AWS 3 – Tier Architecture

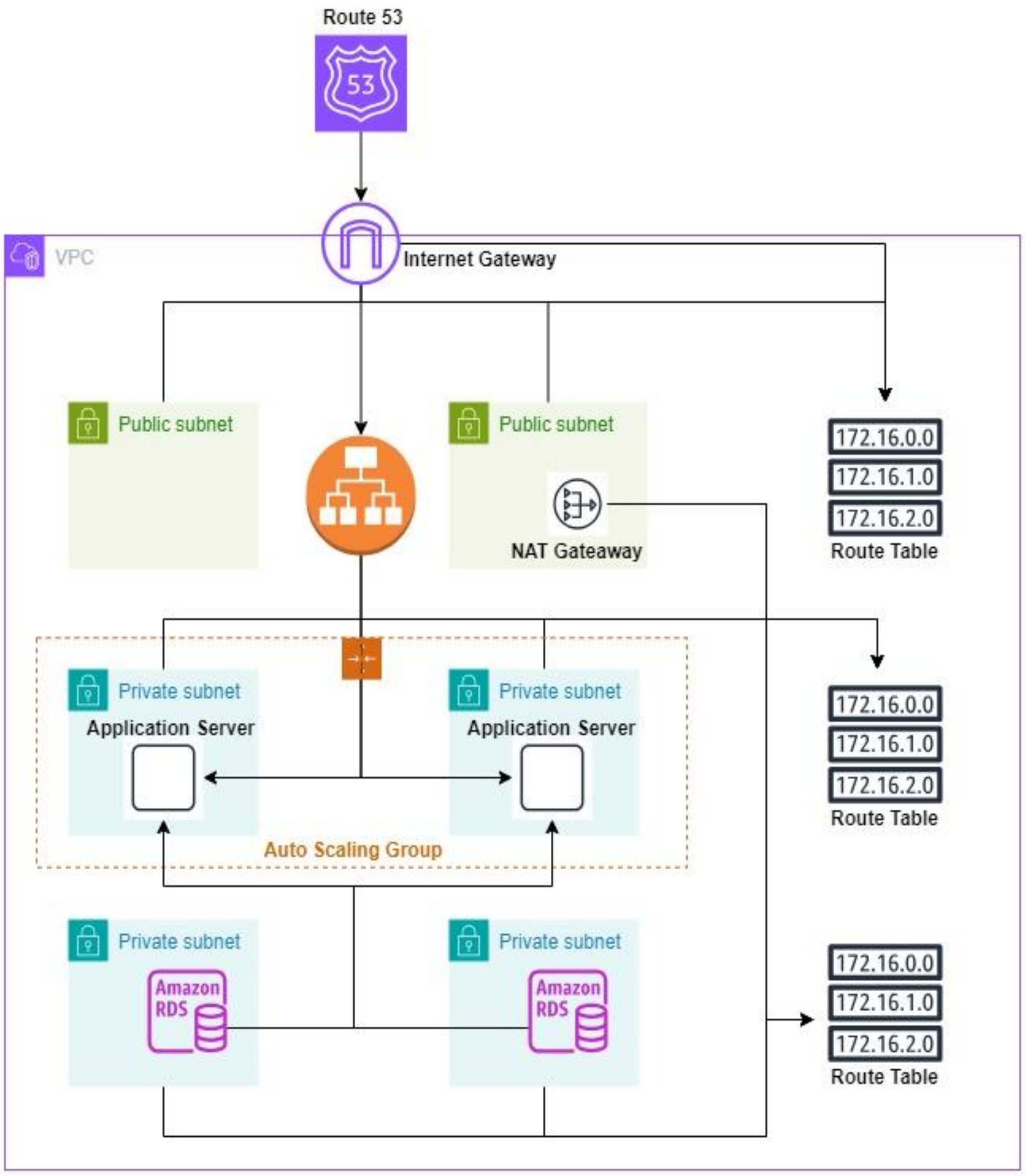
1. Introduction:

Welcome to our project on implementing a robust and scalable web application infrastructure using AWS's three-tier architecture.In today's dynamic digital landscape, the ability to provide a seamless and responsive user experience is paramount. Our project focuses on designing and implementing a three-tier architecture on Amazon Web Services, ensuring our web application is not only highly available but also capable of efficiently handling varying levels of user traffic. In this project, we leverage key AWS services - the Load Balancer, Autoscaling Group, and Relational Database - to create a resilient and high-performance environment for hosting web applications.By the end of this project, we aim to showcase a resilient and scalable web application architecture on AWS, demonstrating how these key components work together to create a highly responsive, fault-tolerant, and cost-effective solution for hosting modern web applications.

