

PROJECT-1

3-TIRE ARCHITECTURE

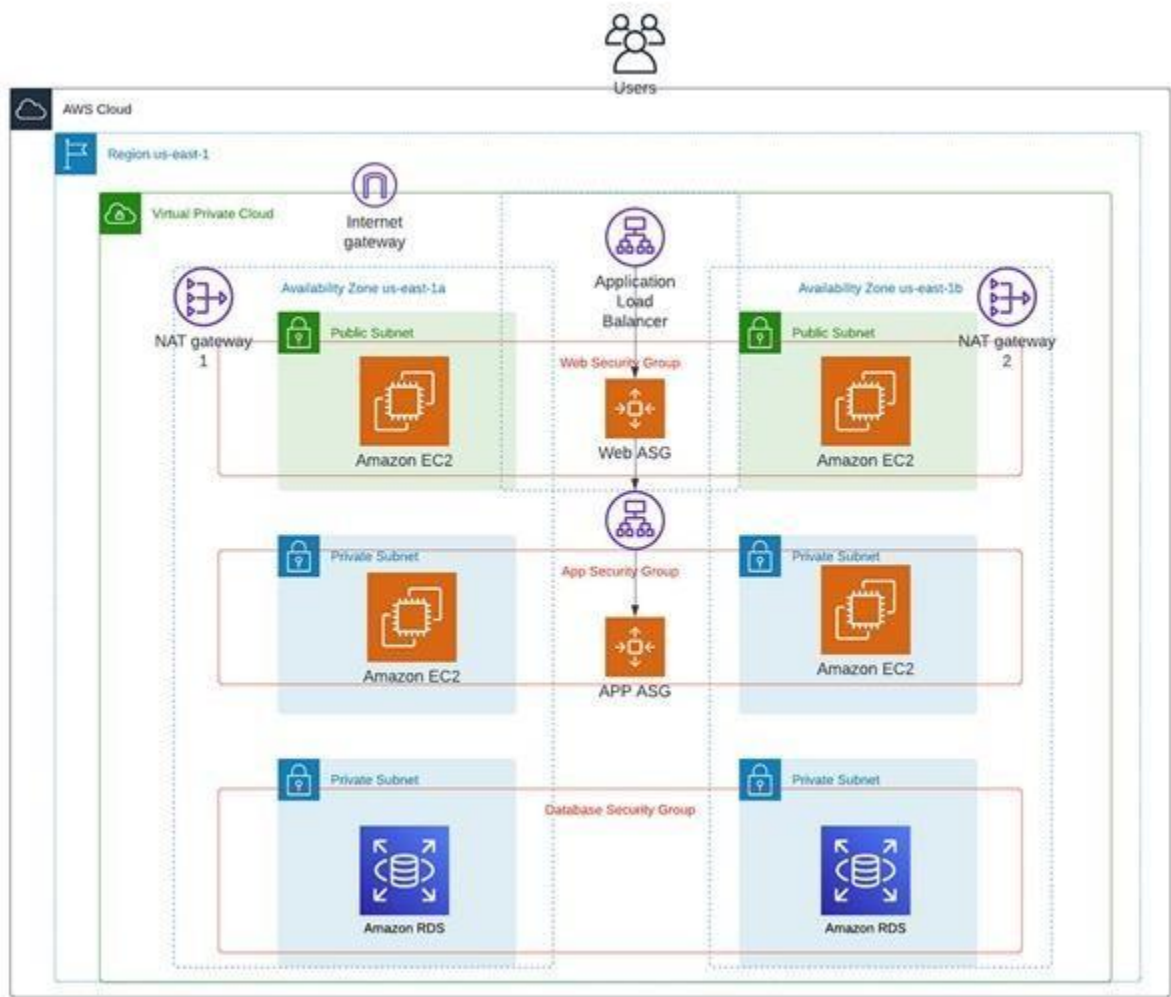
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Vcube Software solutions

Batch Number:139

3- Tier Architecture



What is 3-Tier Architecture?

A 3-Tier Architecture in AWS is a modular cloud design that separates an application into three logical and physical layers to improve scalability, security, and manageability.

1. Presentation Tier (Web Layer)

- Purpose: User interface
- AWS Components:

- Elastic Load Balancer (ELB) – Distributes traffic
- EC2 instances (Web servers) – Hosts front-end code (HTML, CSS, JS)
- Amazon Route 53 – DNS service
- Subnet: Public Subnet
- Access: Internet-facing

2. Application Tier (Logic Layer)

- Purpose: Business logic processing
- AWS Components:
 - EC2 instances – Host backend applications (e.g., Java, Node.js, Python)
 - Auto Scaling Groups – For dynamic scaling
- Subnet: Private Subnet
- Access: Only accessible by Web Tier

3. Database Tier (Data Layer)

- Purpose: Data storage and management
- AWS Components:
 - Amazon RDS (e.g., MySQL, PostgreSQL)
 - Amazon Aurora or DynamoDB (NoSQL)
- Subnet: Private Subnet (with no direct internet access)
- Access: Only by Application Tier

Security Best Practices:

- Use Security Groups to allow only necessary traffic (e.g., Web → App, App → DB).

- Use Network ACLs and Subnets to segment the layers properly.
- Database should never be exposed directly to the public internet.

Open AWS Website and login to your Account

PROCESS:

Step-1: Create VPC

- Open VPC and Click on “Create VPC”.
- Label the VPC (ex: Project-1-vpc).
- Specify Ipv4 CIDR block— 10.0.0.0/16.
- Create it.

The screenshot shows the AWS Management Console VPC dashboard for the Asia Pacific (Sydney) region. The left sidebar contains navigation links for VPC dashboard, EC2 Global View, and various VPC resources like Subnets, Route tables, and Internet gateways. The main content area, titled 'Your VPCs (2)', displays a table of existing VPCs. Below the table, there is a section to 'Select a VPC above'.

Name	VPC ID	State	Block Public...	IPv4 CIDR	IPv6 CIDR
-	vpc-073173b32f9a7e49a	Available	Off	172.31.0.0/16	-
project-1-vpc	vpc-0e7840cff4d580ada	Available	Off	10.0.0.0/16	-

2. Create Subnets:

- a) Click
On
Create
Subnet.
- b) Attach
Vpc for
subnets.
- c) Create Two Public and four Private Subnets.
- d) In Public Subnets Choose Different Availability Zones and Different CIDR Block.
- e) In Private Subnets Choose Different AZ and CIDR Block IP Like Public.
- f) Create it.

ap-southeast-2.console.aws.amazon.com/vpcconsole/home?region=ap-southeast-2#subnets:

aws Search [Alt+S] Asia Pacific (Sydney) kethana

VPC > Subnets

VPC dashboard < EC2 Global View [?] Filter by VPC

Virtual private cloud

- Your VPCs
- Subnets
- Route tables
- Internet gateways
- Egress-only internet gateways
- DHCP option sets
- Elastic IPs
- Managed prefix lists
- NAT gateways
- Peering connections
- Route servers New

