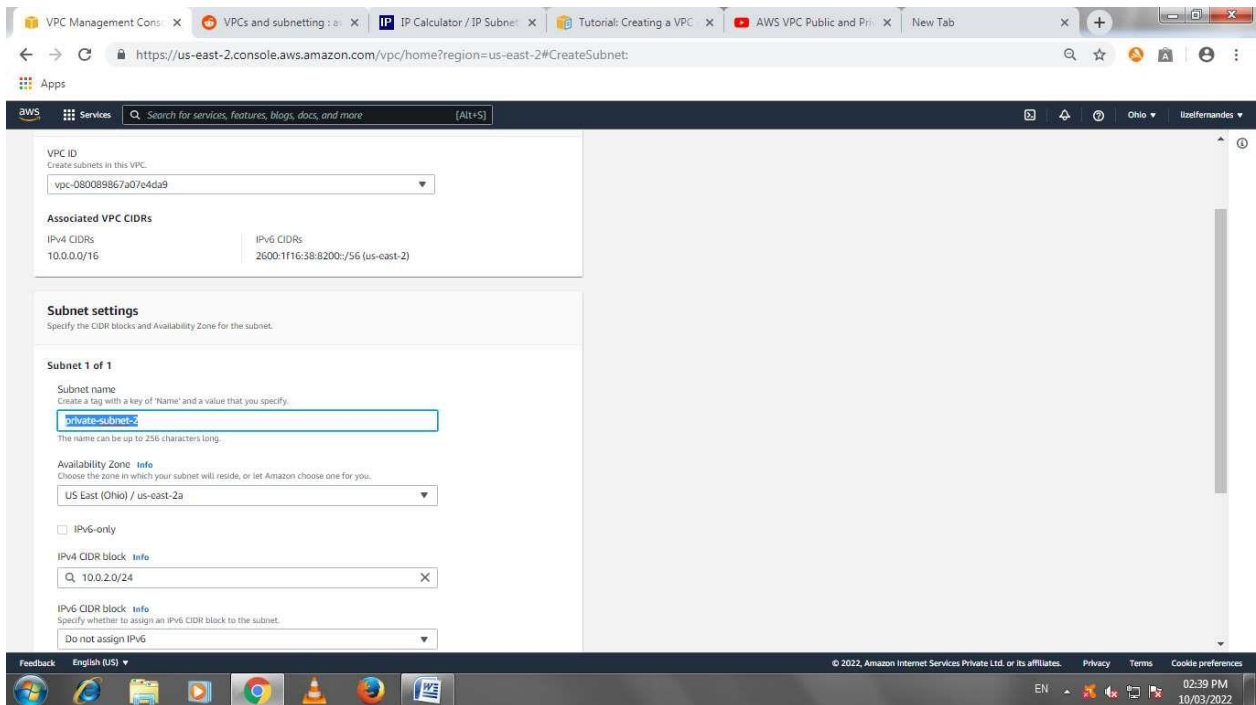
Signature of the Teacher

AWS VPC Configuration

Steps to create a VPC

- Create VPC and public and private subnets
- Create Internet Gateway and attach to VPC
- Create public and private routing tables
- Set public routing table for IG
- Add subnet association (public subnet) in public routing table
- Create NAT Gateway in public subnet
- Set private routing table for NAT
- Add subnet association (private subnet) in private routing table ☐ Create EC2 instances for public and private subnets





VPC Management Console | VPCs and subnetting | IP Calculator / IP Subnet | Tutorial: Creating a VPC | AWS VPC Public and Private | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#CreateSubnet:

Apps

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VPC ID
Create subnets in this VPC.
vpc-080089867a07e4da9

Associated VPC CIDRs
IPv4 CIDRs: 10.0.0.0/16
IPv6 CIDRs: 2600:1f16:38:8200::/56 (us-east-2)

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.
public-subnet-1
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

☐ IPv6-only

IPv4 CIDR block info
10.0.3.0/24

IPv6 CIDR block info
Specify whether to assign an IPv6 CIDR block to the subnet.
Do not assign IPv6

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Subnets | VPC Management | VPCs and subnetting | IP Calculator / IP Subnet | Tutorial: Creating a VPC | AWS VPC Public and Private | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#subnets:SubnetId=subnet-0dce6ca08e56de2e7

Apps

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New VPC Experience Tell us what you think

VPC Dashboard
EC2 Global View new

Filter by VPC:
Q wizard

VIRTUAL PRIVATE CLOUD
Your VPCs
Subnets
Route Tables
Internet Gateways
Egress Only Internet Gateways
DHCP Options Sets
Elastic IPs
Managed Prefix Lists
Endpoints new
Endpoint Services
NAT Gateways
Peering Connections

SECURITY
Network ACLs
Security Groups

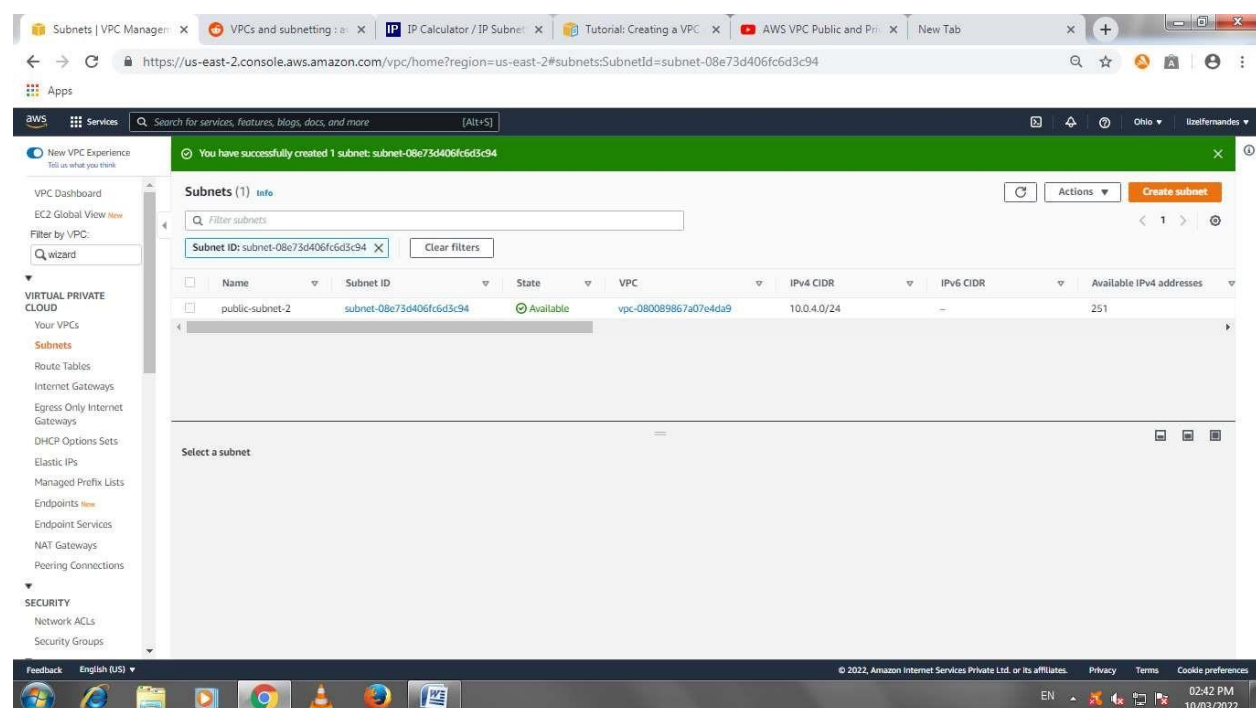
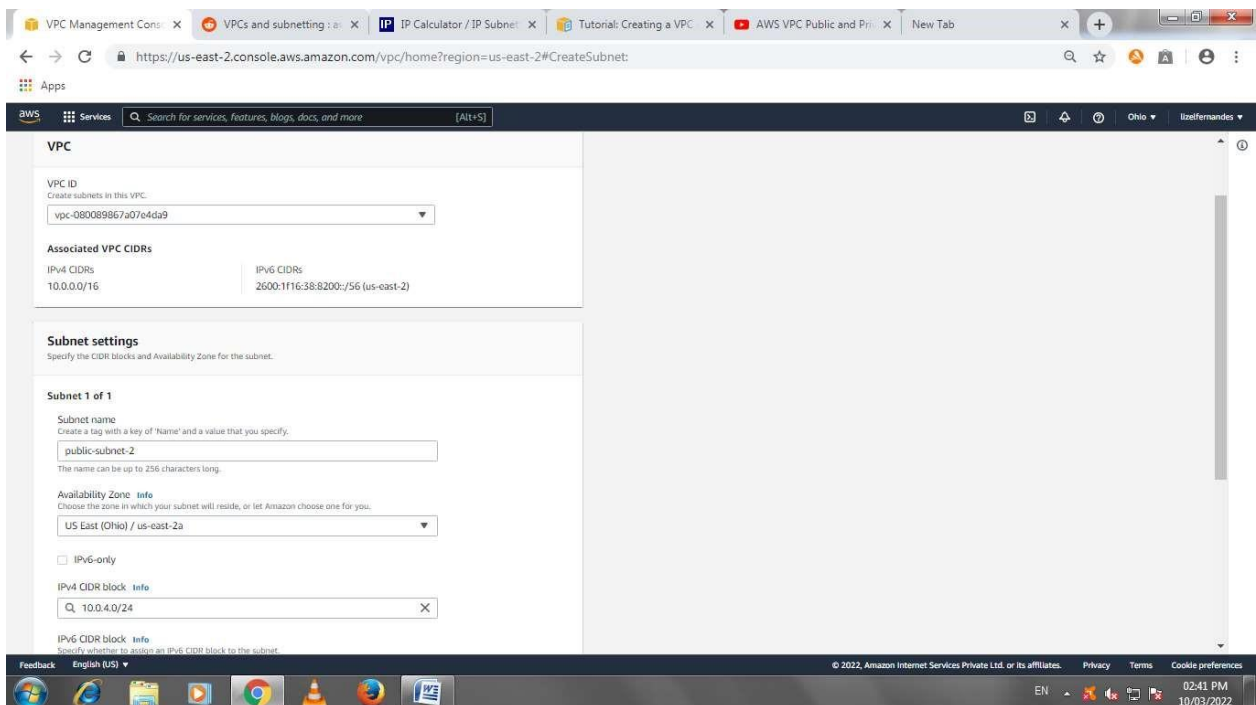
You have successfully created 1 subnet: subnet-0dce6ca08e56de2e7

