

## **Deploying a Multi-Tier Website Using AWS EC2**

**Description:** Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) cloud. Using Amazon EC2 eliminates your need to invest in hardware up front so you can develop and deploy applications faster. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

### **Problem Statement:**

Company ABC wants to move their product to AWS. They have the following things set up right now:

**1. MySQL DB.**

**2. Website (PHP).**

The company wants high availability on this product, therefore wants Auto Scaling to be enabled on this website.

### **Steps To Solve:**

**1. Launch an EC2 Instance.**

**2. Enable Auto Scaling on these instances (minimum 2).**

**3. Create an RDS Instance.**

**4. Create Database & Table in RDS instance:**

**a. Database name: intel.**

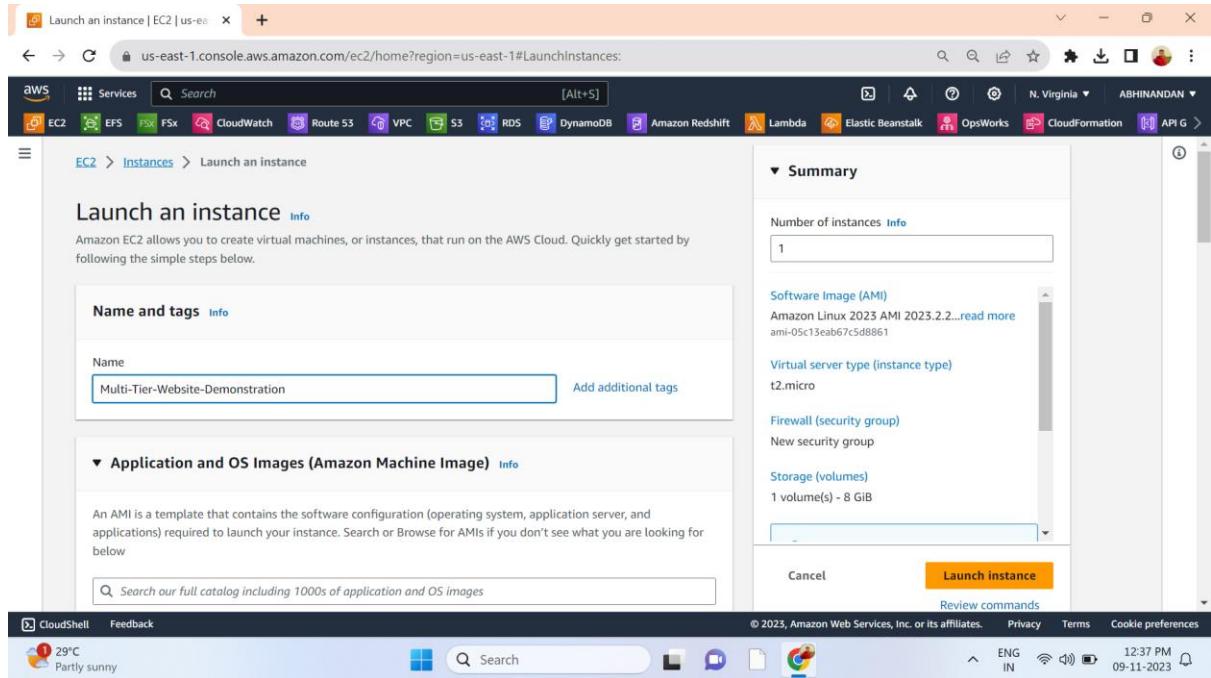
**b. Table name: data.**

**c. Database password: intel123.**

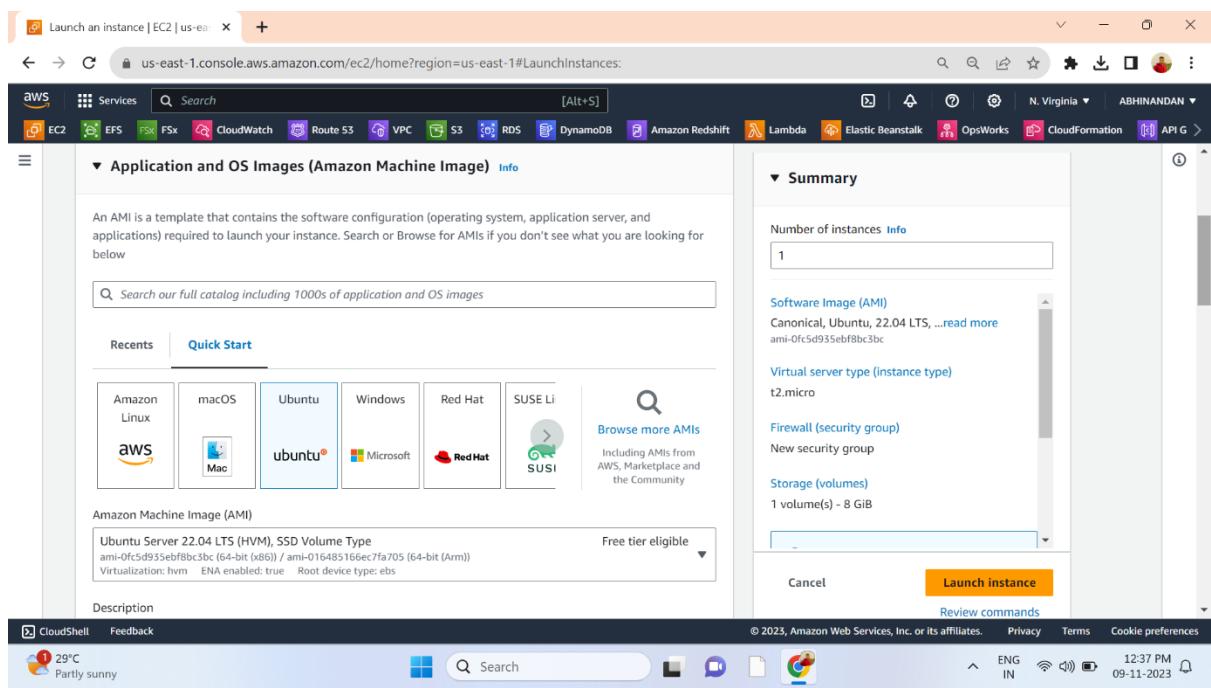
**5. Change hostname in website.**

**6. Allow traffic from EC2 to RDS instance.**

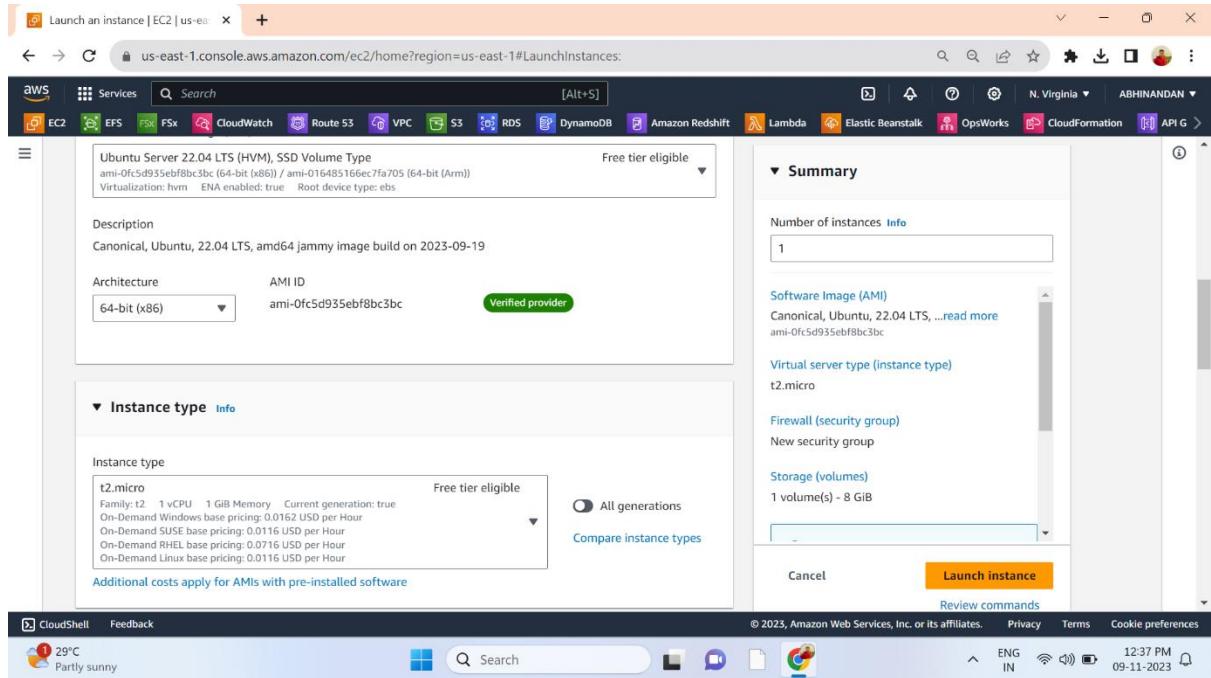
**7. Allow all-traffic to EC2 instance.**



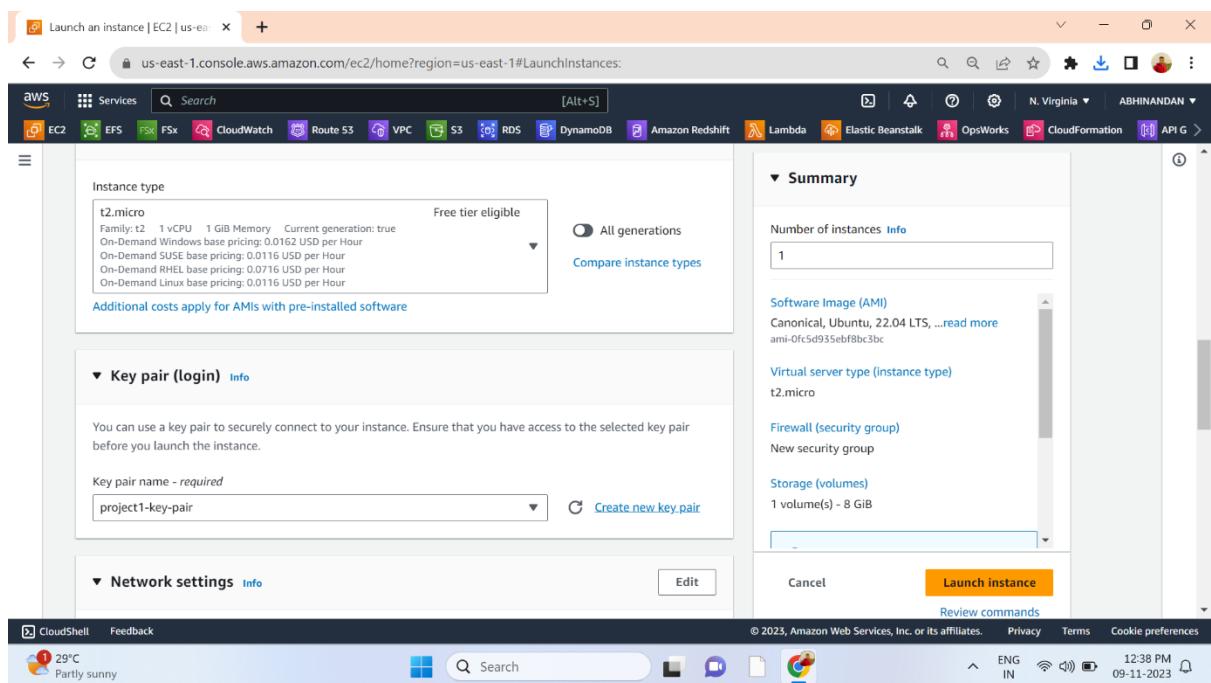
launch an EC2 instance, Give a EC2 instance a name.



