



Project Report - Manual Exercises (Bac +2)

LAB 02

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LAB 02 – VPC Creation

Introduction:

In today's digital landscape, crafting a secure and robust infrastructure is critical for organizations aiming to thrive in the cloud. This lab exercise dives deep into the intricacies of creating a Virtual Private Cloud (VPC) within AWS, an essential step in architecting scalable and resilient cloud environments.

Throughout this lab, I'll guide you through the process of setting up a VPC with carefully planned subnets, including public and private configurations spread across different Availability Zones. We'll explore the significance of subnetting for organizing resources efficiently and ensuring high availability.

Moreover, we'll establish internet connectivity for our VPC by attaching an Internet Gateway (IGW) and configuring route tables. This step is crucial for enabling communication between our VPC and external networks, facilitating access to internet-based services while maintaining security.

Additionally, we'll delve into the implementation of Network Address Translation (NAT) gateways to facilitate outbound internet access from private subnets. This aspect is vital for securely accessing external resources while safeguarding sensitive data within the confines of our private network.

By mastering these concepts and techniques, we'll gain invaluable insights into designing VPCs that are not only secure and scalable but also optimized for performance and reliability. As organizations increasingly rely on cloud infrastructures to power their operations, understanding how to craft well-architected VPCs becomes a cornerstone of successful cloud adoption and management.

1. Create a VPC:

- Go to the AWS Management Console.
- Navigate to the VPC service.
- Click on "Create VPC".
- Select the "VPC Only" option.
- Provide a name for your VPC (e.g., MyVPC1).
- Enter the IPv4 CIDR block as 120.0.0.0/16.
- Select "Default" tenancy.
- Click on "Create VPC".

The screenshot shows the AWS Management Console interface for creating a VPC. The browser address bar indicates the URL is eu-west-3.console.aws.amazon.com. The console header shows the 'CreateVpc | VPC Console' page. The main content area is titled 'Create VPC' and includes a brief description: 'A VPC is an isolated portion of the AWS Cloud populated by AWS objects, such as Amazon EC2 instances.'

The 'VPC settings' section contains the following configuration options:

- Resources to create:** Two radio buttons are present. 'VPC only' is selected, and 'VPC and more' is unselected.
- Name tag - optional:** A text input field contains the value 'victor-VPC-1'.
- IPv4 CIDR block:** Two radio buttons are present. 'IPv4 CIDR manual input' is selected, and 'IPAM-allocated IPv4 CIDR block' is unselected. Below this, a text input field for 'IPv4 CIDR' contains the value '120.0.0.0/16'. A note states: 'CIDR block size must be between /16 and /28.'
- IPv6 CIDR block:** Four radio buttons are present. 'No IPv6 CIDR block' is selected. The other options are 'IPAM-allocated IPv6 CIDR block', 'Amazon-provided IPv6 CIDR block', and 'IPv6 CIDR owned by me', all of which are unselected.
- Tenancy:** A dropdown menu is set to 'Default'.

At the bottom of the console, there is a 'Tags' section and a footer with copyright information: '© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences'.