2. Project Objectives:

- **Scalability:** Implement a scalable infrastructure that can adapt to varying levels of user demand without compromising performance or incurring unnecessary costs.
- **High Availability:** Design a fault-tolerant architecture that minimizes downtime by distributing traffic across multiple instances and providing automatic failover for our database.
- **Cost Optimization:** Leverage Autoscaling to optimize costs by dynamically adjusting resources based on actual demand, ensuring efficient resource utilization.
- **Data Integrity:** Utilize Amazon RDS to provide a secure and managed database solution, ensuring the integrity, availability, and reliability of our application's data.

3. Architecture Overview:

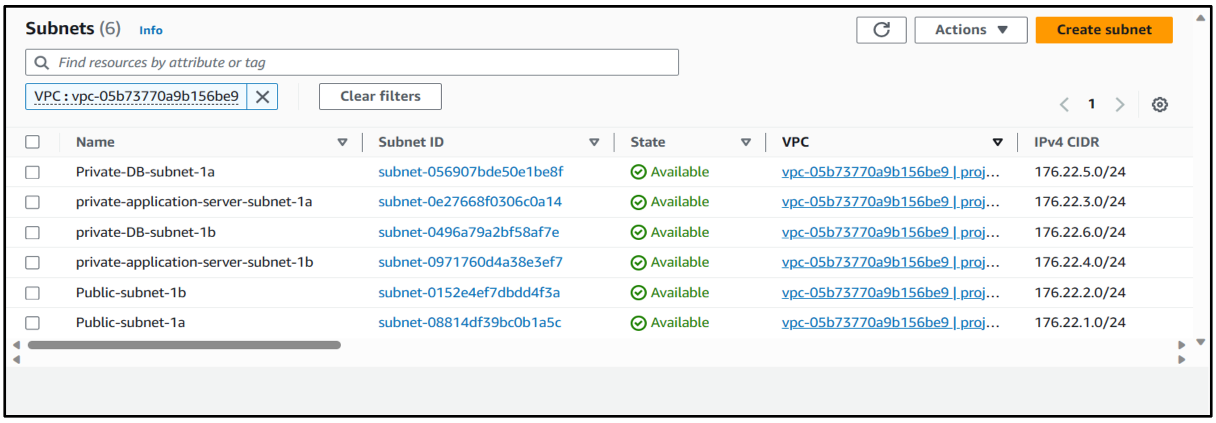


4. **Prerequisites:**

- Virtual Private Cloud.
- 3 Public Subnet.
- 6 Private subnet (3 – application server & 3 – database server).
- NAT Gateway with elastic IP & Internet Gateway.
- 3 Route Table (Public subnet, Private subnet(application & database)).
- Application Load Balancer & Target group.
- Auto Scaling group & Launch Template.
- Relational Database.

