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Individual Assessment Coversheet

To be attached to the front of the assessment.

Campus: Midrand
Faculty: Information Technology
Module Code: ITCFA1-33
Group: 8
Lecturer's Name: Mr K Giresse
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Student Number: Eduv5492073

Indicate	Yes	No
Plagiarism report attached		

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Signature	Date
	29 August 2025

Lecturer's Comments:

Marks Awarded:	%

Signature	Date

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SECTION 1
QUESTION 1

1.1
Amazon ECs with Fargate
Amazon ECs is a container management service and Fargate is a tool that lets you run those containers without needing to manage servers yourself. This means that there is no need to manage physical or virtual servers, it automatically scales depending on the number of users and you only pay for the resources that are being used. This saves time and reduces mistakes for the SaaS platform.

Amazon Aurora
It is a cloud database that is compatible with MySQL and PostgreSQL as it is designed to be very fast, reliable and automatically handles backups and replications. Meaning that customer data is safe and backed up, the system can manage many users at once and developers don't have to worry about database maintenance as it is very good for the SaaS because it can handle global workloads while staying secure.

Amazon Cloudfront
A content delivery network (CDN) which stores copies of website files in many locations around the world. This makes the application faster for users because the data comes from a server close to them as it has faster loading speeds for global users, automatic protection against cyber attacks and the ability to handle large amounts of traffic.

1.2

Amazon Route 53

A DNS service that directs users to the right server whereby for SaaS it helps by sending users to the closest and fastest serve, checking if servers are healthy and moving users to another if one fails and keeps services running with low downtime. This makes the app quicker and more reliable for users around the world.

Amazon Cloudfront

It stores copies as mentioned above 1.1, this improves users to get data from a nearby location, web pages load faster and if one server is down, traffic is redirected to another. Improving security by blocking cyber threats and encrypting data between the app and the users.

Amazon web service identity and access management(IAM)

It controls who can access resources and lets the organization give different permissions to different users, add extra security steps like the multi factor authentication, manage user

access across all regions and create temporary logins when needed. This ensures only the right people can access sensitive customer information.

1.3

Data moving across borders as the first risk

Some countries have laws that data must stay within their borders. If data is moved to another country, the company may break the law.

The AWS solution could be using the Aurora Global Database with data stored in the correct region and using AWS Config to track where data is stored as well as apply encryption with region specific keys to make sure data cant be accessed outside its region.

Different security laws in different countries as the second risk

Each country has different compliance requirements, what is secure in one region may not meet legal requirements.

The AWS solution could be using AWS Control Tower to apply the same baseline rules across all the region and use AWS organisations to manage compliance policies for each region, lastly separate workloads using VPC so data is not mixed across regions.

1.4

To improve high availability and disaster recovery , these can be the steps to be followed by the Multi region deployment and Route 53 failover routing policy by deploying the SaaS platform whereby the multi region deployment should run ECs with Fargate in each region, use Aurora global database to keep data in sync and use AWS systems manager to maintain the same setting across all regions.

Route 53 health should check monitor servers, if the main region goes down, route 53 should automatically send traffic to a backup region and once the main region is healthy again, traffic can return as this ensures that very short downtime with an automatic recovery.

1.5

Security pillar

All about protecting both the system and data where in AWS there are tools like AWS Web Application Firewall that can stop bad traffic. This works well if it is connected with services like Amazon Cloudfront and API gateway because these add more layers of protection. The idea is that you don't wait for a hack to happen, you put security at different level.

Reliability pillar

Systems should still work even if one part breaks where if one zone has a problem,the other zone can take over without much delay. If the database goes down in one place, the whole app should not crash, Amazon Aurora has a feature called Multi AZ deployment where the database is copied in more than one zone. This helps the SaaS app to be more stable and users will not easily notice downtime.

Cost pillar

This pillar is about not wasting money, one way to do this is to use ECs with Fargate spot which is cheaper but works best for tasks that can be interrupted like background jobs. This way the company pays for what it actually use. For the database Aurora serverless is useful because it only gives power when needed and reduces power when usage is low whereby Cloudwatch can also help by giving alerts if costs starts to go up.

References

Wilkins. M. (2019)., Learning Amazon Web Services (AWS): A hands-on Guide to the Fundamentals of AWS Cloud. Addison-Wesley Professional.

Amazon Web Services. (2025).

Available at: https://aws.amazon.com/ [accessed on 28 August 2025]

QUESTION 2

2.1 Calculations of Costs

A.

EC2 Instance Costs

Total EC2 cost= 4 x 730 x 0,0416

=$121,27 per month

B.

EBS Storage Costs

EBS = 500 X 0,08

= $40,00 per month

C.

S3 Storage Costs

S3 = 1000 x 0,023

= $23,00 per month

D.

1. EC2 = 500GB

Where 1GB is free therefore EC2 = 499 GB and price = $0,09 per GB

EC2 = 499 x 0,09

= $44,91 per month

2. Cloudfront = 800GB

Price = $0,085 per GB

Cloudfront = 800 x 0,085

= $68,00 per month

Total data = $44,91 + $68,00

=$112,91

E.

1. AWS system manager

4 instances x 730 hrs x $0,00695

=$20,31

2. AWS business support plan

Infrastructure subtotal =317,49 x 0.1

Business support =$31,75 per month

F.

Total Monthly cost = $121,27 + $40,00 + $23,00 + $44,91+ $68,00 + $20,31 + $31,75

=$349,24

2.2

For the EC2, high availability and fault tolerance can be designed by deploying instances across multiple availability zones, using application load balancer to distribute traffic, configure auto scaling to replace failed instances automatically and store data on EBS volumes to protect against instance failure.

Then for S3, it replicates data across multiple facilities for durability, enables cross region replication for extra backup as well as turn on versioning to prevent accidental deleting incidents.