Security

- Network ACLs
- Security groups

PrivateLink and Lattice

Subnets (6) Info

Find subnets by attribute or tag

Last updated less than a minute ago Actions Create subnet

<input type="checkbox"/>	Name	Subnet ID	State	VPC	Block Public...	IPv4 CIDR
<input type="checkbox"/>	pub-sub-2	subnet-0ceb399f0c29f9846	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.128.0/
<input type="checkbox"/>	pvt-sub-2	subnet-055be0efe2d327edb	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.192.0/
<input type="checkbox"/>	pvt-sub-1	subnet-0a47a1990b29cbe00	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.144.0/
<input type="checkbox"/>	pvt-sub-3	subnet-0dfe590a23f4071ac	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.22.0/2
<input type="checkbox"/>	pub-sub-1	subnet-0a685c35a8fb5d19	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.20.0/2
<input type="checkbox"/>	pvt-sub-4	subnet-0436d9ea8b146274e	Available	vpc-Oe7840cff4d580ada proje...	Off	10.0.162.0/

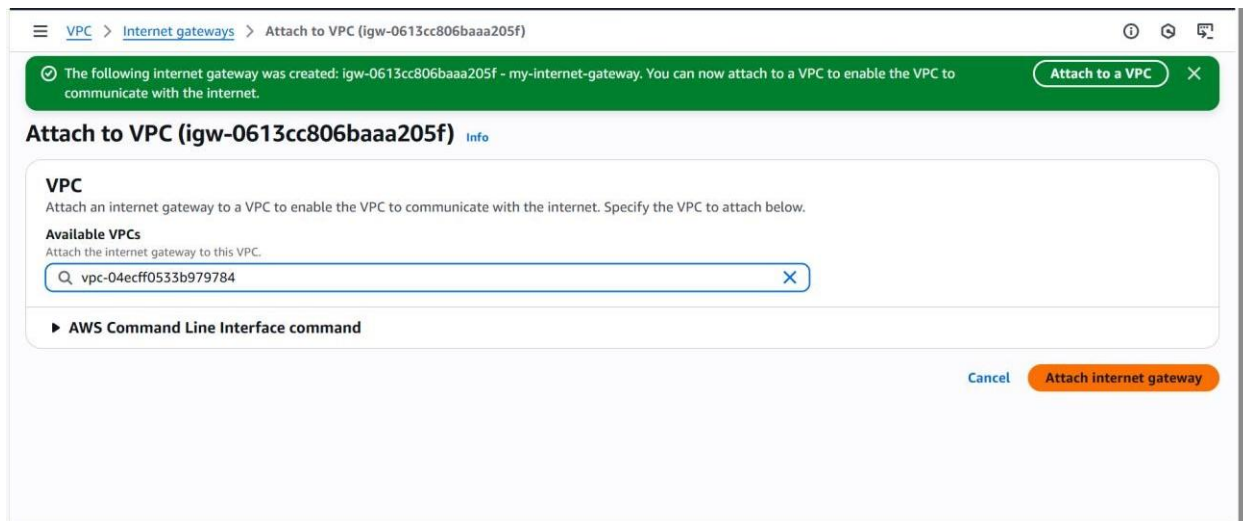
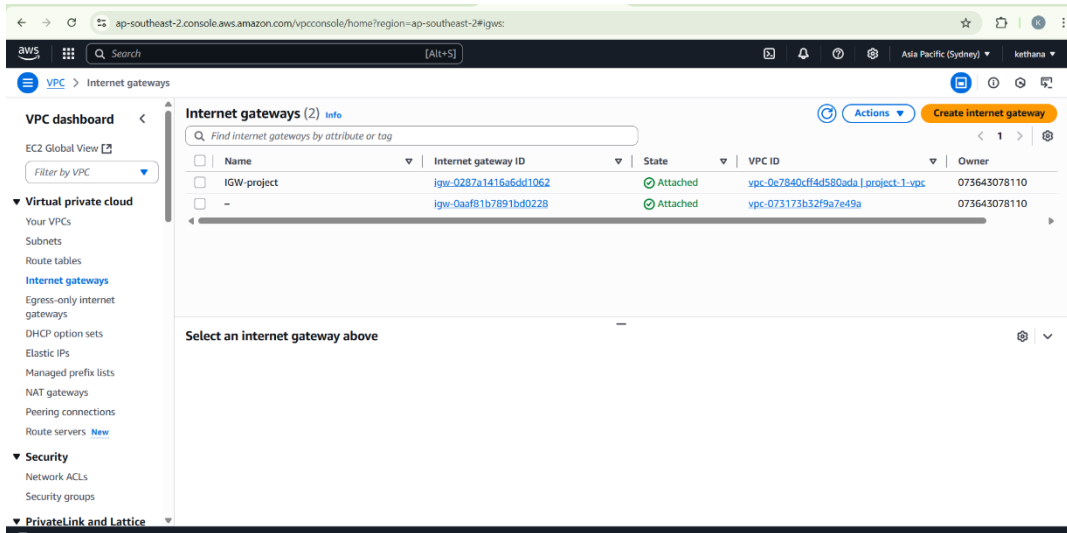
Select a subnet

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V.

Step-3: Create Internet Gateway:

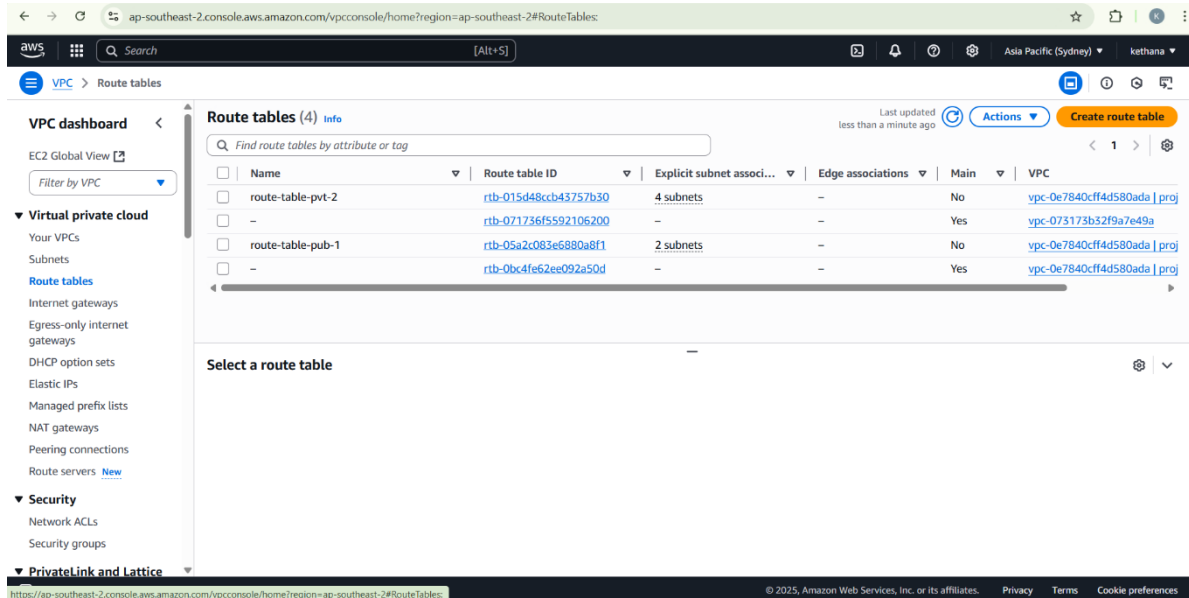
- a) Select InternetGateway.
- b) Attach Vpc to it.