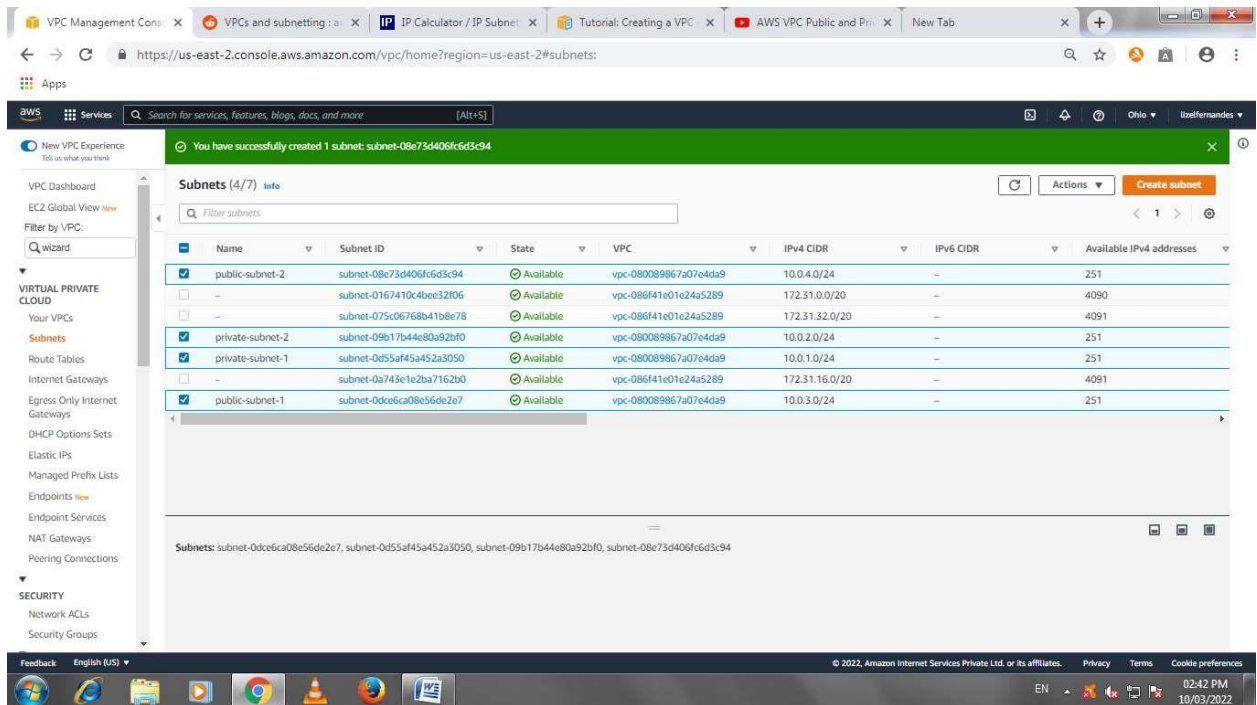
Subnets (1) info
Filter subnets
Subnet ID: subnet-0dce6ca08e56de2e7 Clear filters

	Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR	Available IPv4 addresses
<input type="checkbox"/>	public-subnet-1	subnet-0dce6ca08e56de2e7	Available	vpc-080089867a07e4da9	10.0.3.0/24	—	251