Figure 1 - create VPC

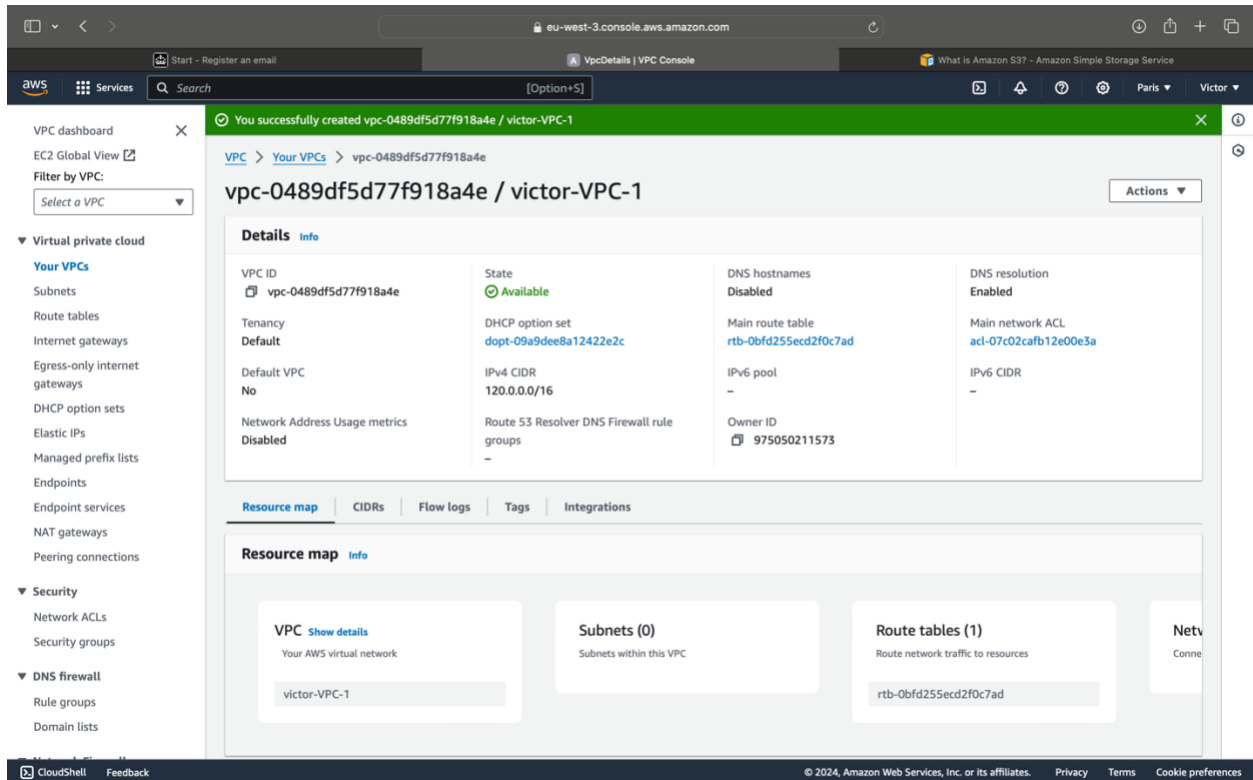


Figure 2 - VPC created

2. Create Subnets:

- After creating the VPC, click on "Subnets" in the VPC service.
- Click on "Create subnet".
- For the first subnet (public):
 - Select the VPC you just created.
 - Provide a name for the subnet (e.g., Public).
 - Assign the IPv4 CIDR block for this subnet as 120.0.3.0/24.
 - Click on "Create subnet".
- For the second subnet (private1):
 - Select the appropriate VPC.
 - Provide a name for the subnet (e.g., Private1).
 - Select an Availability Zone (AZ) different from the one used for the public subnet for redundancy.
 - Assign the IPv4 CIDR block for this subnet as 120.0.1.0/24.
 - Click on "Create subnet".
- For the third subnet (private2):
 - Repeat the same steps as for private1 subnet, with a different name and CIDR block (e.g., Private2, 120.0.2.0/24).

eu-west-3.console.aws.amazon.com

Start - Register an email CreateSubnet | VPC Console What is Amazon S3? - Amazon Simple Storage Service

Services Search [Option+S]

IPv4 CIDR blocks
120.0.0.0/16

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.

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.

IPv4 VPC CIDR block [Info](#)
Choose the VPC's IPv4 CIDR block for the subnet. The subnet's IPv4 CIDR must lie within this block.

IPv4 subnet CIDR block
 256 IPs
< > ^ v

Tags - optional

Key	Value - optional	
<input type="text" value="Name"/>	<input type="text" value="Public"/>	<input type="button" value="Remove"/>
<input type="text" value="Type"/>	<input type="text" value="Public"/>	<input type="button" value="Remove"/>

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Figure 3 - creating subnet 1

You have successfully created 1 subnet: subnet-0e046efff326dccbe

Subnets (1) [Info](#)

Subnet ID : subnet-0e046efff326dccbe

<input type="checkbox"/>	Name	Subnet ID	State	VPC	IPv4 CIDR
<input type="checkbox"/>	Public subnets	subnet-0e046efff326dccbe	Available	vpc-0489df5d77f918a4e victo...	120.0.3.0/24

Figure 4 - subnet 1 created

eu-west-3.console.aws.amazon.com

Start - Register an email CreateSubnet | VPC Console What is Amazon S3? - Amazon Simple Storage Service

Services Search [Option+S]

Paris Victor

IPv4 CIDRs
120.0.0.0/16

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.