Glacier uses lifecycle policies to move old data or rather backups from S3 to glacier as it provides cost efficient long term storage and choose instant retrieval or deep archive based on access needs. This design keeps the app running during failures, ensures backups and maintains availability during traffic spikes.

References

Wilkins. M. (2019)., Learning Amazon Web Services (AWS): A Hands-on Guide to the Fundamentals of AWS Cloud. Addison-Websley Professional.

Amazon Web Services. (2025)., Amazon EC2 Pricing.

Available at: https://aws.amazon.com/ec2/pricing/ [Accessed 28 August 2025]

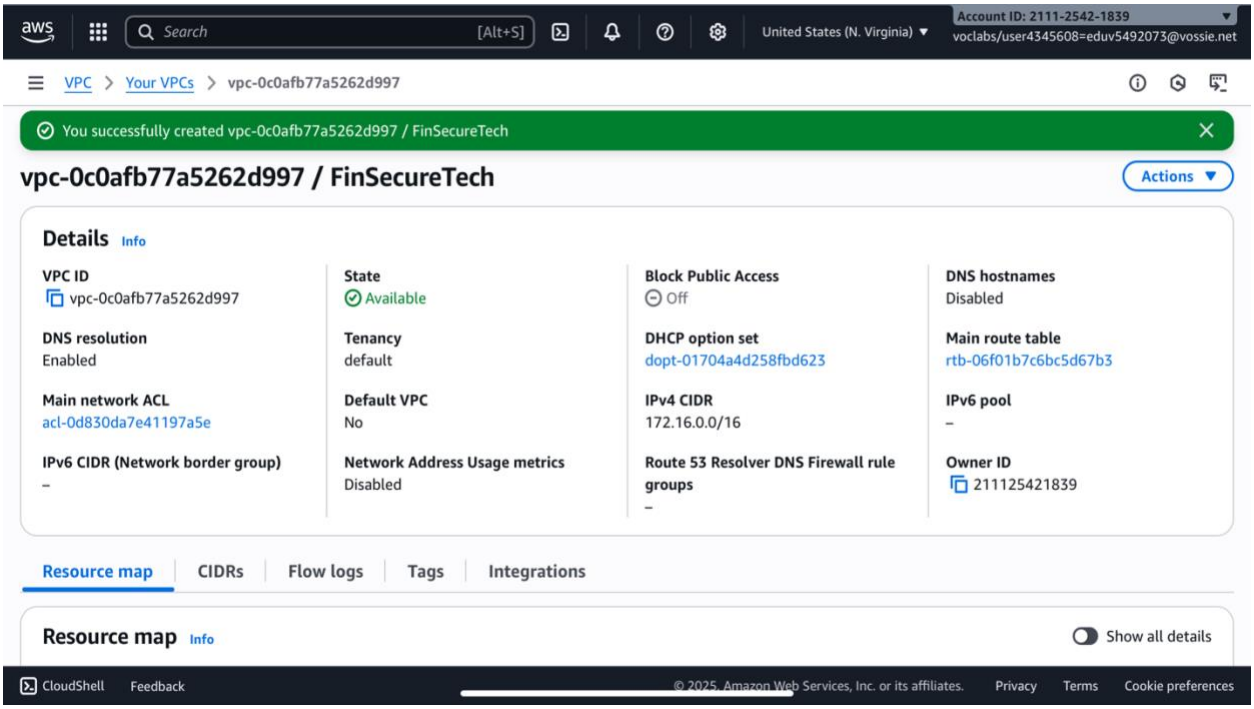
Amazon Web Service. (2025)., Amazon S3 Pricing.

Available at: https://aws.amazon.com/s3/pricing/ [Accessed 28 August 2025]