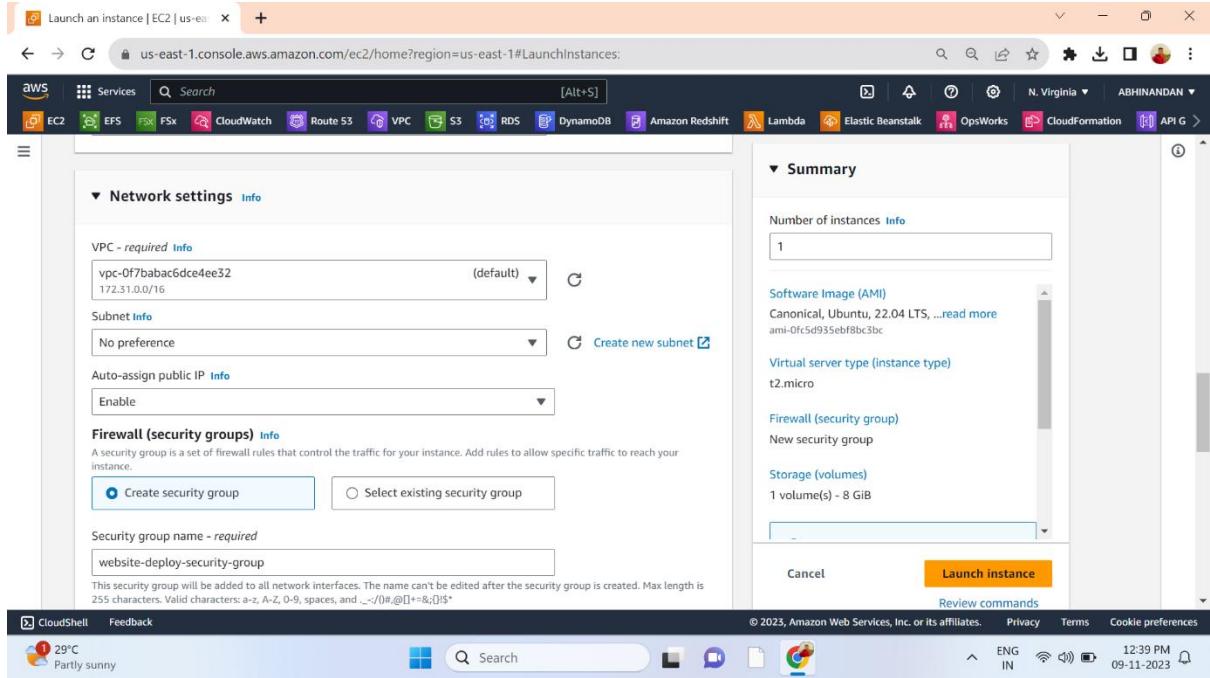
Choose a Ubuntu machine.



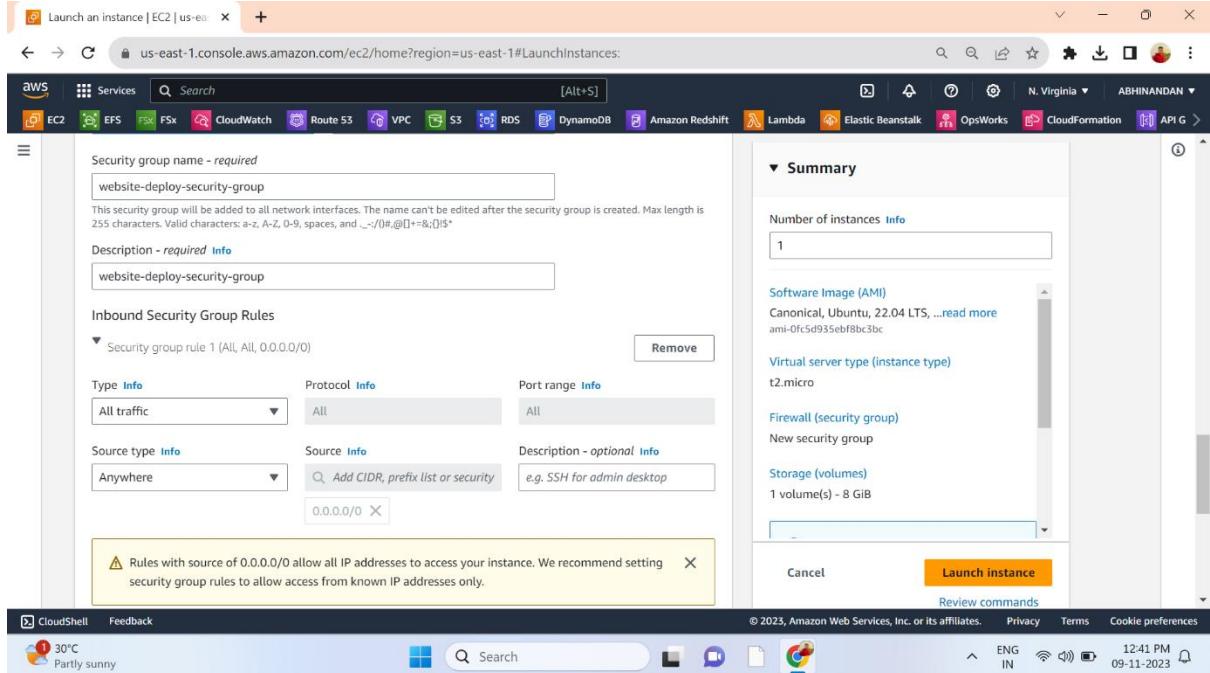
choose instance type as t2.micro



create a new key pair. give a key pair type as "RSA". private key file format ".pem".



Next, in network settings, click on edit. go with the default VPC only. Leave the subnet as a no-preference only. leave auto-assign public IP as enabled only.



Give the security group name as "website-deploy-security-group." Copy this name and give the same name in the description as well. next in inbound security group rules. We will allow all traffic, anywhere. Next click on Launch Instance.

The instance is now launched.

```
i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102
```