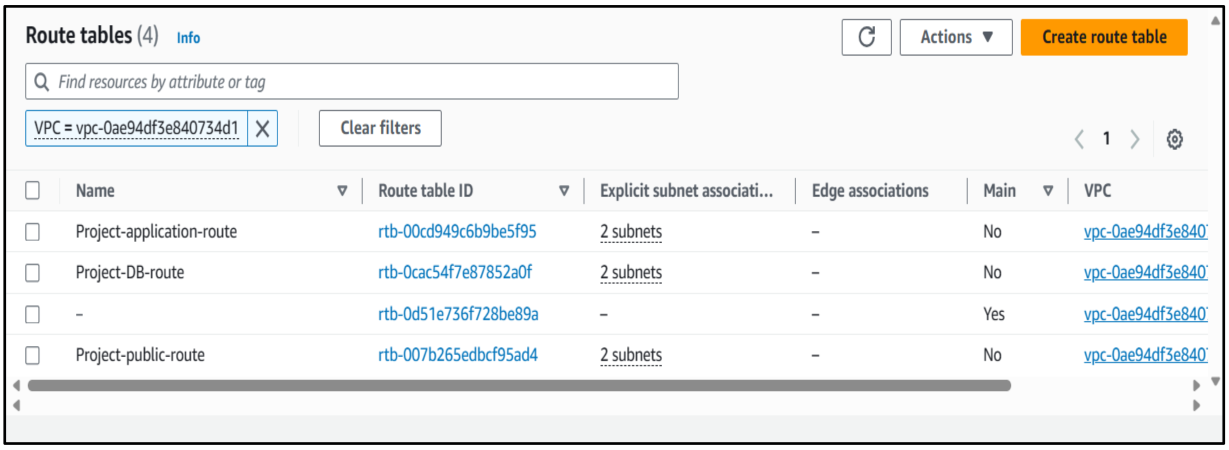
5. **Steps to be followed:**

- Create a VPC with 3 public subnet and 6 private subnets (Application server & Database server).


Subnets (6) Info
Actions
Create subnet
Find resources by attribute or tag
VPC : vpc-05b73770a9b156be9
Clear filters
1

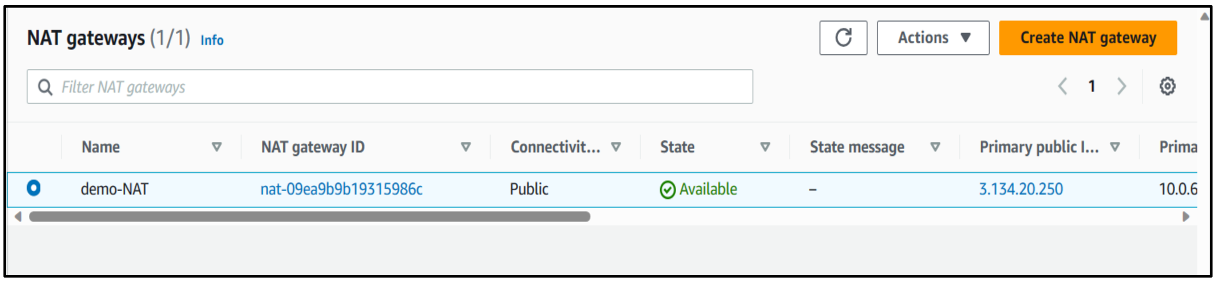
Name	Subnet ID	State	VPC	IPv4 CIDR
Private-DB-subnet-1a	subnet-056907bde50e1be8f	Available	vpc-05b73770a9b156be9 | proj...	176.22.5.0/24
private-application-server-subnet-1a	subnet-0e27668f0306c0a14	Available	vpc-05b73770a9b156be9 | proj...	176.22.3.0/24
private-DB-subnet-1b	subnet-0496a79a2bf58af7e	Available	vpc-05b73770a9b156be9 | proj...	176.22.6.0/24
private-application-server-subnet-1b	subnet-0971760d4a38e3ef7	Available	vpc-05b73770a9b156be9 | proj...	176.22.4.0/24
Public-subnet-1b	subnet-0152e4ef7dbdd4f3a	Available	vpc-05b73770a9b156be9 | proj...	176.22.2.0/24
Public-subnet-1a	subnet-08814df39bc0b1a5c	Available	vpc-05b73770a9b156be9 | proj...	176.22.1.0/24

- Create 3 route table and associate the private subnet in private route table and associate application subnet with application route table and database server with database route.


Route tables (4) Info
Actions
Create route table
Find resources by attribute or tag
VPC = vpc-0ae94df3e840734d1
Clear filters
1