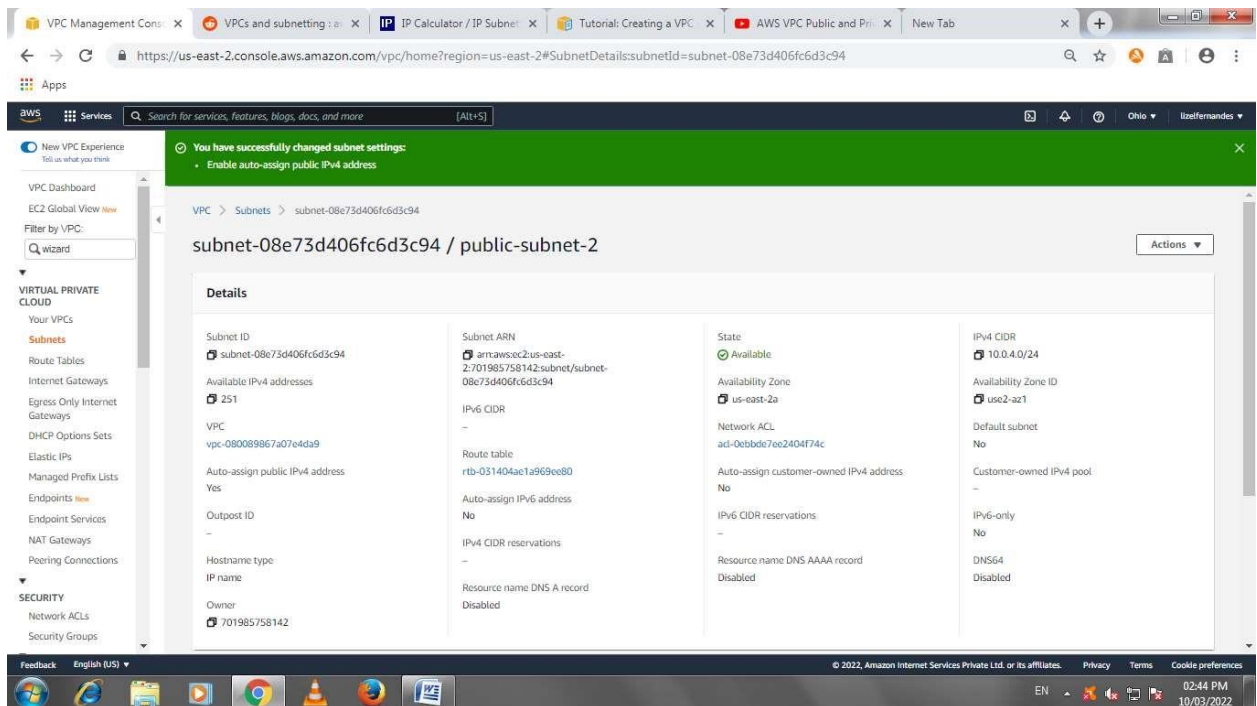
Select a subnet

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Auto assign enable for public subnet 2



Auto assign enable for public subnet 1

Browser tabs: VPC Management Console, VPCs and subnetting, IP Calculator / IP Subnet, Tutorial: Creating a VPC, AWS VPC Public and Private, New Tab.

URL: <https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#SubnetDetails:subnetId=subnet-0dce6ca08e56de2e7>

Notification: You have successfully changed subnet settings: Enable auto-assign public IPv4 address.

Breadcrumbs: VPC > Subnets > subnet-0dce6ca08e56de2e7

subnet-0dce6ca08e56de2e7 / public-subnet-1

Actions

Details			
Subnet ID subnet-0dce6ca08e56de2e7	Subnet ARN arn:aws:ec2:us-east-2:701985758142:subnet/subnet-0dce6ca08e56de2e7	State Available	IPv4 CIDR 10.0.3.0/24
Available IPv4 addresses 251	IPV6 CIDR -	Availability Zone us-east-2a	Availability Zone ID use2-az1
VPC vpc-080089867a07e4da9	Route table rtb-031404ac1a969ee80	Network ACL acl-0ebbd67ee2404f74c	Default subnet No
Auto-assign public IPv4 address Yes	Auto-assign IPv6 address No	Auto-assign customer-owned IPv4 address No	Customer-owned IPv4 pool -
Outpost ID -	IPV4 CIDR reservations -	IPV6 CIDR reservations -	IPV6-only No
Hostname type IP name	Resource name DNS AAAA record Disabled	Resource name DNS AAAA record Disabled	DNS64 Disabled
Owner 701985758142			

Internet gateway

Browser tabs: Create internet gateway, VPCs and subnetting, IP Calculator / IP Subnet, Tutorial: Creating a VPC, AWS VPC Public and Private, New Tab.

URL: <https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#CreateInternetGateway:>

Breadcrumbs: VPC > Internet gateways > Create internet gateway

Create internet gateway

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

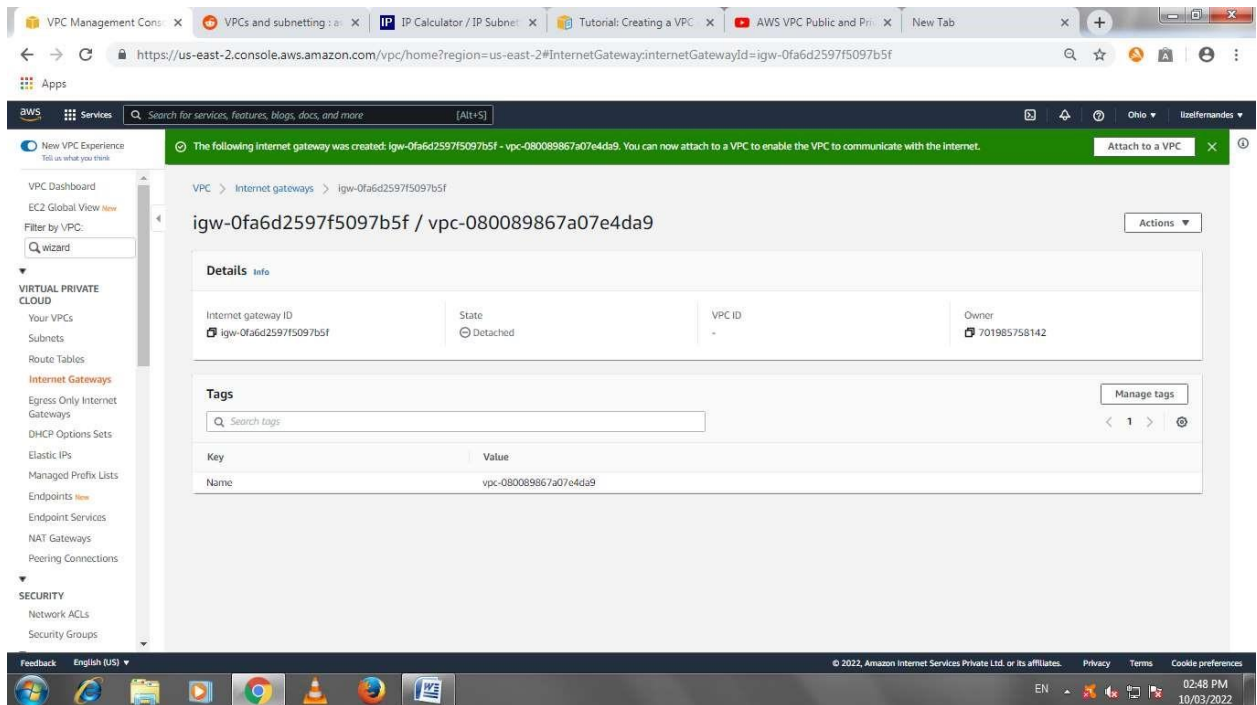
Name tag
Creates a tag with a key of 'Name' and a value that you specify.

Value: vpc-080089867a07e4da9

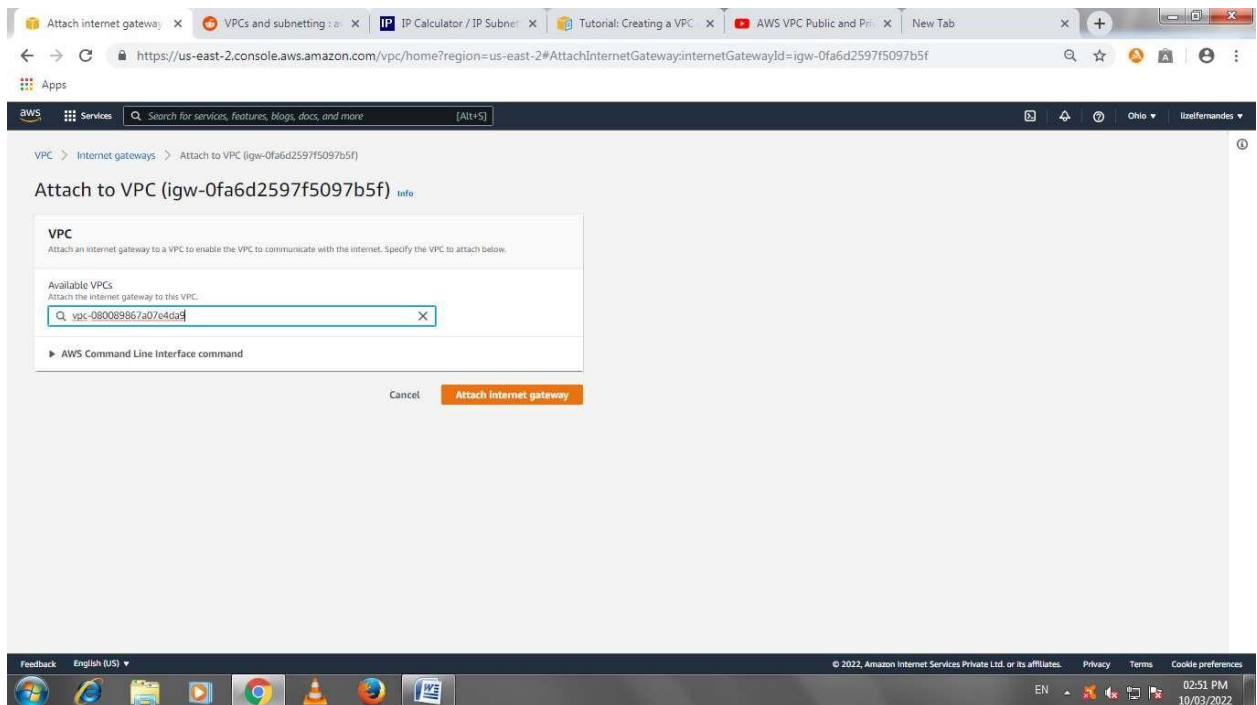
Tags - optional
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