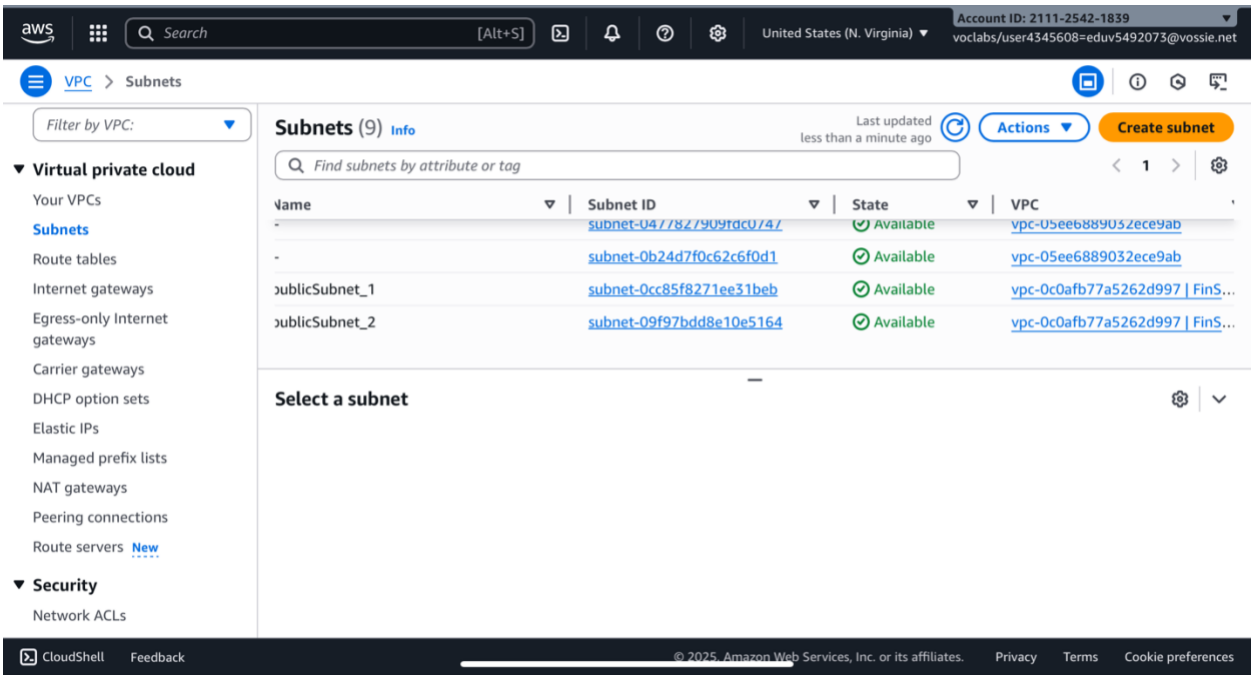
QUESTION 3

3.1

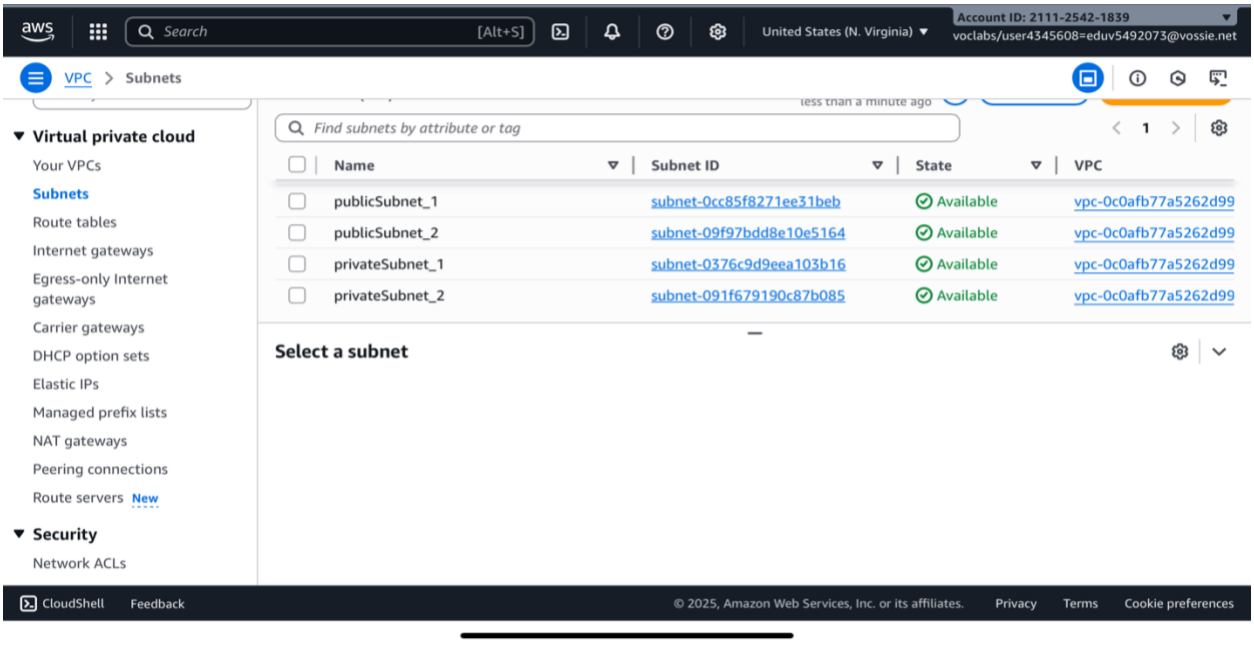
A. The VPC



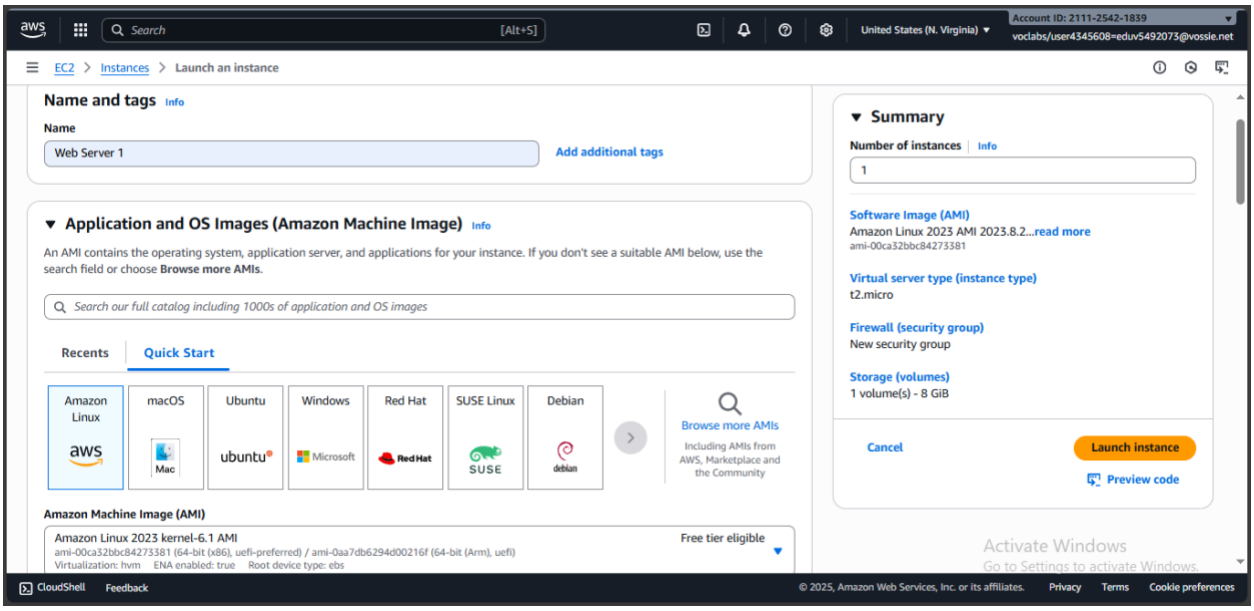
A. Two public subnets



A. Two private subnets



3.2


Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
EC2 > Instances > Launch an instance
Name and tags Info
Name
Web Server 1
Add additional tags
Application and OS Images (Amazon Machine Image) Info
An AMI contains the operating system, application server, and applications for your instance. If you don't see a suitable AMI below, use the search field or choose Browse more AMIs.
Search our full catalog including 1000s of application and OS images
Recents
Quick Start
Amazon Linux
macOS
Ubuntu
Windows
Red Hat
SUSE Linux
Debian
Browse more AMIs
Including AMIs from AWS, Marketplace and the Community
Amazon Machine Image (AMI)
Amazon Linux 2023 kernel-6.1 AMI
Free tier eligible
ami-00ca32bbc84273381 (64-bit (x86), uefi-preferred) / ami-0aa7db6294d00216f (64-bit (Arm), uefi)
Virtualization: hvm ENA enabled: true Root device type: ebs
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-00ca32bbc84273381