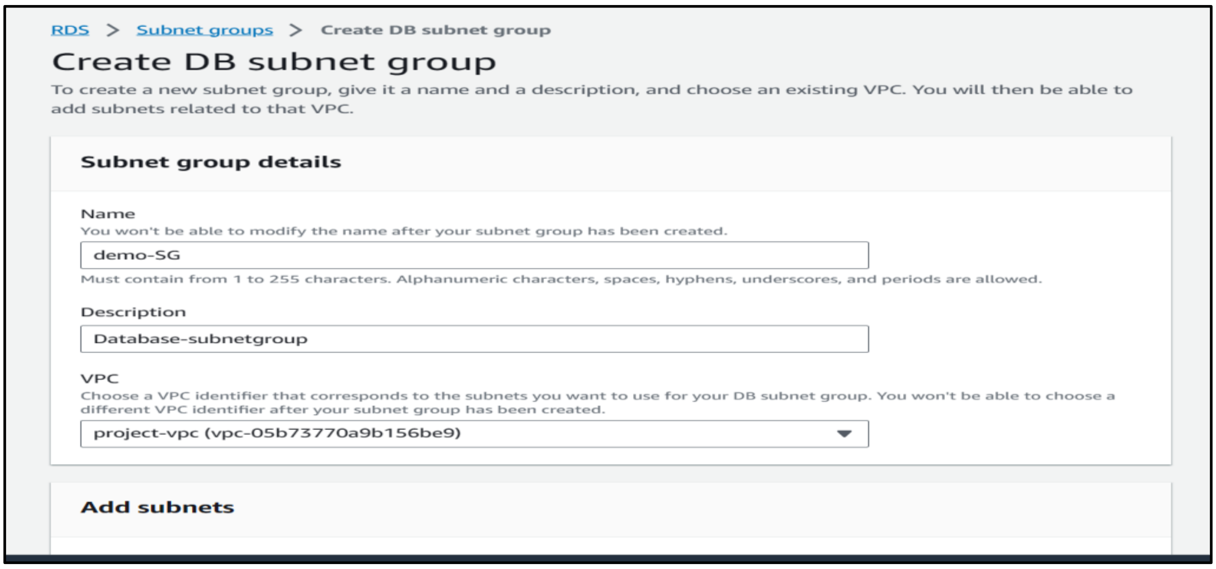
Name	Route table ID	Explicit subnet associati...	Edge associations	Main	VPC
Project-application-route	rtb-00cd949c6b9be5f95	2 subnets	–	No	vpc-0ae94df3e840
Project-DB-route	rtb-0cac54f7e87852a0f	2 subnets	–	No	vpc-0ae94df3e840
–	rtb-0d51e736f728be89a	–	–	Yes	vpc-0ae94df3e840
Project-public-route	rtb-007b265edbcf95ad4	2 subnets	–	No	vpc-0ae94df3e840

- Create a NAT gateaway and allocate the elastic IP and add the route of NAT gateway to the applicationroute table and database route table.



	Name	NAT gateway ID	Connectivit...	State	State message	Primary public I...	Prima
●	demo-NAT	nat-09ea9b9b19315986c	Public	Available	–	3.134.20.250	10.0.6

- Now create a subnet group of the private subnet which we are going to use for database server.



RDS > Subnet groups > Create DB subnet group

Create DB subnet group

To create a new subnet group, give it a name and a description, and choose an existing VPC. You will then be able to add subnets related to that VPC.

Subnet group details

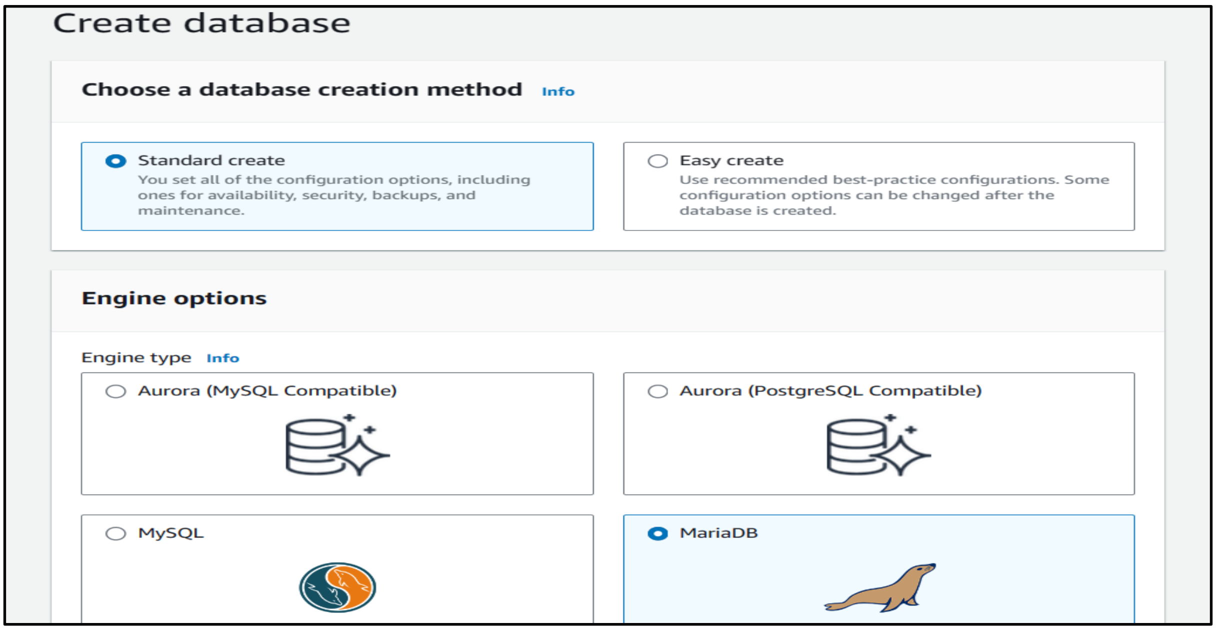
Name
You won't be able to modify the name after your subnet group has been created.
demo-SG
Must contain from 1 to 255 characters. Alphanumeric characters, spaces, hyphens, underscores, and periods are allowed.