First we will update machine by using command \$sudo apt-get update

```

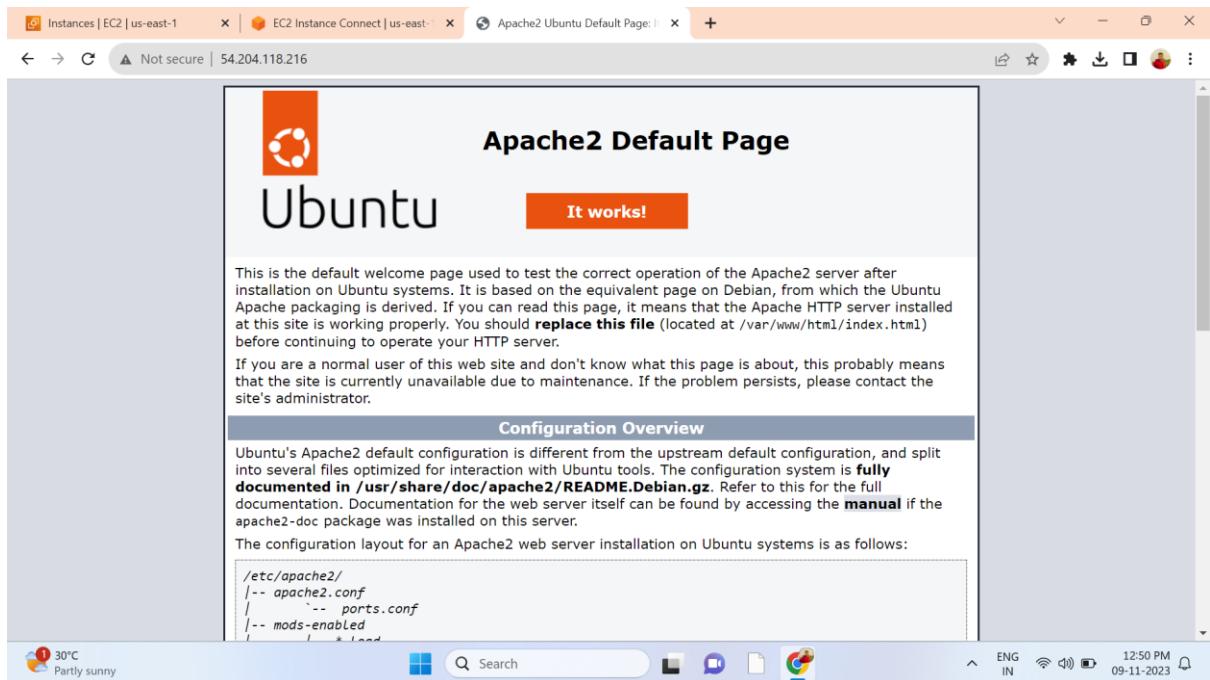
ubuntu@ip-172-31-30-102:~$ sudo apt-get install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils bzip2 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.3-0 mailcap mime-support ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser bzip2-doc
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils bzip2 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.3-0 mailcap mime-support
  ssl-cert
0 upgraded, 13 newly installed, 0 to remove and 49 not upgraded.
Need to get 2137 kB of archives.
After this operation, 8505 kB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1 amd64 1.7.0-8ubuntu0.22.04.1 [108 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1-ldap amd64 1.6.1-5ubuntu4.22.04.2 [92.8 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.1-5ubuntu4.22.04.2 [11.3 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1-ldap amd64 1.6.1-5ubuntu4.22.04.2 [9170 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 liblua5.3-0 amd64 5.3.6-1build1 [140 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-bin amd64 2.4.52-1ubuntu4.6 [1345 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-data all 2.4.52-1ubuntu4.6 [165 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 apache2-utils amd64 2.4.52-1ubuntu4.6 [89.1 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 mailcap all 3.70+nmulubuntu1 [23.8 kB]

```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)

PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

Next we will install apache-2 webpage by using command \$sudo apt-get install apache2 -y.  
Copy the Public IP address and paste it in browser.



Here we now installed apache-2 webpage.

```

Instances | EC2 | us-east-1 x EC2 Instance Connect | us-east-1 x Apache2 Ubuntu Default Page: ii + 
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?connType=standard&instanceId=i-019129ca50c37e93a&osUser=ubuntu&r... Search [Alt+S]
AWS Services Search [Alt+S] N. Virginia ABHINANDAN
EC2 EFS FSx CloudWatch Route 53 VPC S3 RDS DynamoDB Amazon Redshift Lambda Elastic Beanstalk OpsWorks CloudFormation API G
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apache-htcacheclean.service.
Processing triggers for ufw (0.36.1-4ubuntu0.1) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.3) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-30-102:~$ cd/var/www/html
-bash: cd/var/www/html: No such file or directory
ubuntu@ip-172-31-30-102:~$ cd /var/www/html
ubuntu@ip-172-31-30-102:/var/www/html$ ls
index.html
ubuntu@ip-172-31-30-102:/var/www/html$ 

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

```

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30°C Partly sunny ENG IN 12:51 PM 09-11-2023

Next we will be removing the apache-2 webpage over here. to change webpage we will go to this location /var/www/html/index.html

```

Instances | EC2 | us-east-1 x EC2 Instance Connect | us-east-1 x Apache2 Ubuntu Default Page: ii + 
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?connType=standard&instanceId=i-019129ca50c37e93a&osUser=ubuntu&r... Search [Alt+S]
AWS Services Search [Alt+S] N. Virginia ABHINANDAN
EC2 EFS FSx CloudWatch Route 53 VPC S3 RDS DynamoDB Amazon Redshift Lambda Elastic Beanstalk OpsWorks CloudFormation API G
Processing triggers for ufw (0.36.1-4ubuntu0.1) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.3) ...
Scanning processes...
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Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-30-102:~$ cd/var/www/html
-bash: cd/var/www/html: No such file or directory
ubuntu@ip-172-31-30-102:~$ cd /var/www/html
ubuntu@ip-172-31-30-102:/var/www/html$ ls
index.html
ubuntu@ip-172-31-30-102:/var/www/html$ sudo rm index.html
ubuntu@ip-172-31-30-102:/var/www/html$ ls
ubuntu@ip-172-31-30-102:/var/www/html$ 

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

```

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Go to EC2 instance type command \$cd /var/www/html. now type \$ls you will see index.html file. Now we will removing index.html file. command will be \$sudo rm index.html. Afterwards type \$ls and you will not get any file, its deleted.