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
Activate Windows
Go to Settings to activate Windows.
CloudShell
Feedback
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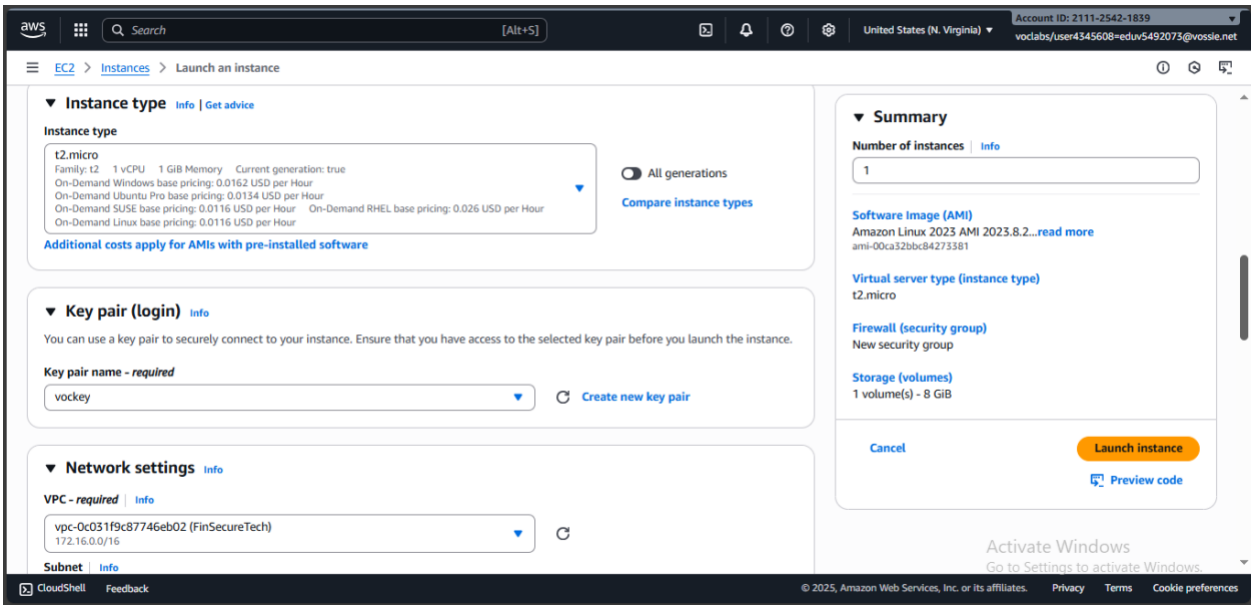
Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
EC2 > Instances > Launch an instance
Instance type Info | Get advice
Instance type
t2.micro
Family: t2 1 vCPU 1 GiB Memory Current generation: true
On-Demand Windows base pricing: 0.0162 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.0134 USD per Hour
On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand RHEL base pricing: 0.026 USD per Hour
On-Demand Linux base pricing: 0.0116 USD per Hour
All generations
Compare instance types
Additional costs apply for AMIs with pre-installed software
Key pair (login) Info
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.
Key pair name - required
vockey
Create new key pair
Network settings Info
VPC - required Info
vpc-0c031f9c87746eb02 (FinSecureTech)
172.16.0.0/16
Subnet Info
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-00ca32bbc84273381