Description
Database-subnetgroup

VPC
Choose a VPC identifier that corresponds to the subnets you want to use for your DB subnet group. You won't be able to choose a different VPC identifier after your subnet group has been created.
project-vpc (vpc-05b73770a9b156be9)

Add subnets

- Create a Relational Database by selecting project VPC and adding username and password.



Create database

Choose a database creation method Info

[✓ Standard create]
You set all of the configuration options, including ones for availability, security, backups, and maintenance.

Easy create
Use recommended best-practice configurations. Some configuration options can be changed after the database is created.

Engine options

Engine type Info

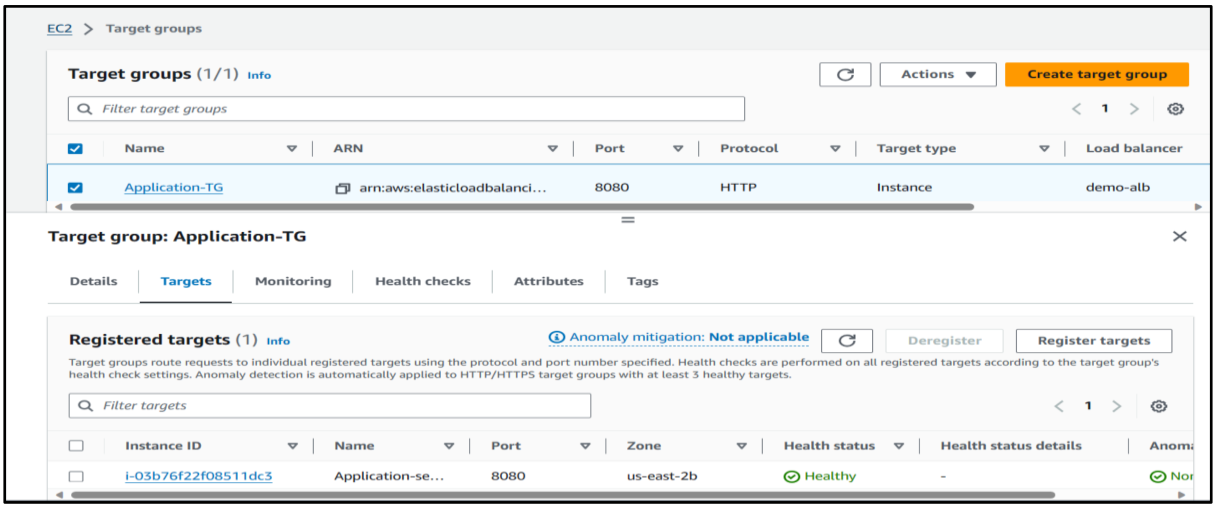
Aurora (MySQL Compatible)

Aurora (PostgreSQL Compatible)

MySQL

[✓ MariaDB]

- Now create a target group by taking port 8080 and health check path also 8080 by giving the path "/sudent/".