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.

IPv4 VPC CIDR block [Info](#)
Choose the VPC's IPv4 CIDR block for the subnet. The subnet's IPv4 CIDR must lie within this block.

IPv4 subnet CIDR block
 256 IPs
< > ^ v

Tags - optional

Key	Value - optional	
<input type="text" value="Name"/>	<input type="text" value="Private1"/>	<input type="button" value="Remove"/>
<input type="text" value="Type"/>	<input type="text" value="Private"/>	<input type="button" value="Remove"/>

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Figure 5 - creating subnet 2

Subnets (5) [Info](#)

< 1 >

<input type="checkbox"/>	Name	Subnet ID	State	VPC	IPv4 CIDR
<input type="checkbox"/>	Public	subnet-0e046efff326dccbe	Available	vpc-0489df5d77f918a4e	120.0.3.0/24
<input type="checkbox"/>	Private1	subnet-043b9da2c52e7aedf	Available	vpc-0489df5d77f918a4e	120.0.1.0/24

Figure 6 - subnet 2 created

eu-west-3.console.aws.amazon.com

Start - Register an email | CreateSubnet | VPC Console | What is Amazon S3? - Amazon Simple Storage Service

Services Search [Option+S]

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.

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.

IPv4 VPC CIDR block [Info](#)
Choose the VPC's IPv4 CIDR block for the subnet. The subnet's IPv4 CIDR must lie within this block.

IPv4 subnet CIDR block
 256 IPs
[Navigation icons]

Tags - optional

Key	Value - optional	
<input type="text" value="Name"/>	<input type="text" value="Private2"/>	<input type="button" value="Remove"/>
<input type="text" value="Type"/>	<input type="text" value="Private"/>	<input type="button" value="Remove"/>

You can add 48 more tags.

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Figure 7 - creating subnet 3

✓ You have successfully created 1 subnet: subnet-0adf221b47b997041

Subnets (6) [Info](#)

<input type="checkbox"/>	Name	Subnet ID	State	VPC	IPv4 CIDR
<input type="checkbox"/>	Public	subnet-0e046efff326dccbe	✓ Available	vpc-0489df5d77f918a4e	120.0.3.0/24
<input type="checkbox"/>	Private1	subnet-043b9da2c52e7aedef	✓ Available	vpc-0489df5d77f918a4e	120.0.1.0/24
<input type="checkbox"/>	-	subnet-0c68f252e483dd3d3	✓ Available	vpc-049afabd4da5e6cb2	172.31.16.0/20
<input type="checkbox"/>	-	subnet-0ea5d13d4939642fd	✓ Available	vpc-049afabd4da5e6cb2	172.31.32.0/20
<input type="checkbox"/>	-	subnet-06c815525081f8bb7	✓ Available	vpc-049afabd4da5e6cb2	172.31.0.0/20
<input type="checkbox"/>	Private2	subnet-0adf221b47b997041	✓ Available	vpc-0489df5d77f918a4e	120.0.2.0/24

subnets

Figure 8 - subnet 3 created

3. Create Internet Gateway (IGW):

- In the VPC service, click on "Internet Gateways".
- Click on "Create Internet Gateway".
- Provide a name for the internet gateway (e.g., igw1).
- Click on "Create internet Gateway".
- Select the newly created IGW, go to "Actions" and choose "Attach to VPC".
- Select the VPC you created (MyVPC1) and attach the IGW.

eu-west-3.console.aws.amazon.com

Start - Register an email | Create internet gateway | VPC Management Console | What is Amazon S3? - Amazon Simple Storage Service

Services Search [Option+S]

VPC > Internet gateways > 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.

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	
<input type="text" value="Name"/>	<input type="text" value="igw1"/>	<button>Remove</button>
<input type="text" value="Purpose"/>	<input type="text" value="For Public subnet"/>	<button>Remove</button>

Add new tag
You can add 48 more tags.