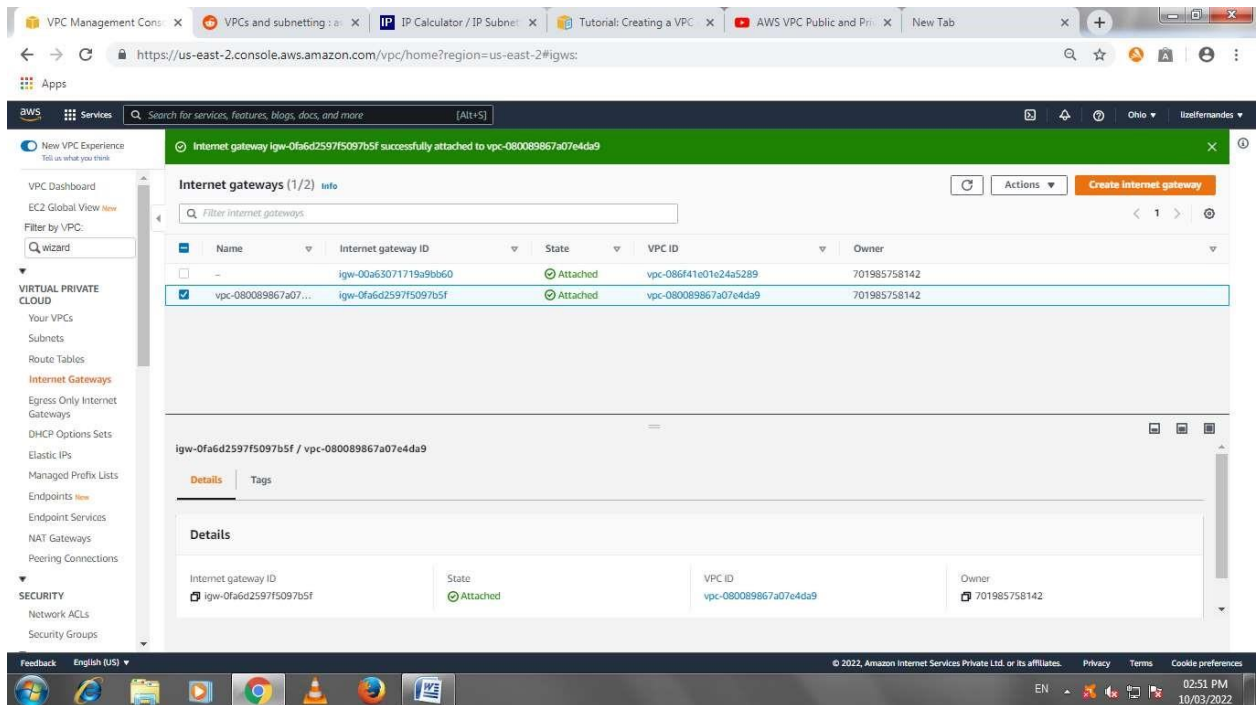
Key: Name
Value: optional: vpc-080089867a07e4da9