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
Activate Windows
Go to Settings to activate Windows.
CloudShell
Feedback
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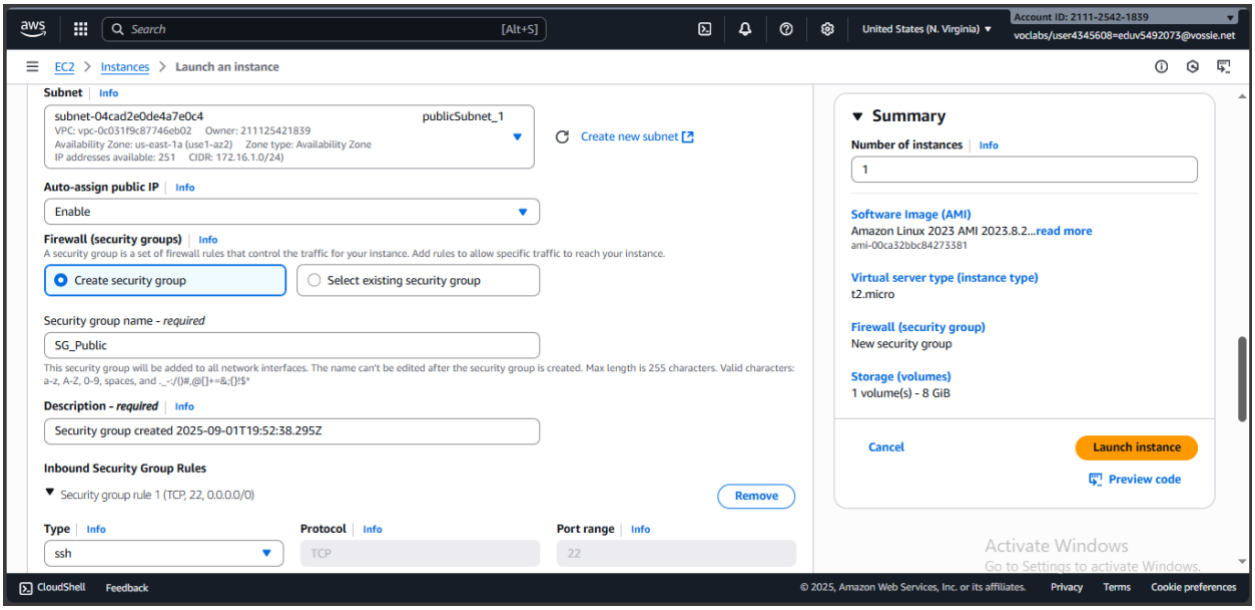
Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
EC2 > Instances > Launch an instance
Subnet | Info
subnet-04cad2e0de4a7e0c4 publicSubnet_1
VPC: vpc-0c031f9c87746eb02 Owner: 211125421839
Availability Zone: us-east-1a (use1-az2) Zone type: Availability Zone
IP addresses available: 251 CIDR: 172.16.1.0/24)
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
SG_Public
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
Security group created 2025-09-01T19:52:38.295Z
Inbound Security Group Rules
Security group rule 1 (TCP, 22, 0.0.0.0/0)
Remove
Type | Info
ssh
Protocol | Info
TCP
Port range | Info
22
Summary
Number of instances | Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-00ca32bbc84273381
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
Activate Windows
Go to Settings to activate Windows.
CloudShell