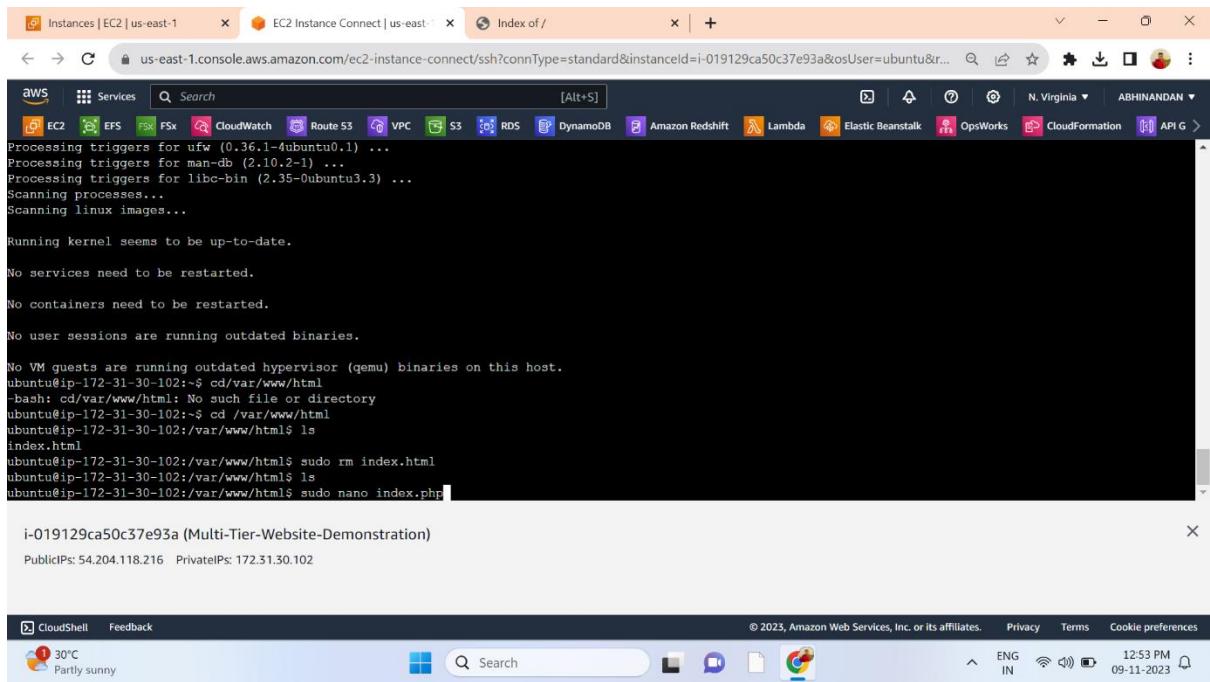
## Index of /

Name Last modified Size Description

Apache/2.4.52 (Ubuntu) Server at 54.204.118.216 Port 80



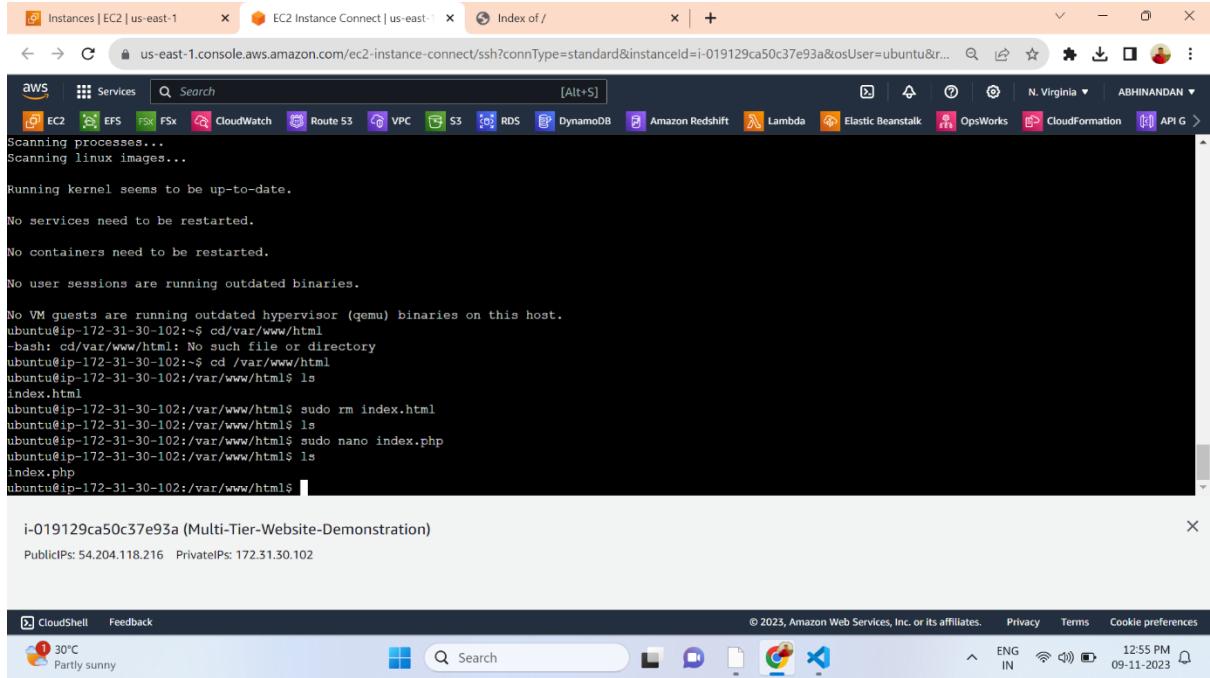
If i go to webpage and refresh it there is nothing here.



Now here we will create a PHP file over here. The command is \$sudo nano index.php.

Copy this index.php file code and paste it in the index.php file that we created in the EC2 instance.