Buttons: Cancel, Create internet gateway

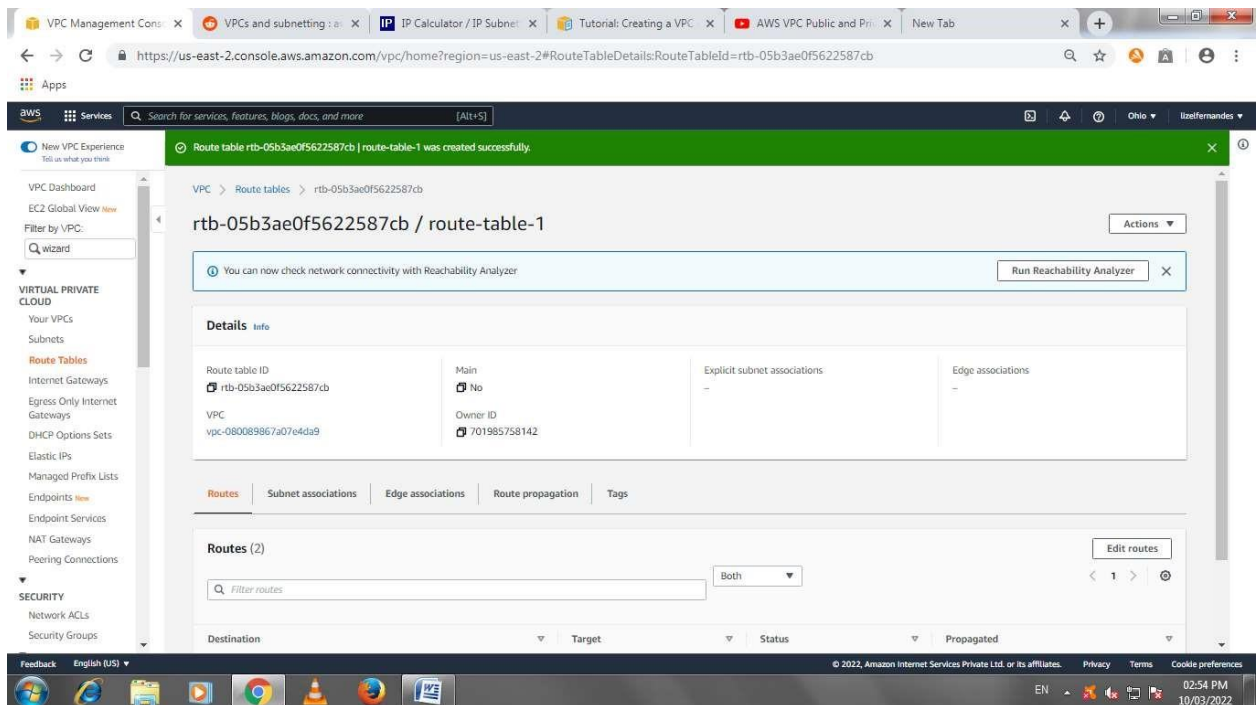


Internet gateway attached to vpc

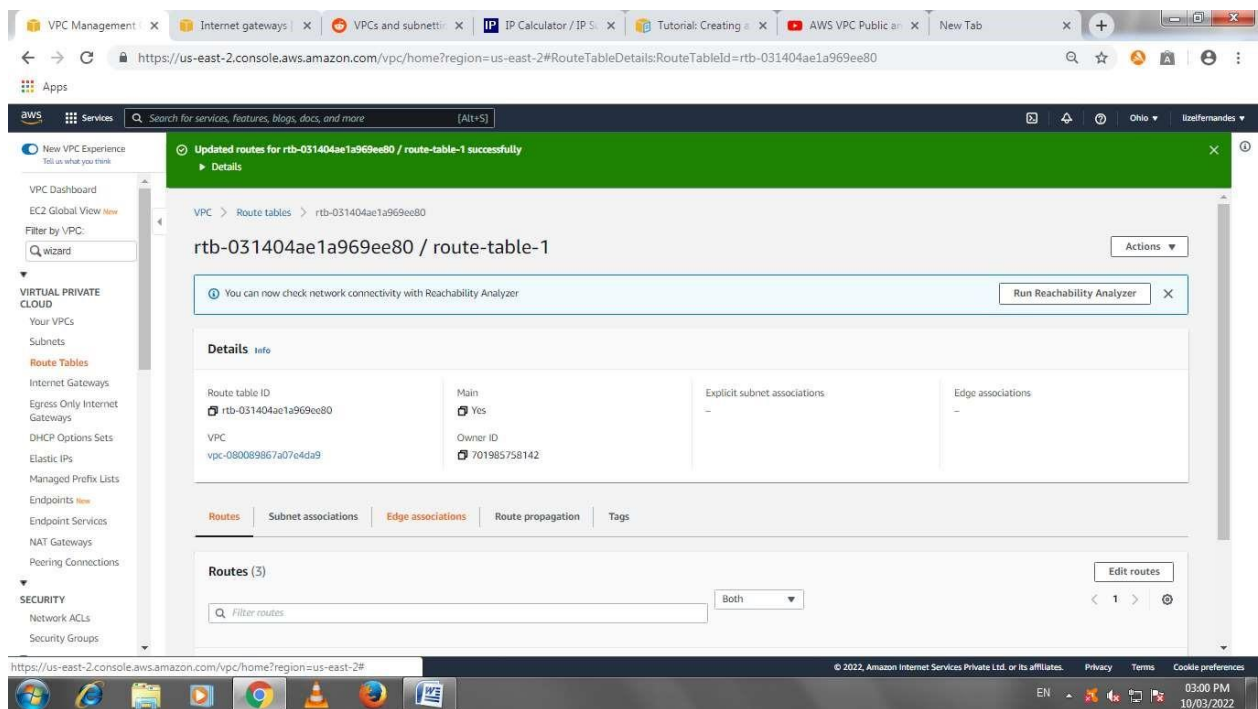
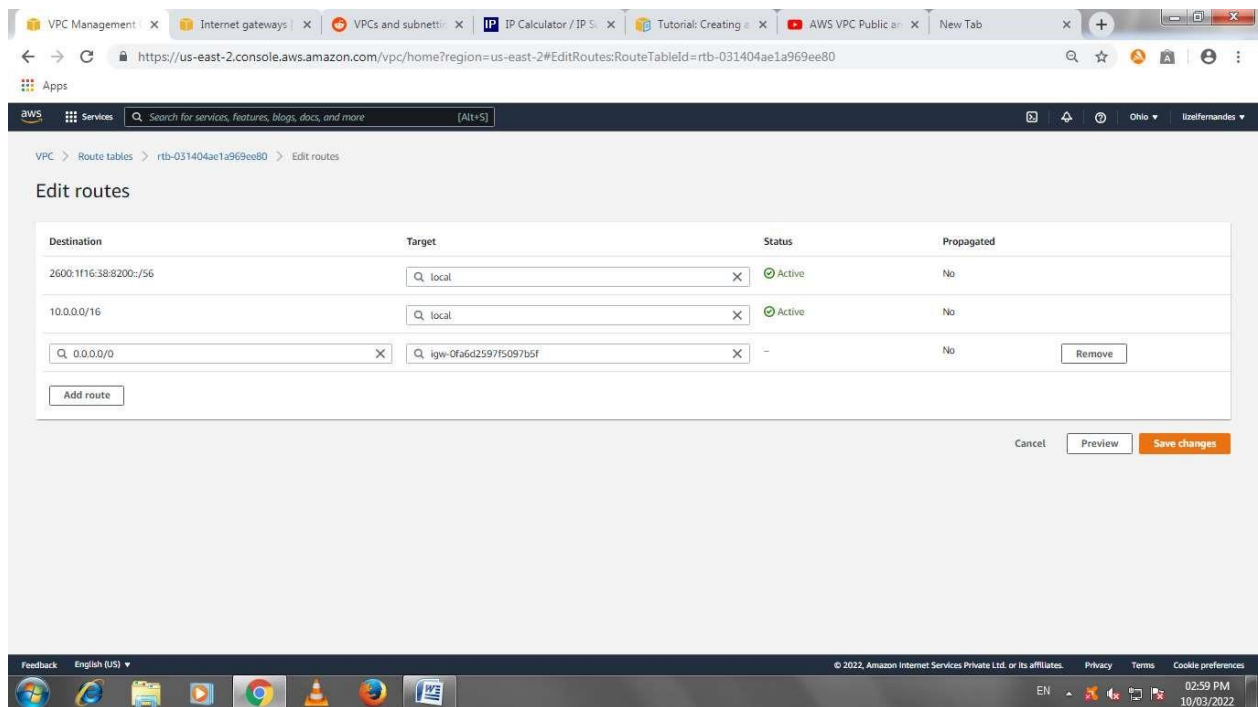




Route table creation



Adding internet gateway



Adding public subnets to the route table

VPC Management | Internet gateways | VPCs and subnets | IP Calculator / IP S... | Tutorial: Creating a... | AWS VPC Public... | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#EditRouteTableSubnetAssociations:RouteTableId=rtb-031404ae1a969ee80

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Edit subnet associations

Change which subnets are associated with this route table.

Available subnets (2/4)

Filter subnet associations

	Name	Subnet ID	IPv4 CIDR	IPv6 CIDR	Route table ID
<input checked="" type="checkbox"/>	public-subnet-2	subnet-08e73d406f6d3c94	10.0.4.0/24	-	Main (rtb-031404ae1a969ee80 / route-table-1)
<input type="checkbox"/>	private-subnet-2	subnet-09b17b4e80a92bf0	10.0.2.0/24	-	Main (rtb-031404ae1a969ee80 / route-table-1)
<input type="checkbox"/>	private-subnet-1	subnet-0d55af45a452a3050	10.0.1.0/24	-	Main (rtb-031404ae1a969ee80 / route-table-1)
<input checked="" type="checkbox"/>	public-subnet-1	subnet-0dc6ca08e56dc2e7	10.0.3.0/24	-	Main (rtb-031404ae1a969ee80 / route-table-1)

Selected subnets

subnet-0dc6ca08e56dc2e7 / public-subnet-1 subnet-08e73d406f6d3c94 / public-subnet-2

Cancel Save associations

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Route tables | VPC | Internet gateways | VPCs and subnets | IP Calculator / IP S... | Tutorial: Creating a... | AWS VPC Public... | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#RouteTables

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New VPC Experience Tell us what you think

EC2 Global View

Filter by VPC: wizard

VIRTUAL PRIVATE CLOUD

- Your VPCs
- Subnets
- Route Tables
- Internet Gateways
- Egress Only Internet Gateways
- DHCP Options Sets
- Elastic IPs
- Managed Prefix Lists
- Endpoints
- Endpoint Services
- NAT Gateways
- Peering Connections

SECURITY

- Network ACLs
- Security Groups

Route tables (2)

Filter route tables

	Name	Route table ID	Explicit subnet associat...	Edge associations	Main	VPC	Owner ID
<input type="checkbox"/>	route-table-1	rtb-031404ae1a969ee80	2 subnets	-	Yes	vpc-080089867a07e4da9	701985758142
<input type="checkbox"/>	-	rtb-0530e56b668d91ec3	-	-	Yes	vpc-086f41e01e24a5289	701985758142

Select a route table

You have successfully updated subnet associations for rtb-031404ae1a969ee80 / route-table-1.