EC2 > Target groups

Target groups (1/1) Info

Name	ARN	Port	Protocol	Target type	Load balancer
Application-TG	arn:aws:elasticloadbalanci...	8080	HTTP	Instance	demo-alb

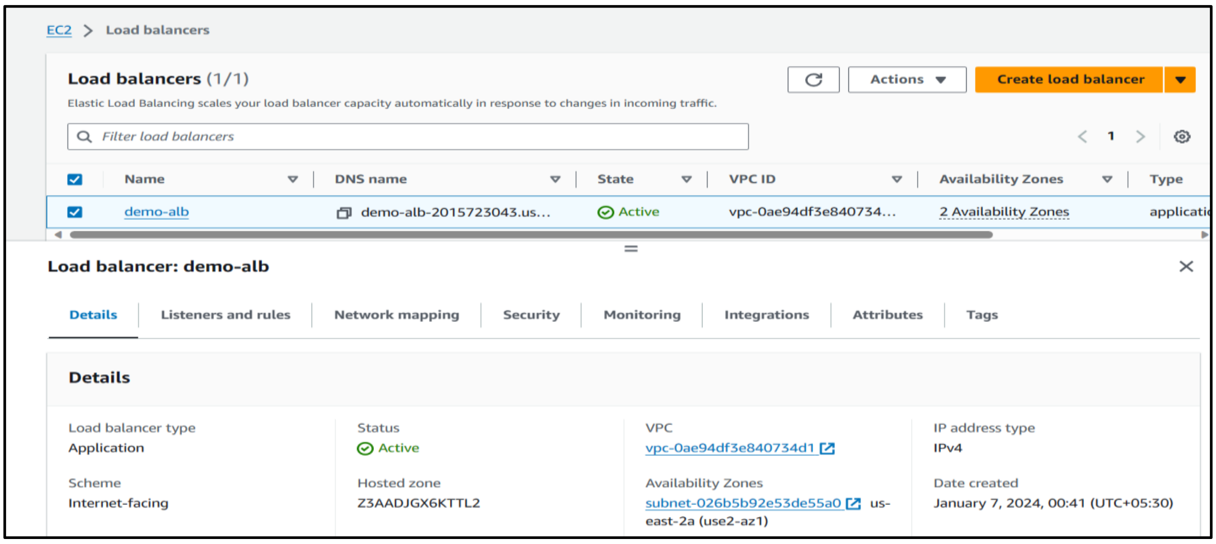
Target group: Application-TG

Registered targets (1) Info — Anomaly mitigation: Not applicable

Target groups route requests to individual registered targets using the protocol and port number specified. Health checks are performed on all registered targets according to the target group's health check settings. Anomaly detection is automatically applied to HTTP/HTTPS target groups with at least 3 healthy targets.

Instance ID	Name	Port	Zone	Health status	Health status details	Anomal
i-03b76f22f08511dc3	Application-se...	8080	us-east-2b	Healthy	-	Nor

- Create a Loadbalancer by selecting project VPC and public subnet by adding the target group and port should be 80.



EC2 > Load balancers

Load balancers (1/1)

Elastic Load Balancing scales your load balancer capacity automatically in response to changes in incoming traffic.

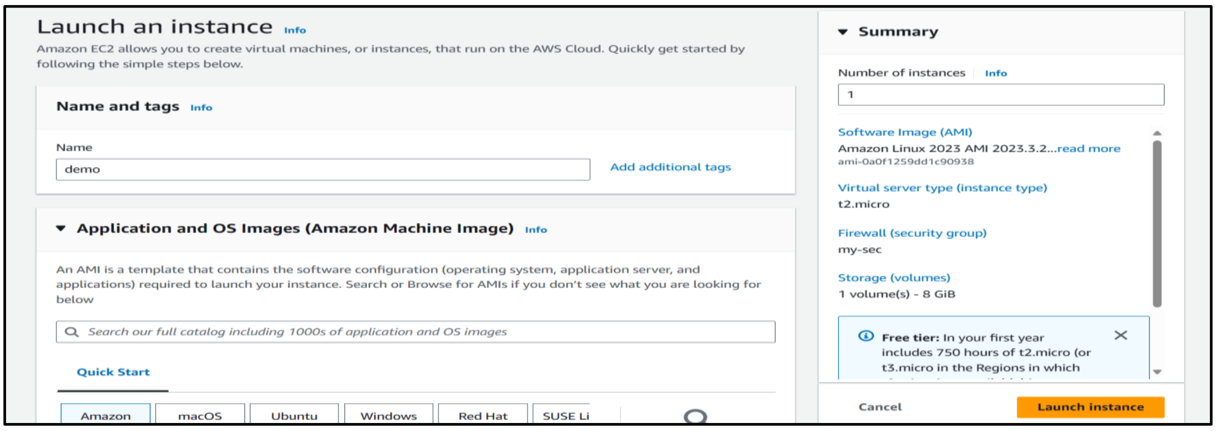
Name	DNS name	State	VPC ID	Availability Zones	Type
demo-alb	demo-alb-2015723043.us...	Active	vpc-0ae94df3e840734...	2 Availability Zones	applicati