After pasting it, press **ctrl+s** to save it, and press **ctrl+x** to move out of here.



```
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

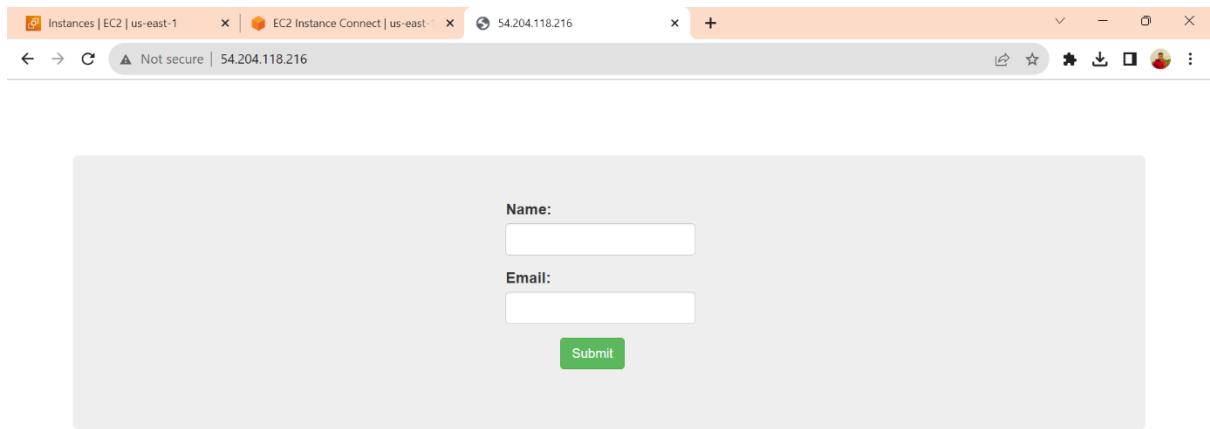
No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-30-102:~$ cd/var/www/html
-bash: cd/var/www/html: No such file or directory
ubuntu@ip-172-31-30-102:~$ cd /var/www/html
ubuntu@ip-172-31-30-102:/var/www/html$ ls
index.html
ubuntu@ip-172-31-30-102:/var/www/html$ sudo rm index.html
ubuntu@ip-172-31-30-102:/var/www/html$ ls
ubuntu@ip-172-31-30-102:/var/www/html$ sudo nano index.php
ubuntu@ip-172-31-30-102:/var/www/html$ ls
index.php
ubuntu@ip-172-31-30-102:/var/www/html$ 
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)  
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

Now if I type \$ls, we will see index.php over here. Now you can see index.php file available over here.



Now if I go to the webpage and refresh it, Now we can see this webpage is displayed over here. Here below, we have some errors displayed. We will resolve these errors.

The screenshot shows the AWS RDS Databases page. The left sidebar includes options like Dashboard, Databases (selected), Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom engine versions, and Zero-ETL integrations. The main content area displays a message about Aurora I/O-Optimized and a note about Blue/Green Deployments. Below these is a table titled 'Databases (0)' with columns for DB identifier, Status, Role, Engine, Region & AZ, Size, Actions, CPU, and Current activity. A search bar and filter options are at the top of the table. The status bar at the bottom indicates 'No instances found'.

Now we will be going to create an RDS database in MYSQL. Go to databases. Click on Create a Database.

The screenshot shows the 'Create database' page for MySQL. It starts with a section to 'Choose a database creation method' with 'Standard create' selected. It then moves to 'Engine options' where 'MySQL' is chosen. To the right, a help panel provides information about MySQL, mentioning its popularity and various features. The status bar at the bottom shows 'NZ - SL In 2 hours'.

choose a database creation method as standard create only.

The screenshot shows the AWS RDS MySQL setup wizard. In the 'Templates' section, the 'Free tier' option is selected. The 'Free tier' template is described as using RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS. It includes a link to 'Info'. To the right, a sidebar provides details about MySQL, stating it's the most popular open-source database in the world, and lists several features: supports database sizes up to 64 TiB, supports General Purpose, Memory Optimized, and Burstable Performance instance classes, supports automated backup and point-in-time recovery, and supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.