Cancel Create internet gateway

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Figure 9 -creating internet gateway

Internet gateways (2) [Info](#)

Refresh Actions Create internet gateway < 1 > Settings

<input type="checkbox"/>	Name	Internet gateway ID	State	VPC ID	Owner
<input type="checkbox"/>	-	igw-0852590c8297c308a	Attached	vpc-049afabd4da5e6cb2	975050211573
<input type="checkbox"/>	igw1	igw-0f0361715046b9434	Detached	-	975050211573

Figure 10 - internet gateway created

[VPC](#) > [Internet gateways](#) > Attach to VPC (igw-0f0361715046b9434)

Attach to VPC (igw-0f0361715046b9434) [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.

► **AWS Command Line Interface command**

AttachInternetGateway

Cancel

Attach internet gateway

Figure 11 - attaching the internet gateway

4. Enable Internet Route to Public Subnet:

- Go to the route tables in the VPC service.
- Create a new route table (if needed).
- Edit the route table associated with the public subnet.
- Add a route with destination 0.0.0.0/0 and target as the IGW.
- Save the changes.

aws

Services

Search

[Option+S]

VPC

Route tables

Create route table

Create route table [Info](#)

A route table specifies how packets are forwarded between the subnets within your VPC, the internet, and your VPN connection.

Route table settings

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

rtb-private

VPC
The VPC to use for this route table.

vpc-0489df5d77f918a4e (victor-VPC-1)

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

Q Name

X

Q rtb-private

X

Remove

Add new tag

You can add 49 more tags.

CreateRouteTable

Cancel

Create route table

Figure 12 - creating route table

Route tables (3) [Info](#)

Find resources by attribute or tag

Actions

Create route table

< 1 >

	Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
<input type="checkbox"/>	RouteTables	rtb-0191c5a1c4687ec5a	-	-	Yes	vpc-049afabd4da5e6cb2
<input type="checkbox"/>	-	rtb-0bfd255ecd2f0c7ad	-	-	Yes	vpc-0489df5d77f918a4e
<input type="checkbox"/>	rtb-private	rtb-01e4c395d9b075af1	-	-	No	vpc-0489df5d77f918a4e

Figure 13 - route table created

VPC > Route tables > rtb-0bfd255ecd2f0c7ad > Edit routes

Edit routes

Destination	Target	Status	Propagated
120.0.0.0/16	local	Active	No
0.0.0.0/0	Internet Gateway	-	No

Remove

Add route

Cancel Preview **Save changes**

EditRoutes

Figure 14 - editing routes

eu-west-3.console.aws.amazon.com

Start - Register an email vpcs | VPC Console vpcs | VPC Console What is Amazon S3? - Amazon Simple Storage Service

Services Search [Option+S]

VPC dashboard EC2 Global View Filter by VPC: Select a VPC

Virtual private cloud Your VPCs

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP
-	vpc-049afabd4da5e6cb2	Available	172.31.0.0/16	-	dopt-0
✓ victor-VPC-1	vpc-0489df5d77f918a4e	Available	120.0.0.0/16	-	dopt-0

Actions Create VPC

Details Resource map CIDRs Flow logs Tags Integrations

Resource map

VPC Show details Your AWS virtual network victor-VPC-1

Subnets (3) Subnets within this VPC

- eu-west-3a Public
- eu-west-3b Private1
- eu-west-3c Private2

Route tables (2) Route network traffic to resources

- Public
- rtb-private

Network connections Connections to resources

- igw1

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Figure 15 - resource map

5. Create NAT Gateway:

- In the VPC service, go to NAT Gateways.
- Click on "Create NAT gateways".
- Provide a name for the NAT gateway (e.g., my-nat-gateway1).

- Select the appropriate subnet(s) (private subnets).
- Choose "Public" for connectivity type.
- Assign an Elastic IP.
- Click on "Create NAT Gateway".

Services
Search
[Option+S]

Elastic IP address 13.39.55.160 (eipalloc-00d82e0ec8a01f8b9) allocated.

NAT gateway settings

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

The name can be up to 256 characters long.

Subnet
Select a subnet in which to create the NAT gateway.

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.