Load balancer: demo-alb

Details

Load balancer type Application	Status Active	VPC vpc-0ae94df3e840734d1	IP address type IPv4
Scheme Internet-facing	Hosted zone Z3AADJGX6KTTL2	Availability Zones subnet-026b5b92e53de55a0 us-east-2a (use2-az1)	Date created January 7, 2024, 00:41 (UTC+05:30)

- Launch a demo instance by adding the script to configure the template with the AMI.



Launch an instance Info

Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tags Info

Name: demo

Application and OS Images (Amazon Machine Image) Info

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

Summary

Number of instances: 1

Software Image (AMI)
Amazon Linux 2023 AMI 2023.3.2...read more
ami-0a0f1259dd1c90938

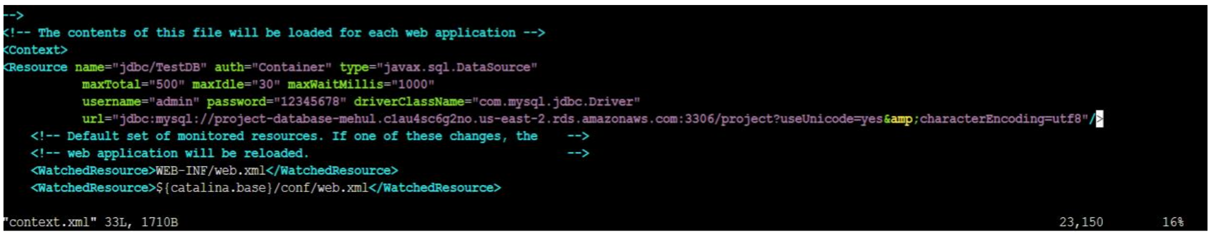
Virtual server type (instance type)
t2.micro

Firewall (security group)
my-sec

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

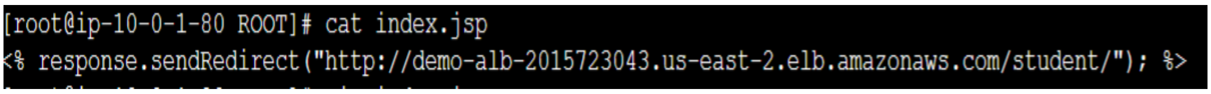
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which

- Now take the SSH of the demo instance and add the database endpoint to configuration file.



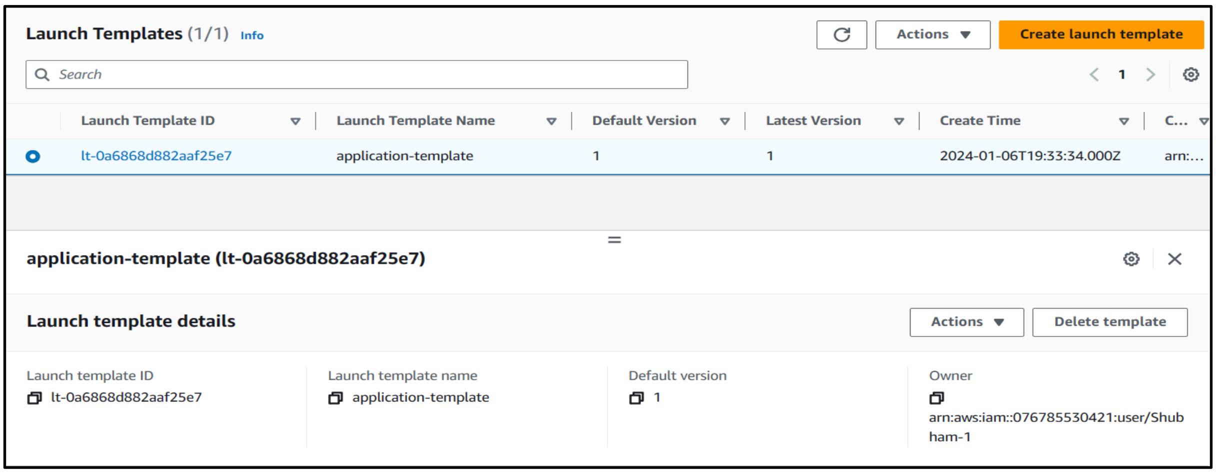
```
-->
<!-- The contents of this file will be loaded for each web application -->
<Context>
<Resource name="jdbc/TestDB" auth="Container" type="javax.sql.DataSource"
          maxTotal="500" maxIdle="30" maxWaitMillis="1000"
          username="admin" password="12345678" driverClassName="com.mysql.jdbc.Driver"
          url="jdbc:mysql://project-database-mehul.c1au4sc6g2no.us-east-2.rds.amazonaws.com:3306/project?useUnicode=yes&amp;characterEncoding=utf8"/>
    <!-- Default set of monitored resources. If one of these changes, the    -->
    <!-- web application will be reloaded.                                   -->
    <WatchedResource>WEB-INF/web.xml</WatchedResource>
    <WatchedResource>${catalina.base}/conf/web.xml</WatchedResource>

"context.xml" 33L, 1710B                                                                          23,150        16%
```