Step-4: Create Route Tables:

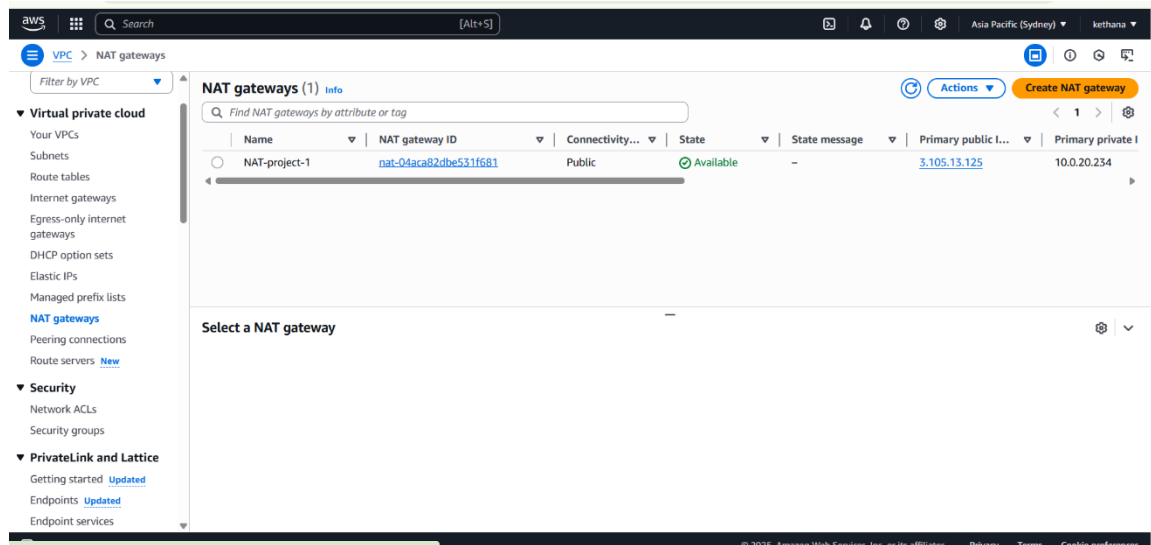
- a) Open Route Tables and select main Vpc.
- b) Create 2 Route Tables (public and private)

- c) Attach 2 public subnets to public Route Table.
- d) 4 private subnets to private Route Table.
- e) Edit it and Add route (InternetGateway).



Step-5: Create NAT Gateway

- a) Now Open NAT Gateway.
- b) Select Public Access.
- c) Allocate ElasticIP and Select Subnets (2Public subnets)



Step-6: Launch EC2 Instances

- Create 2 Public and 2 Private EC2 instances.
- Select UBUNTU For all Instances.
- Create Key Pair. (Keypair is same for every Instance).
- Select VPC – (What We Created)
- Add Subnet and Add Security Group
- Launch Instances.
- Copy the Public Instance SSH link and paste it on Gitbash.
- By Using Commands, we have to connect to the Server.

Step 7: Create images in EC2 Instance:

EC2 > Launch templates > Create launch template

Launch template name - required
autoscaling-template
Must be unique to this account. Max 128 chars. No spaces or special characters like '&', '\', '@'.

Template version description
allow
Max 255 chars

Auto Scaling guidance | Info
Select this if you intend to use this template with EC2 Auto Scaling
☒ Provide guidance to help me set up a template that I can use with EC2 Auto Scaling

► Template tags
► Source template

Launch template contents
Specify the details of your launch template below. Leaving a field blank will result in the field not being included in the launch template.

Summary

Software Image (AMI)
allow
ami-0088c53eaaa932d36

Virtual server type (instance type)
-

Firewall (security group)
-

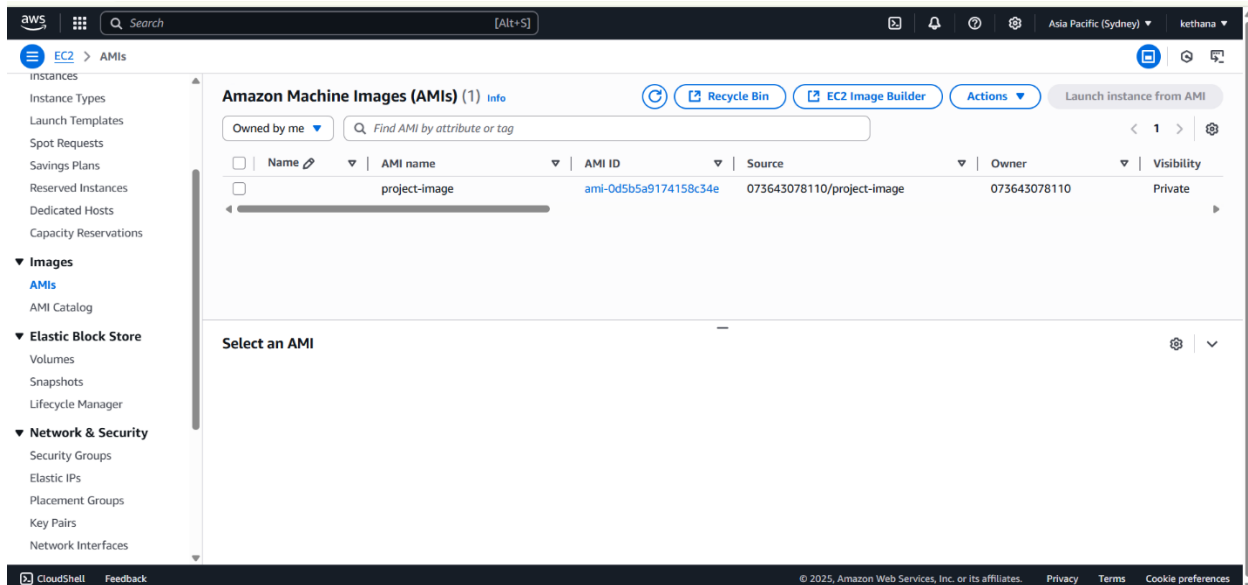
Storage (volumes)
1 volume(s) - 8 GiB

Free tier: In your first year of opening an AWS account, you

Cancel Create launch template

Create image in Instance:

- Click on Image and templates.
- Give A name to image and save it.
- Create it.