Actions Create route table

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Nat gateway creation

VP Management | Elastic IP address | VPCs and subnets | IP Calculator / IP S | Tutorial: Creating | AWS VPC Public an | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#CreateNatGateway:

Apps

Create NAT gateway

A highly available, managed Network Address Translation (NAT) service that instances in private subnets can use to connect to services in other VPCs, on-premises networks, or the internet.

NAT gateway settings

Name - optional
Create a tag with a key of 'Name' and a value that you specify.
nat-gateway-1
The name can be up to 256 characters long.

Subnet
Select a subnet in which to create the NAT gateway.
subnet-0dce6ca08e56de2e7 (public-subnet-1)

Connectivity type
Select a connectivity type for the NAT gateway.
☒ Public
☐ Private

Elastic IP allocation ID [Info](#)
Assign an Elastic IP address to the NAT gateway.
eipalloc-03a492827cf65984c [Allocate Elastic IP](#)

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
Name

Value - optional
nat-gateway-1 [Remove](#)

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VP Management | Elastic IP address | VPCs and subnets | IP Calculator / IP S | Tutorial: Creating | AWS VPC Public an | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#NatGatewayDetails:natGatewayId=nat-0c10feedb24db885c

Apps

NAT gateway nat-0c10feedb24db885c | nat-gateway-1 was created successfully.

VPC Dashboard
EC2 Global View
Filter by VPC:
wizard

VIRTUAL PRIVATE CLOUD

- Your VPCs
- Subnets
- Route Tables
- Internet Gateways
- Egress Only Internet Gateways
- DHCP Options Sets
- Elastic IPs
- Managed Prefix Lists
- Endpoints
- Endpoint Services
- NAT Gateways**
- Peering Connections

SECURITY

- Network ACLs
- Security Groups

nat-0c10feedb24db885c / nat-gateway-1 [Delete](#)

Details [Info](#)

NAT gateway ID nat-0c10feedb24db885c	Connectivity type Public	State Pending	State message Info -
Elastic IP address -	Private IP address -	Network interface ID -	
Subnet subnet-0dce6ca08e56de2e7 / public-subnet-1	Created Thursday, March 10, 2022, 15:04:20 GMT+5:30	Deleted -	

Monitoring [Tags](#)

Monitoring

1h 3h 12h 1d 3d 1w [Add to dashboard](#)

Packets out to destination (Count)	Packets out to source (Count)	Bytes out to destination (Bytes)
1	1	1

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Route table 2 creation

The image consists of two screenshots of the AWS Management Console, specifically the VPC section, showing the process of creating and viewing a route table.

Top Screenshot: Create route table

The browser address bar shows the URL: `https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#CreateRouteTable:`

The page title is "Create route table". Below the title, there is a description: "A route table specifies how packets are forwarded between the subnets within your VPC, the internet, and your VPN connection."

The "Route table settings" section includes:

- Name - optional:** A text input field containing "route-table-2".
- VPC:** A dropdown menu showing "vpc-080089867a07e4da9".

The "Tags" section includes:

- Key:** "Name"
- Value - optional:** "route-table-2"
- Buttons:** "Remove", "Add new tag", "Cancel", and "Create route table".

Bottom Screenshot: Route table details

The browser address bar shows the URL: `https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#RouteTableDetails:RouteTableId=rtb-0078922c2f8e802c2`

The page title is "Route table rtb-0078922c2f8e802c2 / route-table-2".

The "Details" section includes:

- Route table ID:** "rtb-0078922c2f8e802c2"
- Main:** "No"
- Owner ID:** "701985758142"
- Explicit subnet associations:** "-"
- Edge associations:** "-"

The "Routes" section shows a table with 2 routes. The table has columns: Destination, Target, Status, and Propagated. The table is currently empty, with a "Filter routes" input field and a "Both" dropdown menu.

Adding nat gateway for the private subenests

The first screenshot shows the 'Edit routes' page for route table 'rtb-0078922c2f8e802c2'. It displays a table with three routes:

Destination	Target	Status	Propagated
2600:1f16:38:8200::/56	local	Active	No
10.0.0.0/16	local	Active	No
0.0.0.0/0	nat-0c10feedb24db885c	Active	No

The second screenshot shows the 'route-table-2' details page after the routes have been updated. A green notification banner at the top states: 'Updated routes for rtb-0078922c2f8e802c2 / route-table-2 successfully'. The 'Details' tab shows the route table ID, VPC ID, and owner ID. The 'Routes' tab shows the same three routes as in the first screenshot.

Adding association for the private subnets (route table for private subnets)

VPC Management | NAT gateways | VPCs and subnets | IP Calculator | IP Subnet Calculator | Tutorial: Creating a VPC | AWS VPC Public IP Address | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#EditRouteTableSubnetAssociations:RouteTableId=rtb-0078922c2f8e802c2

Apps

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Edit subnet associations

Change which subnets are associated with this route table.

Available subnets (2/4)

Filter subnet associations

	Name	Subnet ID	IPv4 CIDR	IPv6 CIDR	Route table ID
<input type="checkbox"/>	public-subnet-2	subnet-08e73d406f6d3c94	10.0.4.0/24	-	rtb-031404ae1a969ec80 / route-table-1
<input checked="" type="checkbox"/>	private-subnet-2	subnet-09b17b44e80a92bf0	10.0.2.0/24	-	Main (rtb-031404ae1a969ec80 / route-table-1)
<input checked="" type="checkbox"/>	private-subnet-1	subnet-0d55af45a452a3050	10.0.1.0/24	-	Main (rtb-031404ae1a969ec80 / route-table-1)
<input type="checkbox"/>	public-subnet-1	subnet-0dce6ca08e56dc2e7	10.0.3.0/24	-	rtb-031404ae1a969ec80 / route-table-1

Selected subnets

subnet-0d55af45a452a3050 / private-subnet-1 subnet-09b17b44e80a92bf0 / private-subnet-2

Cancel Save associations

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VPC Management | NAT gateways | VPCs and subnets | IP Calculator | IP Subnet Calculator | Tutorial: Creating a VPC | AWS VPC Public IP Address | New Tab

https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#RouteTableDetails:RouteTableId=rtb-0078922c2f8e802c2

Apps

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New VPC Experience Tell us what you think

VPC Dashboard EC2 Global View

Filter by VPC: wizard

VIRTUAL PRIVATE CLOUD

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- DHCP Options Sets
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- Endpoint Services
- NAT Gateways
- Peering Connections

SECURITY

- Network ACLs
- Security Groups

You have successfully updated subnet associations for rtb-0078922c2f8e802c2 / route-table-2.

VPC > Route Tables > rtb-0078922c2f8e802c2

rtb-0078922c2f8e802c2 / route-table-2

Actions

You can now check network connectivity with Reachability Analyzer

Run Reachability Analyzer

Details Info

Route table ID	Main	Explicit subnet associations	Edge associations
rtb-0078922c2f8e802c2	No	2 subnets	-
VPC	Owner ID		
vpc-080089867a07e4da9	701985758142		

Routes Subnet associations Edge associations Route propagation Tags

Routes (3)

Filter routes Both

Destination	Target	Status	Propagated
-------------	--------	--------	------------

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Enable dns for the vpc

The image consists of two screenshots of the AWS Management Console interface, showing the configuration of a VPC.

Top Screenshot: Edit DNS hostnames

The browser address bar shows the URL: `https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#EditDnsHostnamesVpcId=vpc-080089867a07e4da9`.

The page title is "Edit DNS hostnames". Below the title, there is a section "DNS hostnames" with the description: "Indicates whether instances with public IP addresses get corresponding public DNS hostnames."