From the templates option, choose the free tier option.

The screenshot shows the AWS RDS MySQL setup wizard in the 'Settings' section. Under 'DB instance identifier', the value 'multi-tier-website-DB' is entered. A note states that the DB instance identifier is case-insensitive and must be unique across all DB instances owned by the AWS account in the current Region. Under 'Credentials Settings', the 'Master username' is set to 'admin'. A note indicates that if master credentials are managed in AWS Secrets Manager, some RDS features won't be supported, with a link to 'Learn more'. To the right, the MySQL sidebar reiterates its popularity and lists its features.

In settings, give a DB instance identifier and give a name as a multi-tier website-DB This will be our instance name. Give Master username as admin.

If you manage the master user credentials in Secrets Manager, some RDS features aren't supported. [Learn more](#)

Auto generate a password  
Amazon RDS can generate a password for you, or you can specify your own password.

Master password [Info](#)  
\*\*\*\*\*  
Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), {single quote}, {double quote} and @ (at sign).

Confirm master password [Info](#)  
\*\*\*\*\*

**Instance configuration**  
The DB instance configuration options below are limited to those supported by the engine that you selected above.

DB instance class [Info](#)  
▼ Hide filters

MySQL  
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
- Supports automated backup and point-in-time recovery.
- Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.

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Give your own master password and confirm the master password.

The DB instance configuration options below are limited to those supported by the engine that you selected above.

DB instance class [Info](#)  
▼ Hide filters

Show instance classes that support Amazon RDS Optimized Writes [Info](#)  
Amazon RDS Optimized Writes improves write throughput by up to 2x at no additional cost.

Include previous generation classes

Standard classes (includes m classes)  
 Memory optimized classes (includes r and x classes)  
 Burstable classes (includes t classes)

db.t3.micro  
2 vCPUs 1 GiB RAM Network: 2,085 Mbps

**Storage**  
Storage type [Info](#)  
General Purpose SSD (gp2)  
Baseline performance determined by volume size

MySQL  
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
- Supports automated backup and point-in-time recovery.