After Connected to the Server We Have to Commands:

- Sudo -i
- apt update apache2
- apt install apache2
- cd /var/www/html
- rm index.html
- vi index.html (insert data)
- systemctl restart apache2 (to restart the server)
- systemctl status apache2 (to see the status of server)
- cat index.html (used to insert the data in it gitbash).

```

root@ip-10-0-20-15: ~
ssh -i "project.pem" ubuntu@13.239.184.176
Warning: Permanently added '13.239.184.176' (EC2:Amazon.com) to the list of known hosts.
Welcome to Ubuntu 24.04.2 LTS (GNU/Linux 6.8.0-1029-aws x86_64)

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

System information as of Mon Aug 4 16:16:34 UTC 2025

System load:  0.02               Processes:    105
Usage of /:   25.8% of 6.71GB    Users logged in: 0
Memory usage: 20%              IPv4 address for enx0: 10.0.20.15
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

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

Last login: Mon Aug 4 16:11:19 2025 from 13.239.158.5
ubuntu@ip-10-0-20-15:~$ sudo -i
root@ip-10-0-20-15:~# apt update apache2
E: The update command takes no arguments
root@ip-10-0-20-15:~# apt update -y
Hit:1 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:5 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:6 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [508 kB]
Get:7 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
Get:8 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
Get:9 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [295 kB]
Get:10 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation-en [118 kB]
Get:11 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64

```

```
root@ip-20-0-2-5: ~  
ubuntu@ip-20-0-2-5:~$ sudo -i  
root@ip-20-0-2-5:~# apt update -y
```

```
root@ip-20-0-2-5: ~  
root@ip-20-0-2-5:~# apt install apache2
```

```
root@ip-20-0-2-5:~# cd /var/www/html
root@ip-20-0-2-5:/var/www/html# ls
index.html
root@ip-20-0-2-5:/var/www/html# rm index.html
root@ip-20-0-2-5:/var/www/html# vi index.html
```

```
root@ip-20-0-2-5: /var/www/html
```

```
root@ip-20-0-2-5:/var/www/html# vim index.html
root@ip-20-0-2-5:/var/www/html# vi index.html
root@ip-20-0-2-5:/var/www/html# systemctl restart apache2
root@ip-20-0-2-5:/var/www/html# systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: enabled)
   Active: active (running) since Sat 2025-08-02 17:04:16 UTC; 18s ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 2499 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
   Main PID: 2503 (apache2)
     Tasks: 55 (limit: 1124)
    Memory: 5.0M (peak: 5.1M)
       CPU: 28ms
```

X.

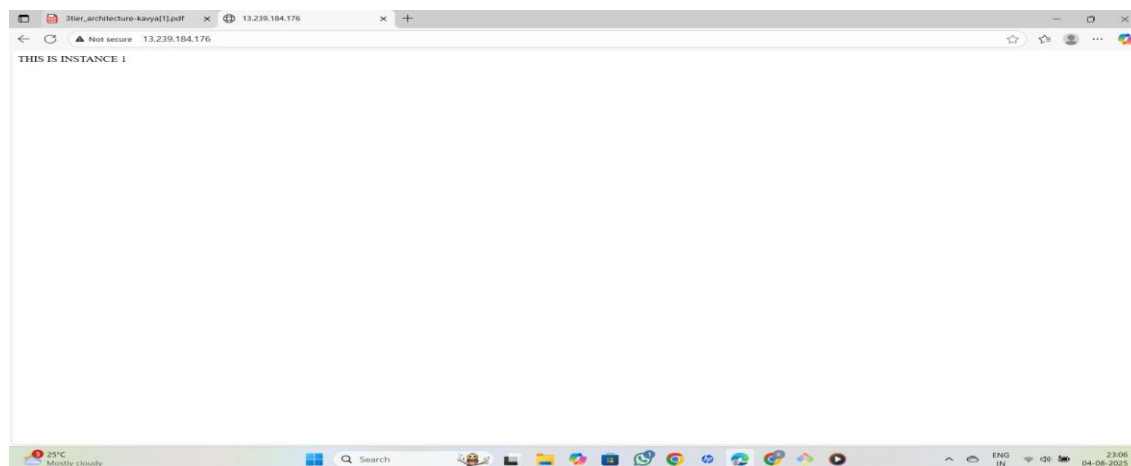
```
root@ip-20-0-2-5: /var/www/html# cat index.html
This is a instance 1
root@ip-20-0-2-5:/var/www/html# vi index.html

root@ip-20-0-2-5:~# sudo -i
ubuntu@ip-20-0-2-5:~$ vi new-project1-key.per
root@ip-20-0-2-5:~$ vi new-project-key.pair
root@ip-20-0-2-5:~$ ls
new-project-key.pair  new-project1-key.per  snap
root@ip-20-0-2-5:~$ rm new-project1-key.per
root@ip-20-0-2-5:~$ ls
new-project-key.pair  snap
root@ip-20-0-2-5:~$

root@ip-20-0-2-5:~$ ls
new-project-key.pair  snap
root@ip-20-0-2-5:~$ [200-ssh -i "project.pem" ubuntu@3.107.95.228~
[200-ssh: command not found.
root@ip-20-0-2-5:~$ ssh -i "project.pem" ubuntu@3.107.95.228
Warning: Identity file project.pem not accessible: No such file or directory.
The authenticity of host '3.107.95.228 (3.107.95.228)' can't be established.
ED25519 key fingerprint is SHA256:9AeQQdu+5wOrolJijThJ38yBec70uf1CbA3lLPmzrwY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '3.107.95.228' (ED25519) to the list of known hosts.
ubuntu@3.107.95.228: Permission denied (publickey).
root@ip-20-0-2-5:~$ ls
new-project-key.pair  snap
root@ip-20-0-2-5:~$ ls -l

ubuntu@ip-20-0-4-58:~$ ping google.com
PING google.com (142.250.204.14) 56(84) bytes of data:
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=1 ttl=118 time=0.678 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=2 ttl=118 time=0.688 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=3 ttl=118 time=0.687 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=4 ttl=118 time=0.693 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=5 ttl=118 time=0.694 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=6 ttl=118 time=0.720 ms
64 bytes from syd09s25-in-f14.1e100.net (142.250.204.14): icmp_seq=7 ttl=118 time=0.692 ms

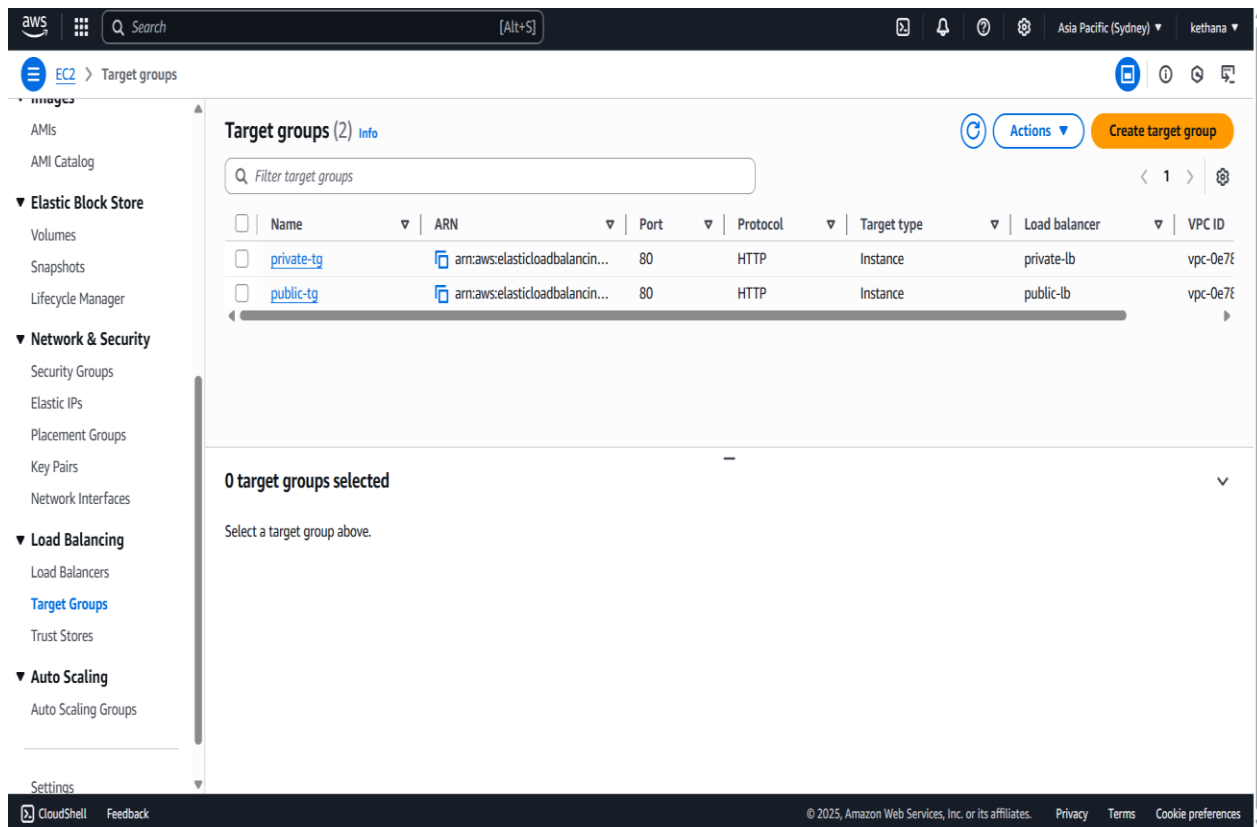
--- google.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6126ms
rtt min/avg/max/mdev = 0.678/0.693/0.720/0.012 ms
ubuntu@ip-20-0-4-58:~$
```