Below this, there is a form with two fields:

- VPC ID: `vpc-080089867a07e4da9`
- DNS hostnames: ☒ Enable

At the bottom of the form, there are two buttons: "Cancel" and "Save changes".

Bottom Screenshot: Your VPCs (1/2)

The browser address bar shows the URL: `https://us-east-2.console.aws.amazon.com/vpc/home?region=us-east-2#vpcs:`.

A green notification banner at the top says: "DNS hostnames successfully updated."

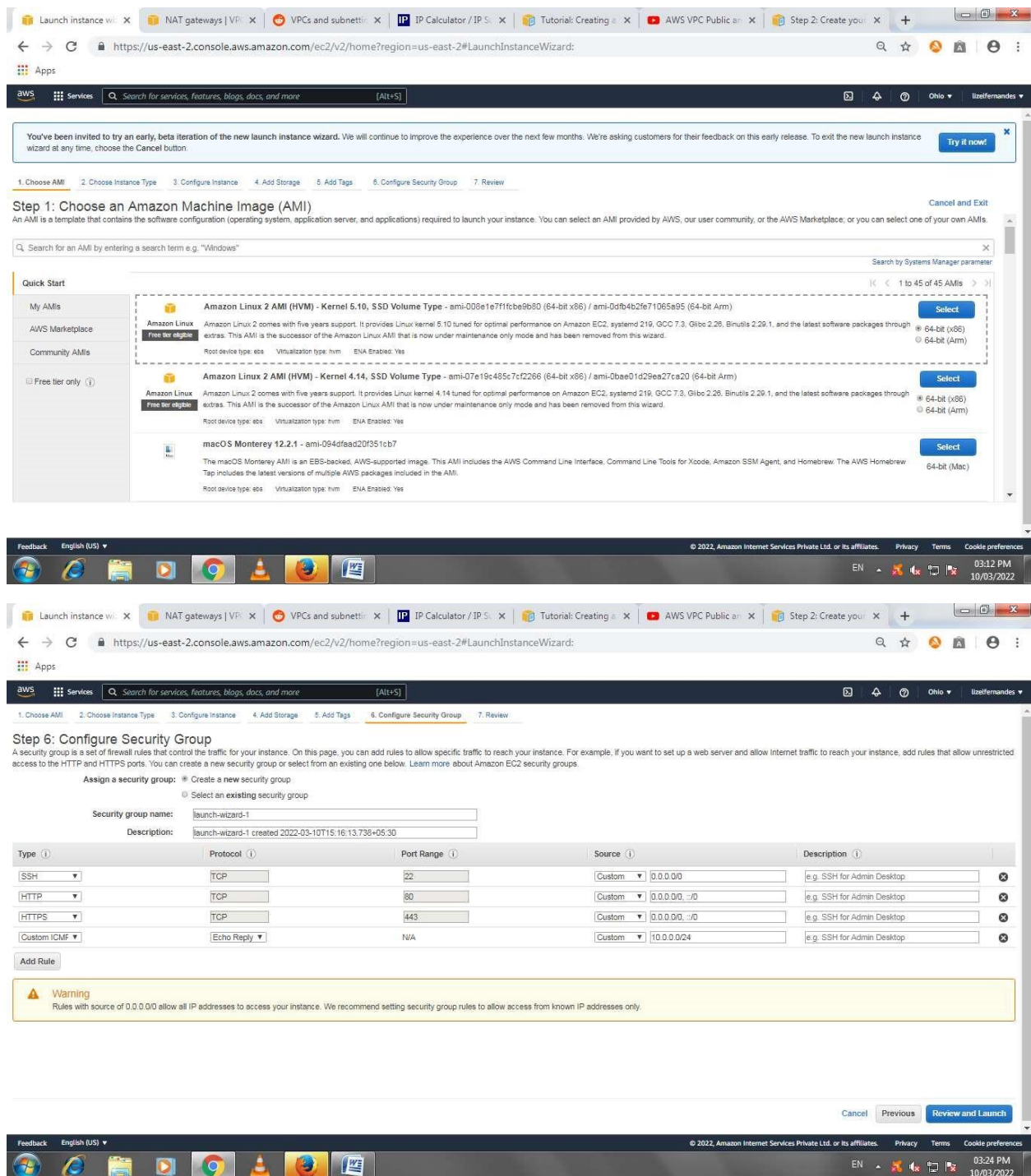
The main content area is titled "Your VPCs (1/2)". It contains a table with the following columns: Name, VPC ID, State, IPv4 CIDR, IPv6 CIDR, DHCP options set, and Main route table.

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP options set	Main route table
<input checked="" type="checkbox"/>	<code>vpc-080089867a07e4da9</code>	Available	<code>10.0.0.0/16</code>	<code>2600:1f16:38:8200::/56</code>	<code>dopt-09e5d5d3e263...</code>	<code>rtb-031404ae1a969ee80</code>
<input type="checkbox"/>	<code>vpc-086f41e01e24a5289</code>	Available	<code>172.31.0.0/16</code>	-	<code>dopt-09e5d5d3e263...</code>	<code>rtb-0530e56b668d91ec3</code>

Below the table, there is a section for the selected VPC `vpc-080089867a07e4da9`. It has tabs for "Details", "CIDRs", "Flow logs", and "Tags". The "Details" tab is active, showing the following information:

- VPC ID: `vpc-080089867a07e4da9`
- State: Available
- DNS hostnames: Enabled
- DNS resolution: Enabled

Create ec2 instance and connections for new instances



To enable internet on private instance we must do the following:

- Go to the folder where the keypair is stored for the instance
- Copy the file from your machine to the public instance `scp -i keyname.pem keyname.pem ubuntu@public ipv4 dns:/home/ubuntu`
(e.g., `scp -i CC2802.pem CC2802.pem ubuntu@ec2-65-0-31-129.ap-south1.compute.amazonaws.com:/home/ubuntu`)
(Note: if you created instance using linux put ec2-user instead of ubuntu everywhere)

```
Command Prompt
Microsoft Windows [Version 10.0.22000.434]
(c) Microsoft Corporation. All rights reserved.

C:\Users\divit>cd Downloads

C:\Users\divit\Downloads>scp -i CC2802.pem CC2802.pem ubuntu@ec2-65-0-31-129.ap-south-1.compute.amazonaws.com:/home/ubuntu
CC2802.pem
100% 1700 138.7KB/s 00:00

C:\Users\divit\Downloads>
```

- Now connect your public EC2 instance through SSH or putty

```
Command Prompt
W: Some index files failed to download. They have been ignored, or old ones used instead.
root@ip-192-168-0-39:~# client_loop: send disconnect: Connection reset

C:\Users\divit\Downloads>ssh -i "CC2802.pem" ubuntu@ec2-65-0-31-129.ap-south-1.compute.amazonaws.com
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.11.0-1022-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Fri Feb 11 11:44:41 UTC 2022

System load: 0.0          Processes:              100
Usage of /:  18.5% of 7.69GB Users logged in:                0
Memory usage: 20%        IPv4 address for eth0: 192.168.0.14
Swap usage:  0%

 * Ubuntu Pro delivers the most comprehensive open source security and
   compliance features.

https://ubuntu.com/aws/pro

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

Last login: Fri Feb 11 11:19:55 2022 from 49.36.109.130
ubuntu@ip-192-168-0-14:~$ ls
CC2802.pem
ubuntu@ip-192-168-0-14:~$ ssh -i CC2802.pem ubuntu@192.168.0.39
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.11.0-1022-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [902 kB]
```