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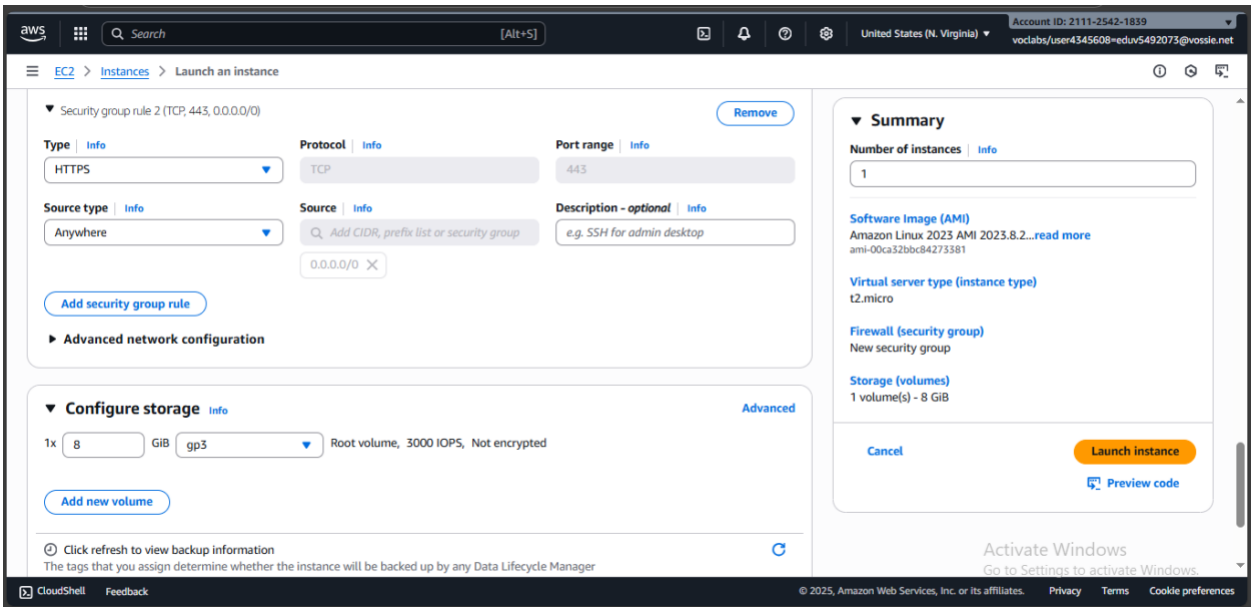
Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
EC2 > Instances > Launch an instance
Security group rule 2 (TCP, 443, 0.0.0.0/0)
Remove
Type | Info
HTTPS
Protocol | Info
TCP
Port range | Info
443
Source type | Info
Anywhere
Source | Info
Add CIDR, prefix list or security group
0.0.0.0/0
Description - optional | Info
e.g. SSH for admin desktop
Add security group rule
Advanced network configuration
Configure storage | Info
Advanced
1x 8 GiB gp3 Root volume, 3000 IOPS, Not encrypted
Add new volume
Click refresh to view backup information
The tags that you assign determine whether the instance will be backed up by any Data Lifecycle Manager
Summary
Number of instances | Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.8.2...read more
ami-00ca32bbc84273381
Virtual server type (instance type)
t2.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
Activate Windows
Go to Settings to activate Windows.
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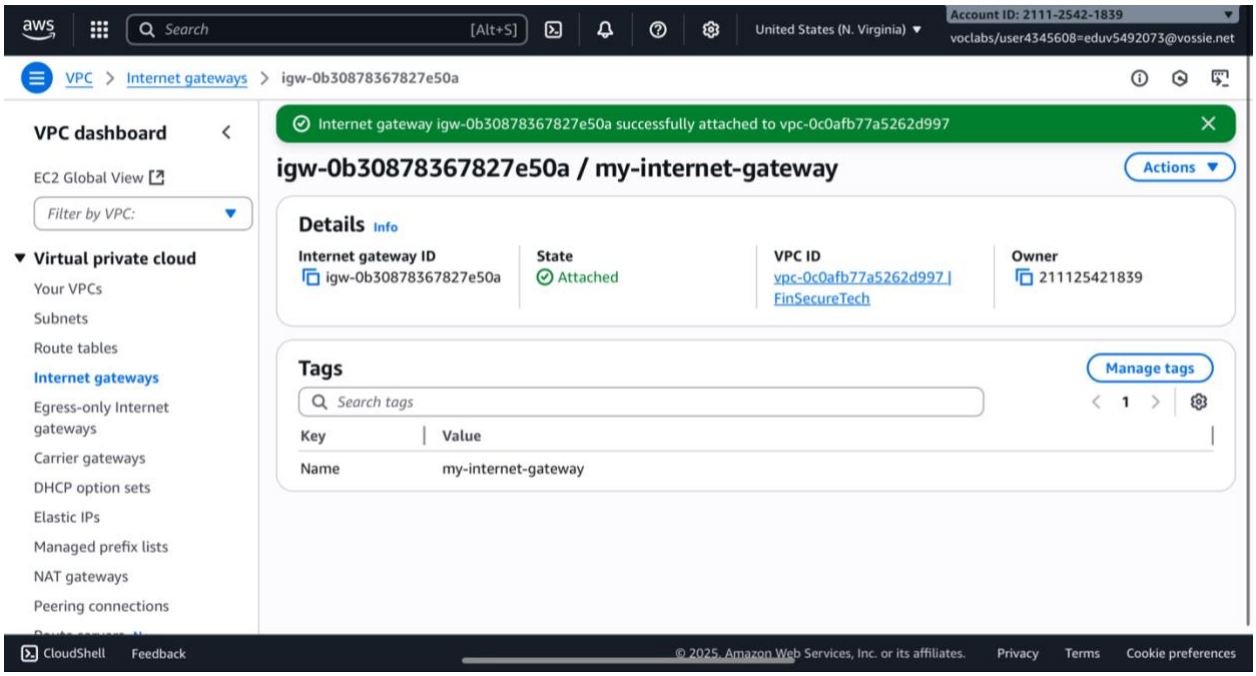
3.3


Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
VPC > Internet gateways > igw-0b30878367827e50a
VPC dashboard
EC2 Global View
Filter by VPC:
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only Internet gateways
Carrier gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Internet gateway igw-0b30878367827e50a successfully attached to vpc-0c0afb77a5262d997
igw-0b30878367827e50a / my-internet-gateway
Actions
Details Info
Internet gateway ID
igw-0b30878367827e50a
State
Attached
VPC ID
vpc-0c0afb77a5262d997 | FinSecureTech
Owner
211125421839
Tags
Manage tags
Search tags
1
Key
Value
Name
my-internet-gateway
CloudShell
Feedback
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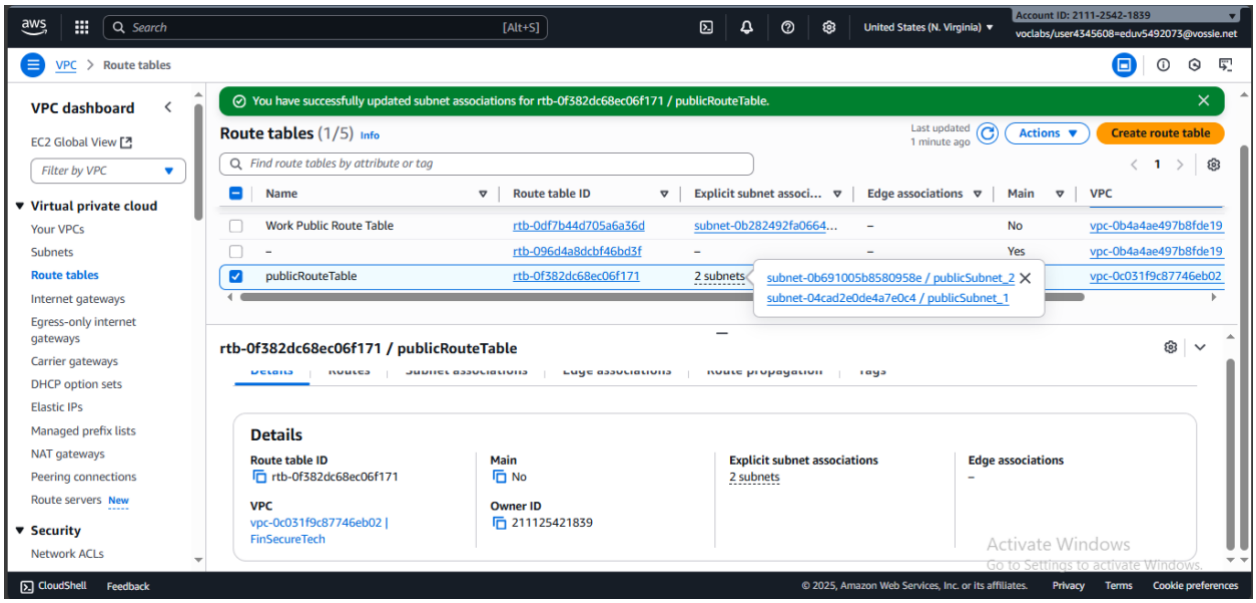
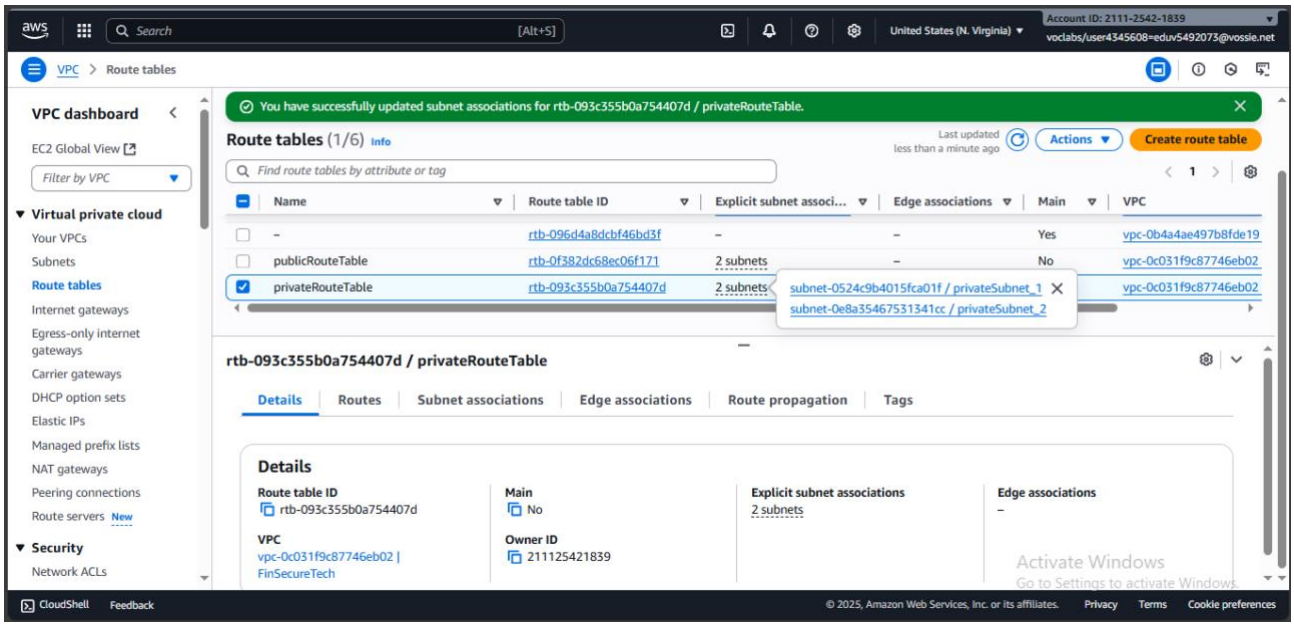
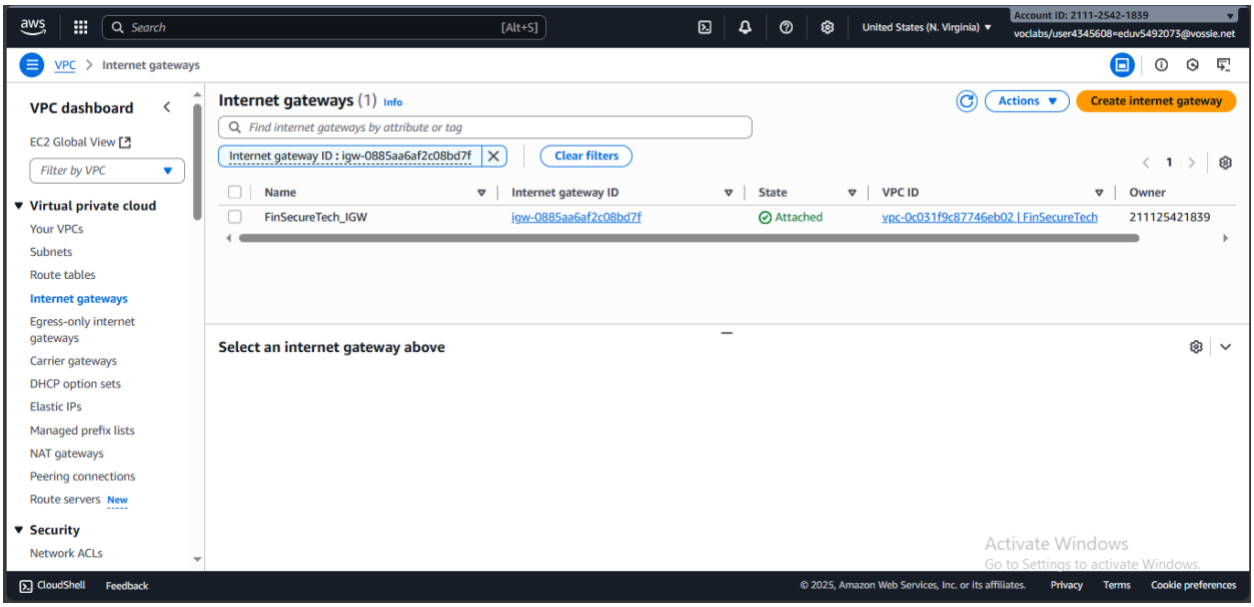
3.4