Step-7: Create TargetGroup:

- Create One Public TargetGroup.
- Give name as (public)
- Add Public Instances to Public TG.
- Create One Private TargetGroup.

- e) Give name as (Private)
- f) Add Private Instances to Private TG.



Step-8: Create LoadBalancer:

- a) Open LoadBalancer.
- b) We have to create Public and private LoadBalancer.
- c) Create Public LoadBalancer.
- d) Select Internet Facing.
- e) Select Subnets.
- f) Select our SecurityGroup. (what we created).
- g) Add Target Group (we Created one).
- h) Create Private Load Balancer same as Public LB
- i) Click On Create LoadBalancer.

EC2 > Load balancers > Create Application Load Balancer

private-loadbalancer

A maximum of 32 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Scheme [Info](#)

Scheme can't be changed after the load balancer is created.

☒ **Internet-facing**

- Serves internet-facing traffic.
- Has public IP addresses.
- DNS name resolves to public IPs.
- Requires a public subnet.

☐ **Internal**

- Serves internal traffic.
- Has private IP addresses.
- DNS name resolves to private IPs.
- Compatible with the IPv4 and Dualstack IP address types.

Load balancer IP address type [Info](#)

Select the front-end IP address type to assign to the load balancer. The VPC and subnets mapped to this load balancer must include the selected IP address types. Public IPv4 addresses have an additional cost.

☒ **IPv4**

Includes only IPv4 addresses.

☐ **Dualstack**

Includes IPv4 and IPv6 addresses.

☐ **Dualstack without public IPv4**

Includes a public IPv6 address, and private IPv4 and IPv6 addresses. Compatible with **internet-facing** load balancers only.

Network mapping [Info](#)

CloudShell Feedback

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EC2 > Load balancers > Create Application Load Balancer

Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.

subnet-0939b5eda95842272 publicsubnet-1

IPv4 subnet CIDR: 20.0.2.0/26

☒ **ap-southeast-2b (apse2-az3)**

Subnet

Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.

subnet-0161987027e1deea1 public-subnet-2

IPv4 subnet CIDR: 20.0.3.0/25

Security groups [Info](#)

A security group is a set of firewall rules that control the traffic to your load balancer. Select an existing security group, or you can [create a new security group](#).

Security groups

Select up to 5 security groups

project-securitygroup
sg-068d4935a98b14c32 VPC: vpc-04ecff0533b979784

project-security-group
sg-096b2a8d2987be261 VPC: vpc-04ecff0533b979784

Step-9: AWS Auto Scaling:

- Click on Create Auto Scaling.
- Auto Scaling group.
- Give Scaling Policies.

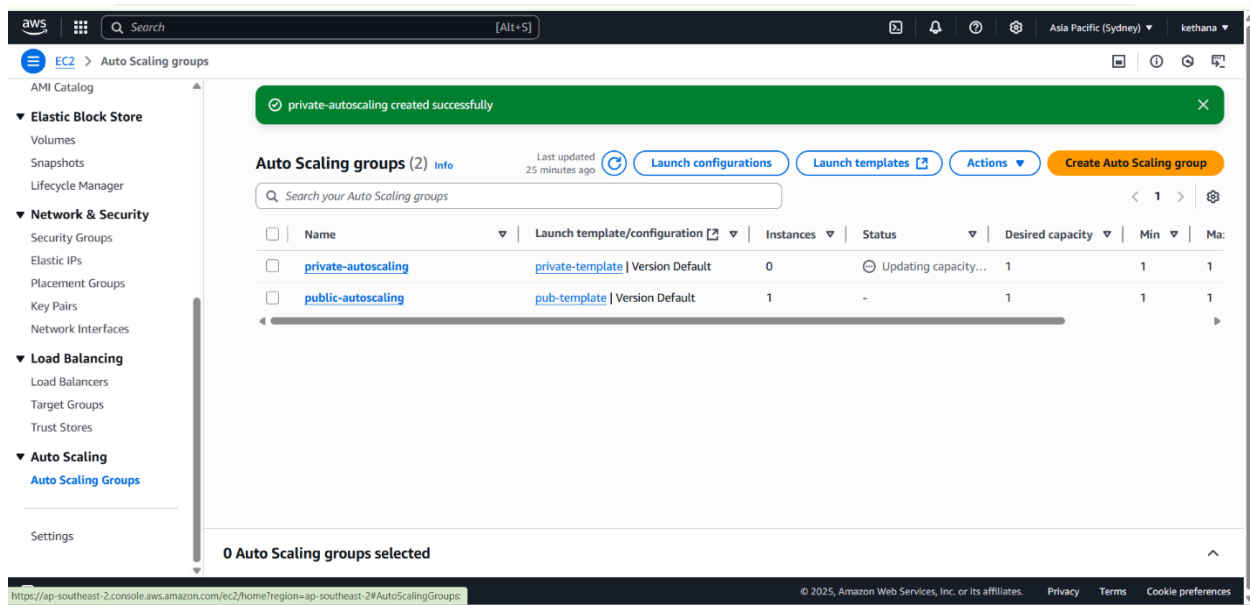
- d) Give the size (max or min).
- e) Attach the load Balancer. (what we created).
- f) Create Public and Private AutoScaling.
- vii. Add Public Subnet to Public AutoScaling.
- g) Add Private Subnet to Private AutoScaling.