- You can check if the .pem file is copied by 'ls' command ☐ Set the permissions for the file:
chmod 400 keyname.pem
- To connect private instance, enter the command:
ssh -i keyname.pem ubuntu@private ip address (private instance)
(Note: you can see that the ip address is changed from public to private after this)
- To check if connection is correct: sudo -i -> apt-get update


```

Command Prompt
To check for new updates run: sudo apt update

Last login: Fri Feb 11 11:19:55 2022 from 49.36.109.130
ubuntu@ip-192-168-0-14:~$ ls
CC2802.pem
ubuntu@ip-192-168-0-14:~$ ssh -i CC2802.pem ubuntu@192.168.0.39
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.11.0-1022-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Fri Feb 11 11:44:47 UTC 2022

System load:  0.0          Processes:      99
Usage of /:   18.5% of 7.69GB Users logged in:  0
Memory usage: 20%         IPv4 address for eth0: 192.168.0.39
Swap usage:   0%

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

```

- This will show that the connections are correct and now you can install any dependencies you want from the private instance

```

Command Prompt
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB]
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 B]
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1572 kB]
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [302 kB]
Get:14 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [14.7 kB]
Get:15 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [801 kB]
Get:16 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [114 kB]
Get:17 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 c-n-f Metadata [500 B]
Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [902 kB]
Get:19 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [200 kB]
Get:20 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [20.1 kB]
Get:21 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [23.7 kB]
Get:22 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse Translation-en [7312 B]
Get:23 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 c-n-f Metadata [580 B]
Get:24 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [42.0 kB]
Get:25 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/main Translation-en [10.0 kB]
Get:26 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/main amd64 c-n-f Metadata [864 B]
Get:27 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/restricted amd64 c-n-f Metadata [116 B]
Get:28 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [21.6 kB]
Get:29 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/universe Translation-en [15.0 kB]
Get:30 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/universe amd64 c-n-f Metadata [716 B]
Get:31 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports/multiverse amd64 c-n-f Metadata [116 B]
Get:32 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [217 kB]
Get:33 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [9560 B]
Get:34 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [748 kB]
Get:35 http://security.ubuntu.com/ubuntu focal-security/restricted Translation-en [107 kB]
Get:36 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 c-n-f Metadata [504 B]
Get:37 http://security.ubuntu.com/ubuntu focal-security/universe amd64 Packages [676 kB]
Get:38 http://security.ubuntu.com/ubuntu focal-security/universe Translation-en [115 kB]
Get:39 http://security.ubuntu.com/ubuntu focal-security/universe amd64 c-n-f Metadata [13.1 kB]
Get:40 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [20.7 kB]
Get:41 http://security.ubuntu.com/ubuntu focal-security/multiverse Translation-en [5196 B]
Get:42 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 c-n-f Metadata [500 B]
Fetched 21.8 MB in 6s (3685 kB/s)
Reading package lists... Done
root@ip-192-168-0-39:~# client_loop: send disconnect: Connection reset

C:\Users\divit\Downloads>
Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [902 kB]

```

Experiment 7: Amazon Web Services VPC Post Lab Questions

Q1. What are the components of Amazon VPC?

In AWS the VPC consists of the following components:-

Subnet: A segment of a VPC's where you can place groups to isolated resources.

Internet Gateway: VPC side of a connection to utilize public Internet.

NAT Gateway: A highly available, managed Network Address Translation (NAT) service for your resources in a private subnet to access the Internet.

Virtual private gateway: The Amazon VPC side of a VPN connection for secure transactions.

Peering Connection: To route traffic via private IP addresses between two peered VPCs.

VPC Endpoints: Enables private connectivity for your service in AWS without using an Internet Gateway, VPN, Network Address Translation (NAT) devices, or firewall proxies.

Egress-only Internet Gateway: A stateful gateway that provides egress only access for IPv6 traffic from the VPC to the Internet.

Q2. How do I get started with Amazon VPC?

To get started using Amazon VPC, you can launch an EC2 instance into your default VPC and default public subnets. Your default VPC is suitable for getting started quickly with Amazon VPC. To learn more about default VPCs and the default public subnets that come with the, see Default VPCs.

Step 1: View information about your default VPC

Step 2: Launch an instance into your VPC

Step 3: Connect to an E2 instance in your public subnet

Step 4: Clean up

Q3. What are the different types of VPC endpoints available on Amazon VPC?

VPC endpoints are virtual devices. They are horizontally scaled, redundant, and highly available VPC components.

- Interface endpoints

An interface endpoint is an elastic network interface with a private IP address from the IP address range of your subnet. It serves as an entry point for traffic destined to a service that is owned by AWS or owned by an AWS customer or partner. For a list of AWS services that integrate with AWS PrivateLink, see AWS services that integrate with AWS PrivateLink.

- Gateway Load Balancer endpoints

A Gateway Load Balancer endpoint is an elastic network interface with a private IP address from the IP address range of your subnet. It serves as an entry point to intercept traffic and route it to a network or security service that you've configured using a Gateway Load Balancer. You specify a Gateway Load Balancer endpoint as a target for a route in a route table. Gateway Load Balancer endpoints are supported only for endpoint services that are configured using a Gateway Load Balancer.

- Gateway endpoints

A gateway endpoint is a gateway that is a target for a route in your route table used for traffic destined to either Amazon S3 or DynamoDB.

There is no charge for using gateway endpoints.

Q4. What are the connectivity options for Amazon VPC?

Option	Use Case	Advantages	Limitations
<u>AWS Managed VPN</u>	AWS managed IPsec VPN connection over the internet to individual VPC	Reuse existing VPN equipment and processes Reuse existing internet connections AWS managed high availability VPN service Supports static routes or dynamic Border Gateway Protocol (BGP) peering and routing policies	Network latency, variability, and availability are dependent on internet conditions Customer managed endpoint is responsible for implementing redundancy and failover (if required) Customer device must support single-hop BGP (when leveraging BGP for dynamic routing)
<u>AWS Transit Gateway + VPN</u>	AWS managed IPsec VPN connection over the internet to regional router for multiple VPCs	Same as the previous option AWS managed high availability and scalability regional network hub for up to 5,000 attachments	Same as the previous option
<u>AWS Direct Connect</u>	Dedicated network connection over private lines	More predictable network performance Reduced bandwidth costs Supports BGP peering and routing policies	May require additional telecom and hosting provider relationships or new network circuits to be provisioned
<u>AWS Direct Connect + AWS Transit Gateway</u>	Dedicated network connection over private lines to regional router for multiple VPCs	Same as the previous option AWS managed high availability and scalability regional network hub for up to 5,000 attachments	Same as previous option

Option	Use Case	Advantages	Limitations
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[AWS Direct Connect + VPN](#)

IPsec VPN connection over private lines

More predictable network performance
Reduced bandwidth costs
Supports BGP peering and routing policies on AWS Direct Connect
Reuse existing VPN equipment and processes
AWS managed high availability VPN service
Supports static routes or dynamic Border Gateway Protocol (BGP) peering and routing policies on VPN connection

May require additional telecom and hosting provider relationships or new network circuits to be provisioned
Customer managed endpoint is responsible for implementing redundancy and failover (if required)
Customer device must support single-hop BGP (when leveraging BGP for dynamic routing)

[AWS Direct Connect + AWS Transit Gateway + VPN](#)

IPSec VPN connection over private lines to regional router for multiple VPCs

Same as previous option
AWS managed high availability and scalability regional network hub for up to 5,000 attachments

Same as previous option

[AWS VPN CloudHub](#)

Connect remote branch offices in a hub-and-spoke model for primary or backup connectivity

Reuse existing internet connections and AWS VPN connections
AWS managed high availability VPN service
Supports BGP for exchanging routes and routing priorities

Network latency, variability, and availability are dependent on the internet
User managed branch office endpoints are responsible for implementing redundancy and failover (if required)

[Software Site-to-Site VPN](#)

Software appliancebased VPN connection over the internet

Supports a wider array of VPN vendors, products, and protocols
Fully customermanaged solution

Customer is responsible for implementing HA (high availability) solutions for all VPN endpoints (if required)