You have successfully updated subnet associations for rtb-0f382dc68ec06f171 / publicRouteTable.
Route tables (1/5) Info
Work Public Route Table
publicRouteTable
2 subnets
subnet-0b691005b8580958e / publicSubnet_2
subnet-04cad2e0de4a7e0c4 / publicSubnet_1
rtb-0f382dc68ec06f171 / publicRouteTable
Details
Route table ID
rtb-0f382dc68ec06f171
Main
No
Explicit subnet associations
2 subnets
Edge associations
VPC
vpc-0c031f9c87746eb02 | FinSecureTech
Owner ID
211125421839


You have successfully updated subnet associations for rtb-093c355b0a754407d / privateRouteTable.
Route tables (1/6) Info
privateRouteTable
2 subnets
subnet-0524c9b4015fca01f / privateSubnet_1
subnet-0e8a35467531341cc / privateSubnet_2
rtb-093c355b0a754407d / privateRouteTable
Details
Routes
Subnet associations
Edge associations
Route propagation
Tags
Route table ID
rtb-093c355b0a754407d
Main
No
Explicit subnet associations
2 subnets
Edge associations
VPC
vpc-0c031f9c87746eb02 | FinSecureTech
Owner ID
211125421839

A.


Search [Alt+S]
United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
VPC > Internet gateways
VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
Carrier gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Route servers New
Security
Network ACLs
Internet gateways (1) Info
Actions
Create internet gateway
Find internet gateways by attribute or tag
Internet gateway ID : igw-0885aa6af2c08bd7f
Clear filters
Name
Internet gateway ID
State
VPC ID
Owner
FinSecureTech_IGW
igw-0885aa6af2c08bd7f
Attached
vpc-0c031f9c87746eb02 | FinSecureTech
211125421839
Select an internet gateway above
Activate Windows
Go to Settings to activate Windows.
CloudShell
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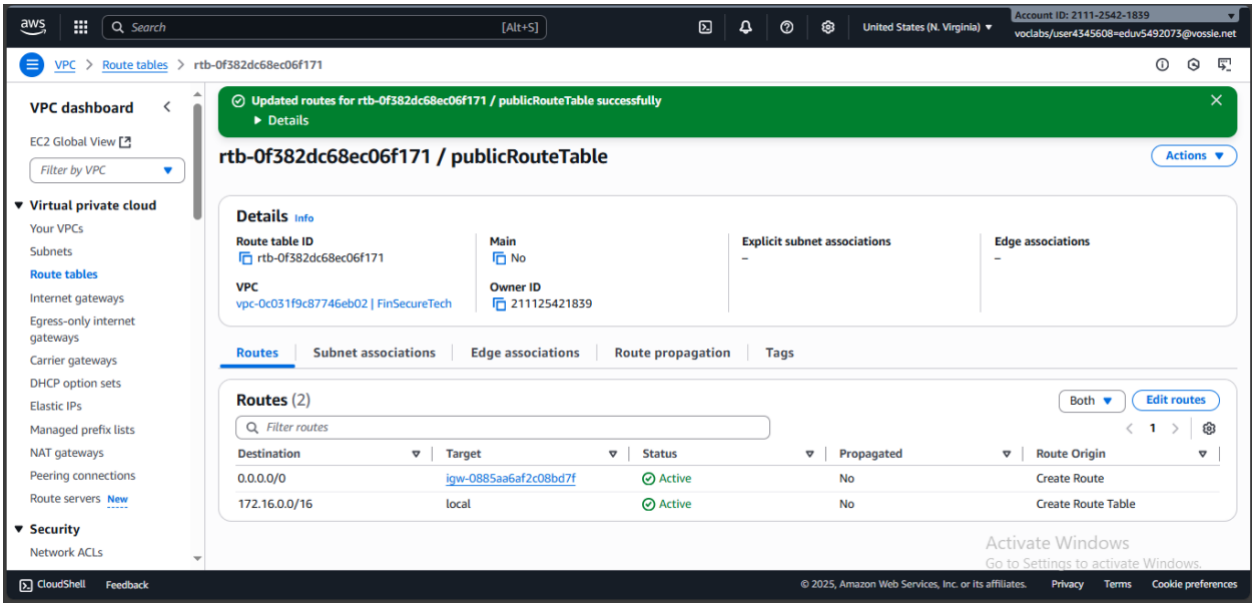
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United States (N. Virginia)
Account ID: 2111-2542-1839
voclabs/user4345608=eduv5492073@vossie.net
VPC > Route tables > rtb-0f382dc68ec06f171
VPC dashboard
EC2 Global View
Filter by VPC
Virtual private cloud
Your VPCs
Subnets
Route tables
Internet gateways
Egress-only internet gateways
Carrier gateways
DHCP option sets
Elastic IPs
Managed prefix lists
NAT gateways
Peering connections
Route servers New
Security
Network ACLs
Updated routes for rtb-0f382dc68ec06f171 / publicRouteTable successfully
Details
rtb-0f382dc68ec06f171 / publicRouteTable
Actions
Details Info
Route table ID
rtb-0f382dc68ec06f171
Main
No
Explicit subnet associations
–
Edge associations
–
VPC
vpc-0c031f9c87746eb02 | FinSecureTech
Owner ID
211125421839
Routes
Subnet associations
Edge associations
Route propagation
Tags
Routes (2)
Both
Edit routes
Filter routes
Destination
Target
Status
Propagated
Route Origin
0.0.0.0/0
igw-0885aa6af2c08bd7f
Active
No
Create Route
172.16.0.0/16
local
Active
No
Create Route Table
Activate Windows
Go to Settings to activate Windows.
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3.5

3.6

The security and design benefits when the web servers are placed in public subnets and the database servers in private subnets are, firstly the controlled internet access, web servers in public can receive HTTP/HTTPS request from users, allowing the application to be accessible online whereas the database servers in private subnets are not directly exposed to the internet due to the protection of sensitive data, reducing the risk of unauthorized access and protecting customer data.

By isolating databases in private subnets, only necessary traffic from the web servers can reach them using layered security, minimizing potential attack vectors. This separation makes sure that web servers handle public requests while databases manage backend storage and processing by organizing network architecture, leading to a more structured and manageable network.

Each layer can scale independently without compromising database security. Private subnets don't require public IP addresses for databases, saving resources while maintaining secure design. With clear separation maintenance tasks can be performed on web servers without impacting the database layer, providing smoother updates and less downtime. This setup supports disaster recovery strategies as data in private subnets can be backed up and restored independently of public components.

References

Wilkins. M. (2019)., Learning Amazon Web Services (AWS): A Hands-on Guide to the Fundamentals of AWS Cloud. Addison-Websley Professional.

Amazon Web Services. (2024)., Amazon VPC User Guide.

Available at: https://docs.aws.amazon.com/vpc/latest/userguide/ [Accessed 30 August 2025]

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