The screenshot shows the AWS Management Console interface for creating an Auto Scaling group. The breadcrumb navigation at the top reads: **EC2** > **Auto Scaling groups** > **Create Auto Scaling group**. On the left, a vertical progress bar lists the steps: **Choose instance launch options** (selected), **Step 3 - optional**, **Integrate with other services**, **Step 4 - optional**, **Configure group size and scaling**, **Step 5 - optional**, **Add notifications**, **Step 6 - optional**, **Add tags**, **Step 7**, and **Review**.

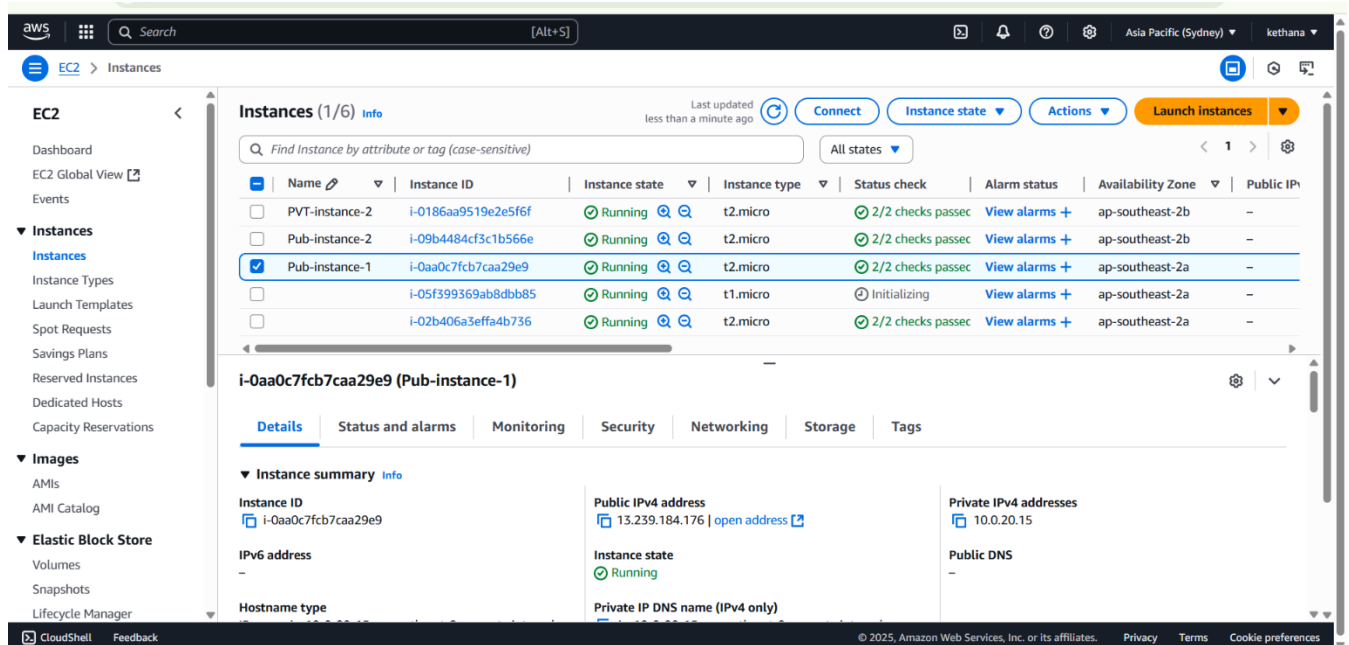
The main content area is divided into two sections:

- Name**
Auto Scaling group name
Enter a name to identify the group.
A text input field contains the value `public-autoscaling`.
A note below the field states: "Must be unique to this account in the current Region and no more than 255 characters."
- Launch template** [Info](#)
A blue information box contains the text: "For accounts created after May 31, 2023, the EC2 console only supports creating Auto Scaling groups with launch templates. Creating Auto Scaling groups with launch configurations is not recommended but still available via the CLI and API until December 31, 2023."
Launch template
Choose a launch template that contains the instance-level settings, such as the Amazon Machine Image (AMI), instance type, key pair, and security groups.
A dropdown menu labeled "Select a launch template" is shown with a downward arrow.
A link "Create a launch template" with an external link icon is located below the dropdown.

The footer of the console includes a "CloudShell" button, a "Feedback" link, and copyright information: "© 2025, Amazon Web Services, Inc. or its affiliates." along with links for "Privacy", "Terms", and "Cookie preferences".

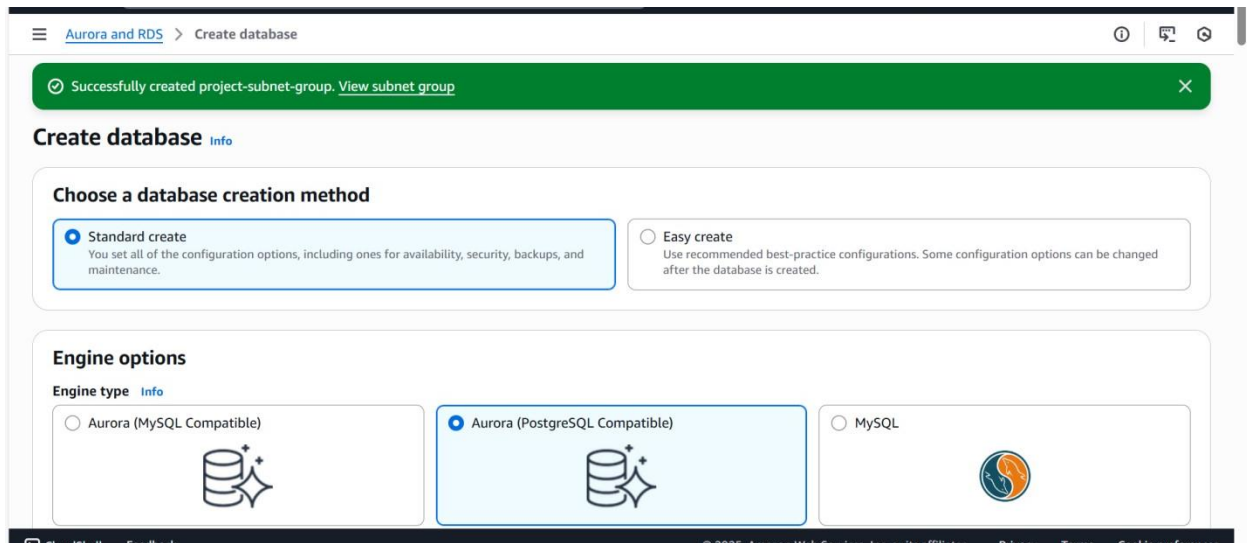


- In EC2 Instance we can see the New Instances Created.
- If we add subnets in auto Scaling. It can create EC2 Instances in EC2.