► **Additional settings** [Info](#)

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	
<input type="text" value="Name"/>	<input type="text" value="Use 'Private subnets'"/>	<input type="button" value="Remove"/>
<input type="text" value="Purpose"/>	<input type="text" value="Private subnets"/>	<input type="button" value="Remove"/>

You can add 48 more tags.

Figure 16 - creating NAT gateway

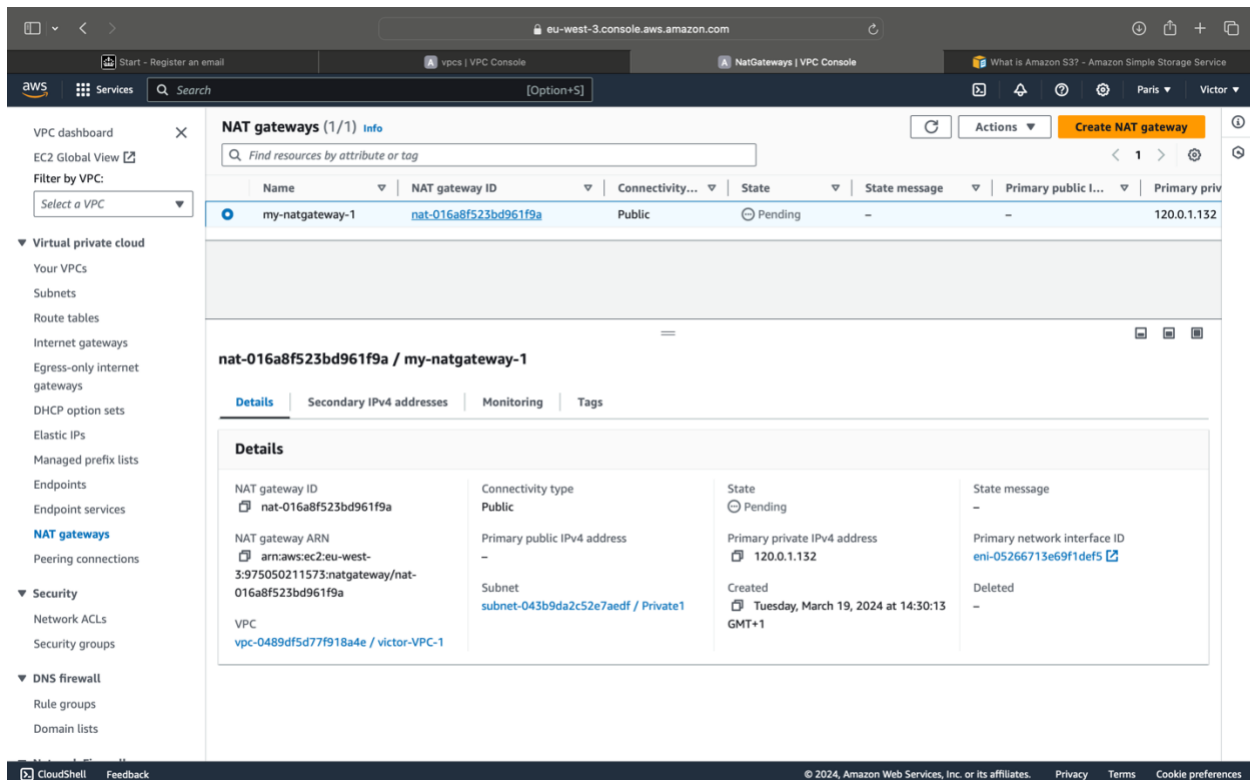


Figure 17 - NAT gateway created

6. Update Private Route Table:

- Go to the route tables in the VPC service.
- Select the route table associated with the private subnet(s).
- Edit the route table.
- Add a route with destination 0.0.0.0/0 and target as the NAT Gateway you created.
- Save the changes.