- Now edit the copy the index.jsp file to index.jsp-abc and addd the redirecting command with ALB dns/student/.



```
[root@ip-10-0-1-80 ROOT]# cat index.jsp
<% response.sendRedirect("http://demo-alb-2015723043.us-east-2.elb.amazonaws.com/student/"); %>
```

- Take the AMI of the demo instance and launch the template by adding small script for catalina stop and start.



Launch Templates (1/1) Info

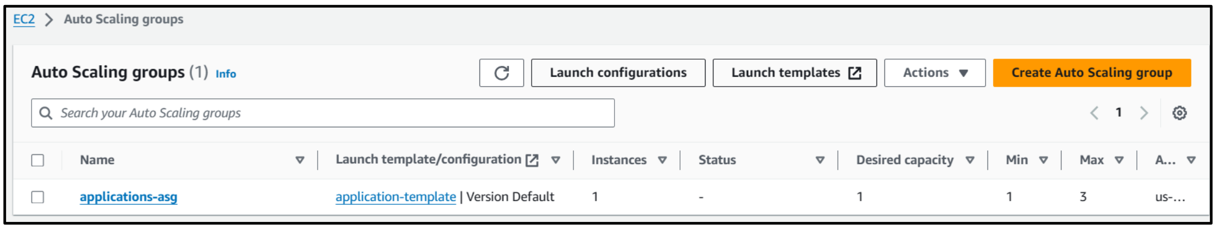
	Launch Template ID	Launch Template Name	Default Version	Latest Version	Create Time	C...
●	lt-0a6868d882aaf25e7	application-template	1	1	2024-01-06T19:33:34.000Z	arn:...

application-template (lt-0a6868d882aaf25e7)

Launch template details

Launch template ID	Launch template name	Default version	Owner
lt-0a6868d882aaf25e7	application-template	1	arn:aws:iam::076785530421:user/Shubham-1

- Create an auto-scalling group for the application server by using this template and selecting the project VPC and subnets of application server and applying target tracking policy.

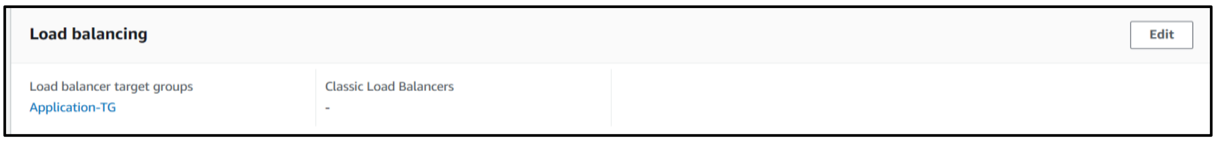


EC2 > Auto Scaling groups

Auto Scaling groups (1) Info

	Name	Launch template/configuration	Instances	Status	Desired capacity	Min	Max	A...
☐	applications-asg	application-template | Version Default	1	-	1	1	3	us-...

- Now at last add the target group to the ASG in load balancing from edit option and hit the dns of the load balancer.



Load balancing

Load balancer target groups	Classic Load Balancers
Application-TG	-