Step-10: Create Database In RDS

- a) Open Arora and RDS.
- b) Click On Databases.
- c) Choose Engine as: MySQL.
- d) In Credentials Management choose myself.
- e) Give new password to it.
- f) It shows monthly Estimated.



Aurora and RDS

>

Create database

► Additional configuration

Database options, encryption turned on, backup turned on, backtrack turned off, maintenance, CloudWatch Logs, delete protection turned on.

Estimated monthly costs

DB instance	341.64 USD
Storage	110.40 USD
Provisioned IOPS	660.00 USD
Total	1112.04 USD

This billing estimate is based on on-demand usage as described in [Amazon RDS Pricing](#). Estimate does not include costs for backup storage, IOs (if applicable), or data transfer.

Estimate your monthly costs for the DB Instance using the [AWS Simple Monthly Calculator](#).

ⓘ You are responsible for ensuring that you have all of the necessary rights for any third-party products or services that you use with AWS services.

Cancel

Create database

aws

Search

[Alt+S]

Aurora and RDS

>

Databases

Aurora and RDS

<

Dashboard

Databases

Query editor

Performance insights

Snapshots

Exports in Amazon S3

Automated backups

Reserved instances

Proxies

Subnet groups

Parameter groups

Option groups

Custom engine versions

Zero-ETL integrations New

Events

Event subscriptions

Databases (1)

Group resources

Modify

Actions

Create database

Filter by databases

< 1 >

DB identifier	Status	Role	Engine	Region ...	Size
database-1	Available	Instance	MySQL Co...	ap-southe...	db.m7g.large

CloudShell

Feedback

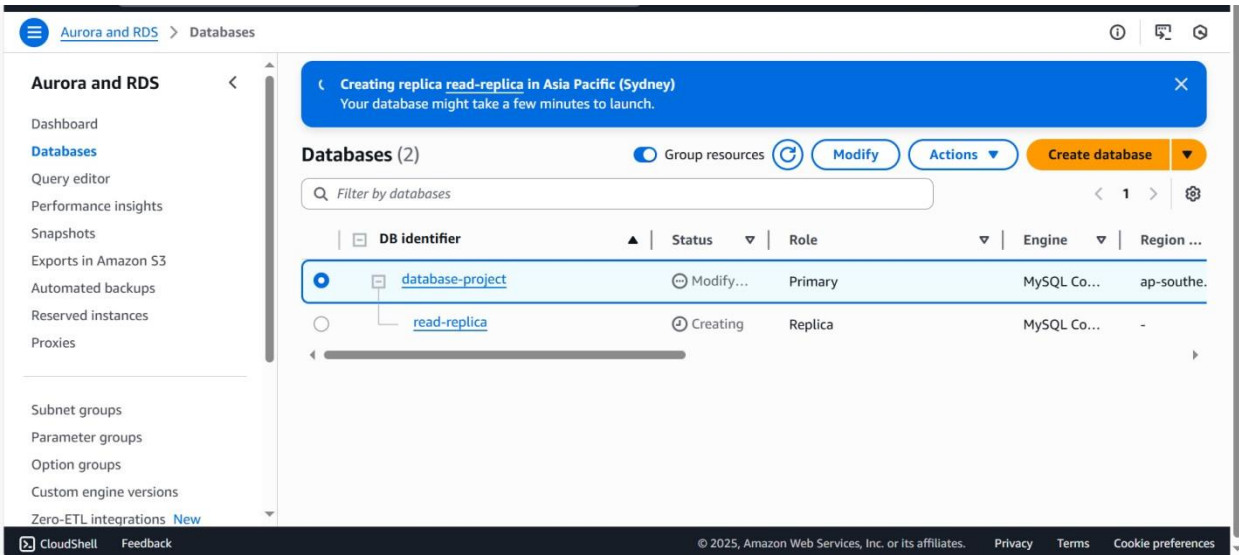
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Privacy

Terms

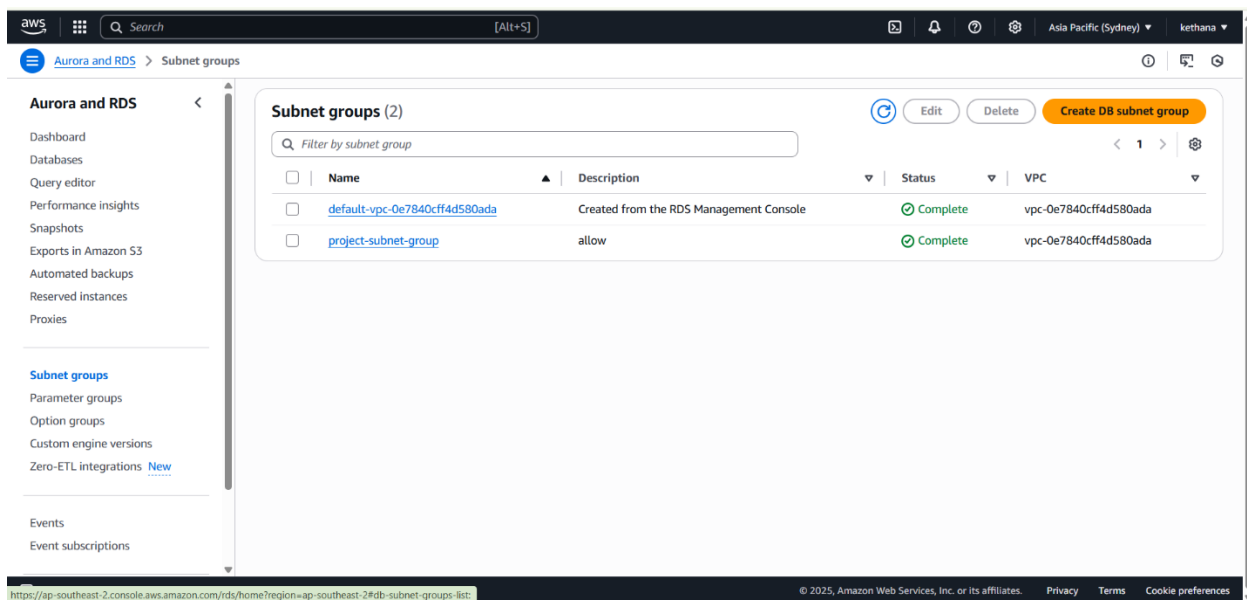
Cookie preferences

Add Read Replica to Database:



Step-11: Create subnet in RDS:

a) Open rds and Create a Subnets Group

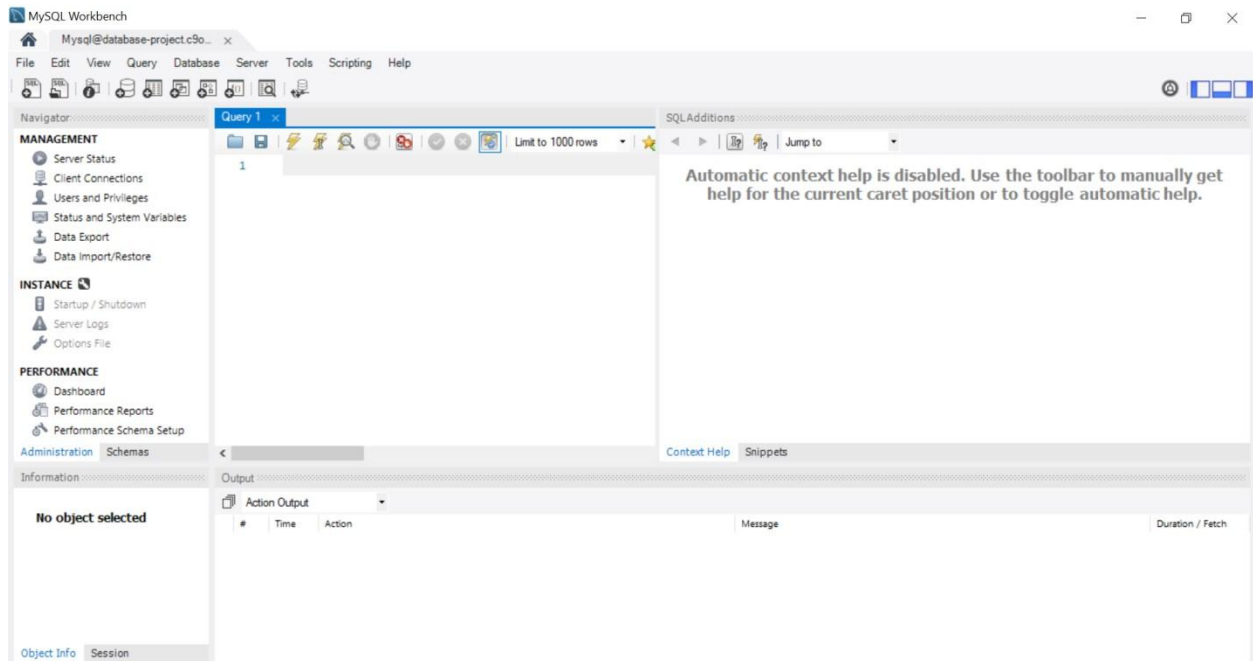


Step-12: Create MySQL:

- Open MySQL Workbench
- In MySQL open Database.
- Give host name and Password to it.
- TO Create Table and Insert Data.

BY Using Commands, we have to insert Data.

- b) show databases;
- c) 2.create database name;
- d) 3.CREATE TABLE Persons.
- e) LastName varchar (255) NOT NULL;
- f) FirstName varchar (255);
- g) Age int;
- h) PRIMARY KEY (ID)
- i) 4. show tables;
- j) 5.INSERT INTO Persons (ID, LastName, FirstName, Age)
- k) 6. select * from Persons



MySQL Workbench

mysql@database-project.c9o... x

File Edit View Query Database Server Tools Scripting Help

Navigator

MANAGEMENT

- Server Status
- Client Connections
- Users and Privileges
- Status and System Variables
- Data Export
- Data Import/Restore

INSTANCE

- Startup / Shutdown
- Server Logs
- Options File

PERFORMANCE

- Dashboard
- Performance Reports
- Performance Schema Setup

Administration Schemas

Query 1 x

show databases;

Execute the statement under the keyboard cursor

SQLAdditions

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Result Grid

Database

- information_schema
- mysql
- performance_schema
- sys
- vcube

Result 2 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	00:24:07	show databases	4 row(s) returned	0.172 sec / 0.000 sec
2	00:25:00	create database vcube	1 row(s) affected	0.203 sec
3	00:25:41	show databases	5 row(s) returned	0.203 sec / 0.000 sec

Object Info Session

MySQL Workbench

mysql@database-project.c9o... x

File Edit View Query Database Server Tools Scripting Help

Navigator

MANAGEMENT

- Server Status
- Client Connections
- Users and Privileges
- Status and System Variables
- Data Export
- Data Import/Restore

INSTANCE

- Startup / Shutdown
- Server Logs
- Options File

PERFORMANCE

- Dashboard
- Performance Reports
- Performance Schema Setup

Administration Schemas

Query 1 x

select

Execute the statement under the keyboard cursor

SQLAdditions

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Result Grid

ID	LastName	FirstName	Age
101	kavya	mamindla	22
102	ashwaaq	abul	21
103	ashwini	yeshala	21

Persons 6 x

Output

Action Output

#	Time	Action	Message	Duration / Fetch
19	00:51:51	INSERT INTO Persons (ID, LastName, FirstName, Age) VALUES (102, 'ashwaaq', '...	1 row(s) affected	0.203 sec
20	00:52:21	INSERT INTO Persons (ID, LastName, FirstName, Age) VALUES (103, 'ashwini', 'y...	1 row(s) affected	0.203 sec
21	00:52:42	show tables	1 row(s) returned	0.312 sec / 0.000 sec
22	00:53:49	select * from persons LIMIT 0, 1000	Error Code: 1146. Table 'vcube.persons' doesn't exist	0.219 sec
23	00:53:50	select * from persons LIMIT 0, 1000	Error Code: 1146. Table 'vcube.persons' doesn't exist	0.203 sec
24	00:54:15	select * from Persons LIMIT 0, 1000	3 row(s) returned	0.203 sec / 0.000 sec

Object Info Session

CONCLUSION

In this project, we successfully designed and deployed a **3-tier architecture** on **Amazon Web Services (AWS)**, comprising the **Presentation Layer (Web Tier)**, **Application Layer (App Tier)**, and **Database Layer (DB Tier)**. This architecture enhances **security**, **scalability**, and **manageability** of applications.

- Implemented **VPC**, **public and private subnets**, ensuring network isolation.
- Configured **EC2 instances** for the web and application tiers.
- Deployed a **MySQL RDS instance** in the private subnet for secure data storage.
- Utilized **Security Groups** to manage fine-grained access control between layers.
- Ensured high availability and scalability using **Auto Scaling Groups** and **Elastic Load Balancer (ELB)**.

This architecture follows industry best practices for building cloud-native applications and can be scaled further to meet growing business needs. It demonstrates how AWS services can be combined effectively to create a secure, modular, and reliable infrastructure.