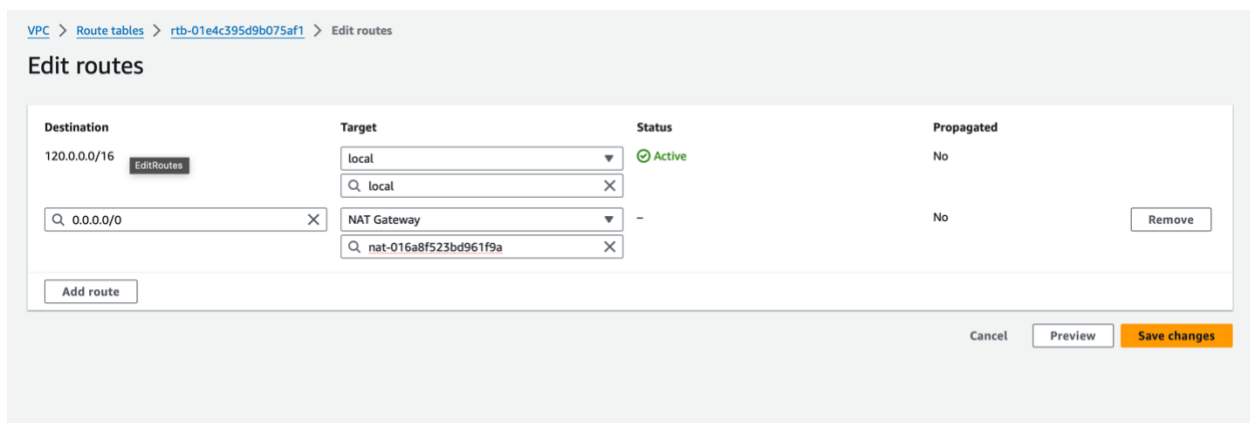


Figure 18 - edit routes to add NAT gateway

eu-west-3.console.aws.amazon.com

Start - Register an email

vpcs | VPC Console

RouteTableDetails | VPC Console

What is Amazon S3? - Amazon Simple Storage Service

Services

Search

[Option+S]

Paris

Victor

VPC dashboard

EC2 Global View

Filter by VPC:

Select a VPC

Virtual private cloud

Your VPCs

Subnets

Route tables

Internet gateways

Egress-only internet gateways

DHCP option sets

Elastic IPs

Managed prefix lists

Endpoints

Endpoint services

NAT gateways

Peering connections

Security

Network ACLs

Security groups

DNS firewall

Rule groups

Domain lists

Updated routes for rtb-01e4c395d9b075af1 / rtb-private successfully

Details

VPC > Route tables > rtb-01e4c395d9b075af1

rtb-01e4c395d9b075af1 / rtb-private

Actions

Details

Info

Route table ID

rtb-01e4c395d9b075af1

VPC

vpc-0489df5d77f918a4e | victor-VPC-1

Main

No

Owner ID

975050211573

Explicit subnet associations

2 subnets

Edge associations

-

Routes

Subnet associations

Edge associations

Route propagation

Tags

Routes (2)

Both

Edit routes

Filter routes

Destination	Target	Status	Propagated
0.0.0.0/0	nat-016a8f523bd961f9a	Active	No
120.0.0.0/16	local	Active	No

CloudShell

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Figure 19 - successfully edited

Summary:

In this lab, we embarked on a comprehensive journey to construct a robust and secure Virtual Private Cloud (VPC) within the AWS ecosystem. By meticulously following a series of guided tasks, we gained practical insights into the intricacies of VPC configuration, subnetting, and connectivity establishment.

We began by creating a custom VPC with a well-defined CIDR block, laying the foundation for our cloud infrastructure. Subsequently, we strategically designed public and private subnets distributed across multiple Availability Zones to ensure fault tolerance and high availability.

The establishment of internet connectivity through the attachment of an Internet Gateway (IGW) to our VPC enabled seamless communication with external networks, facilitating access to internet-based services for resources residing in the public subnet.

Moreover, by implementing Network Address Translation (NAT) gateways, we facilitated secure outbound internet access from private subnets while preserving data confidentiality. This aspect is crucial for organizations seeking to balance connectivity and security in their cloud environments.

Throughout this lab, we honed our skills in VPC management, subnet configuration, and routing within AWS, equipping us with the expertise needed to architect resilient and scalable cloud infrastructures tailored to organizational requirements.

As organizations increasingly embrace cloud technologies, the ability to design well-architected VPCs becomes paramount for driving innovation, scalability, and efficiency in the digital era. By mastering the concepts and techniques covered in this lab, we are better positioned to navigate the complexities of cloud architecture and elevate our organization's cloud strategy to new heights.