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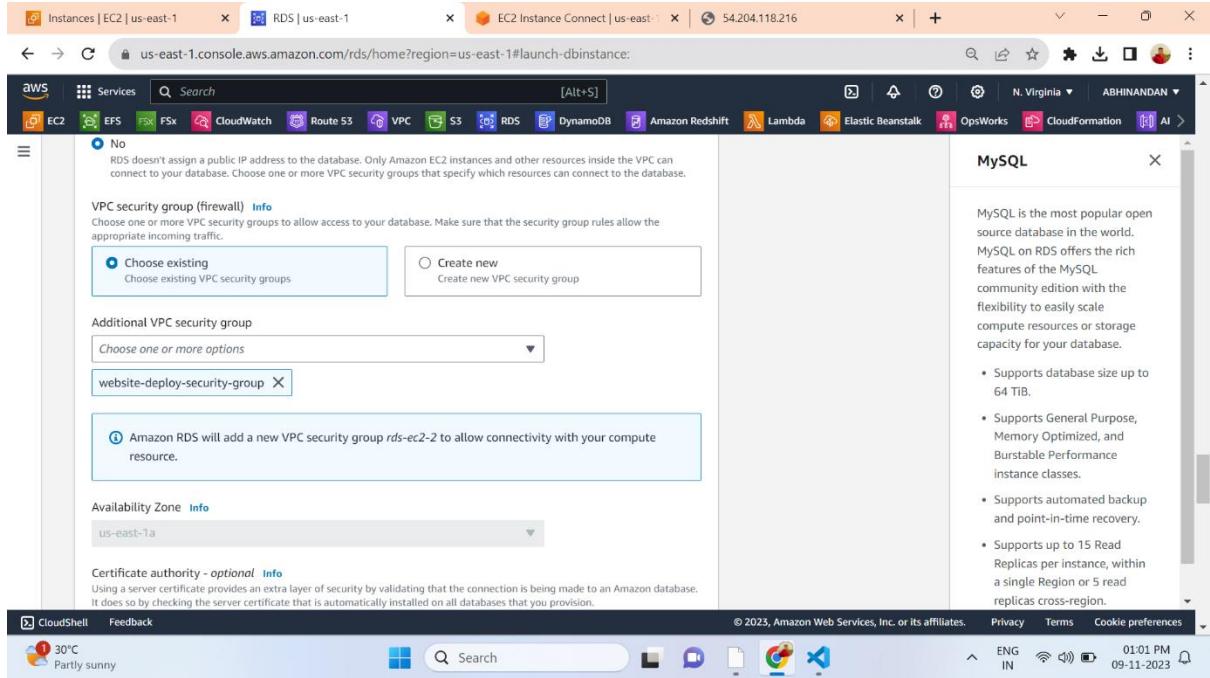
The DB instance class will be db.t3.micro

The storage type will be general-purpose SSD (GP2). For storage autoscaling option, keep it disable.

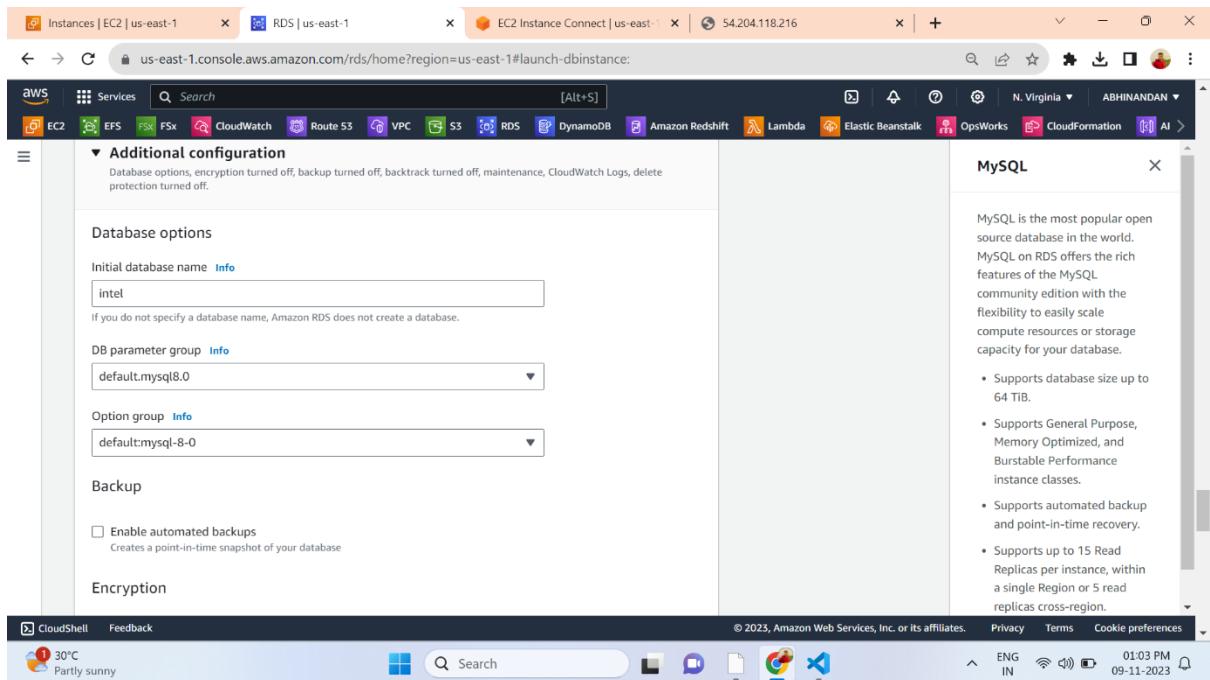
The storage type will be general-purpose SSD (GP2). For storage autoscaling option, keep it disable.

In the connectivity option, choose Connect to an EC2 compute resource. For EC2 instance, we will choose our created EC2 instance named "Multi-tier-website-Demonstration" instance.

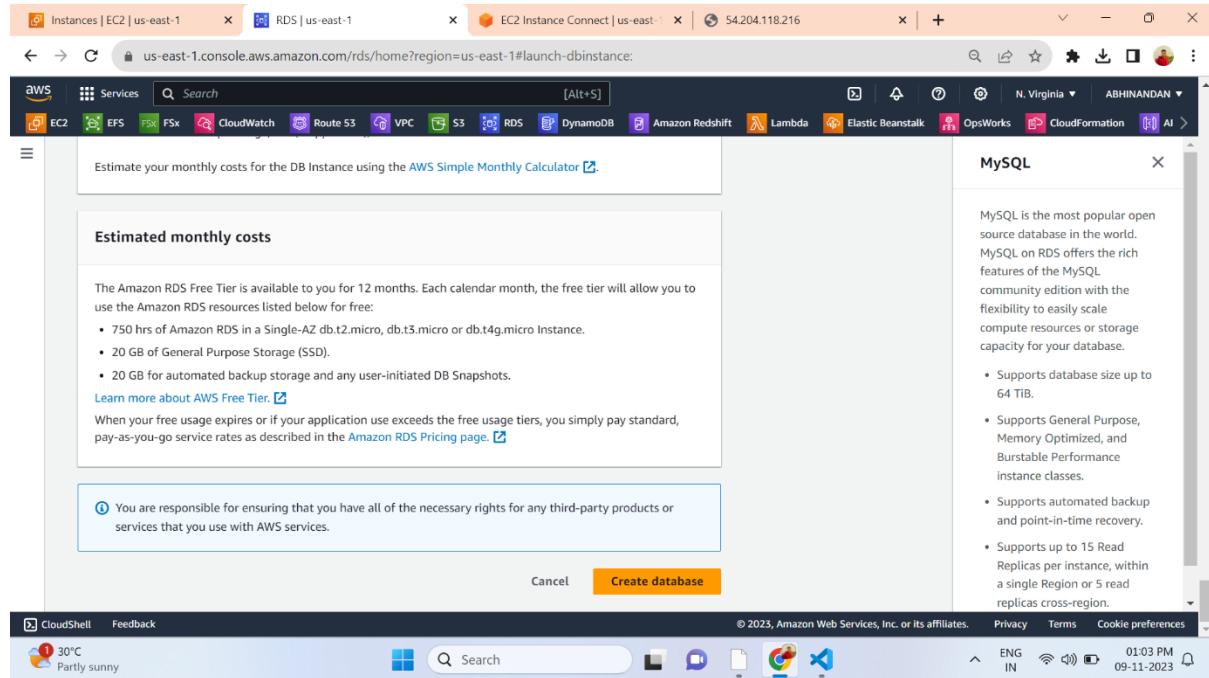
Here it will automatically it will choose VPC.



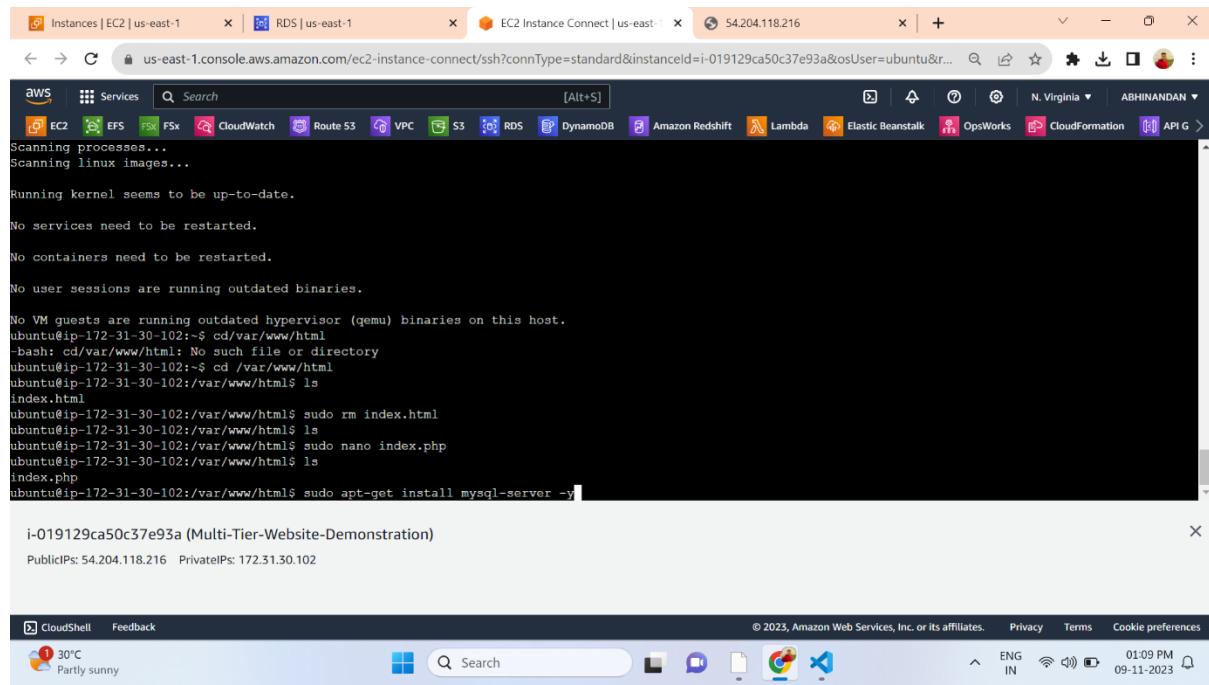
Next in the security group, we have created a security group named "Website-deploy-security-group".



In additional configuration, click on additional configuration. We will have an initial DB name. We will know it by going into our problem statement. Now we will be referring to our source code. Let's go to our problem statement. It says the database name is "intel". give the database name as intel in database options. In Backups do not enable Automated backups.



Next, we will click on Create Database.



Now we will install the MySQL server package by giving the command

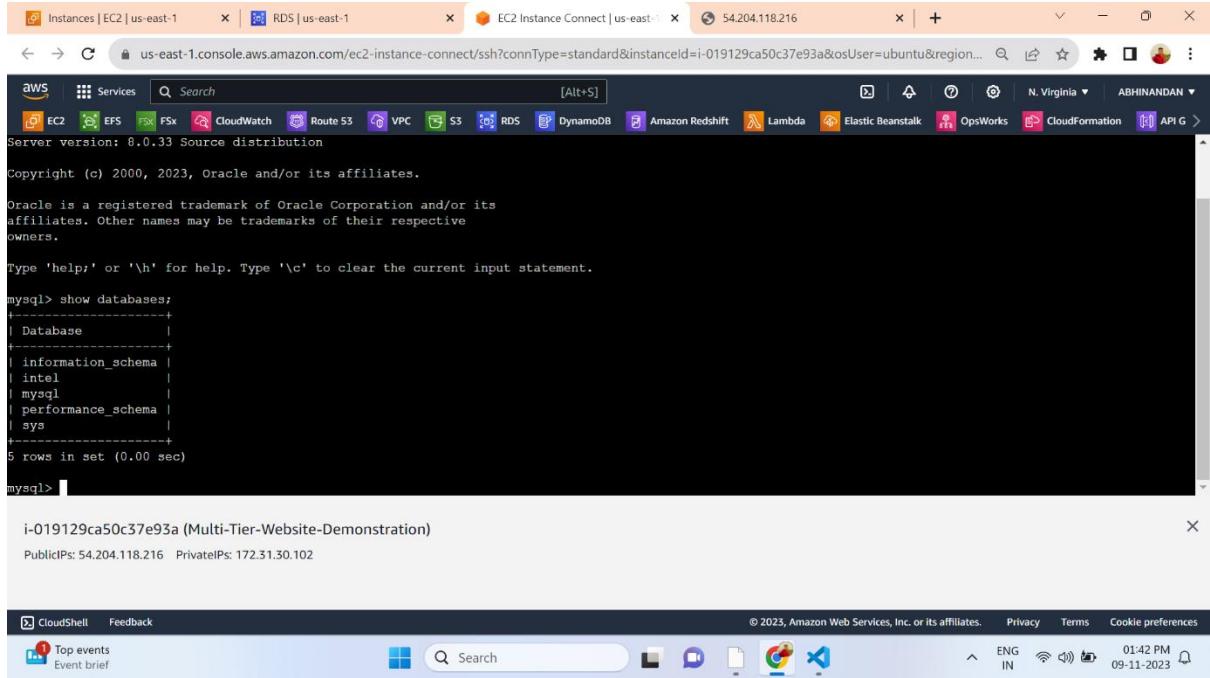
\$sudo apt-get install mysql-server -y, and it will install the MySQL package for us.

A screenshot of a web browser window titled "EC2 Instance Connect | us-east-1". The address bar shows the URL "us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?connType=standard&instanceId=i-019129ca50c37e93a&osUser=ubuntu&region=us-east-1" and the IP "54.204.118.216". The page content is a terminal session on an EC2 instance connected via SSH. The terminal shows the command "\$ sudo mysql -h multi-tier-website-db.c9nlafdcoteg.us-east-1.rds.amazonaws.com -u admin -pintel123" being run. Below the terminal, a message box displays the instance ID "i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)" and its public and private IPs. The browser's status bar at the bottom shows the date and time as "09-11-2023 01:41 PM".

Now we have our endpoint. Copy the endpoint. After that, paste it into the EC2 machine using the command \$sudo mysql -h paste copied endpoint -u admin -pintel123.

A screenshot of a browser window showing the MySQL monitor on the EC2 instance. The terminal session shows the connection command "\$ sudo mysql -h multi-tier-website-db.c9nlafdcoteg.us-east-1.rds.amazonaws.com -u admin -pintel123" and the MySQL prompt "mysql>". The MySQL monitor displays standard startup messages, including the welcome message, connection ID, server version, and copyright information. The browser's status bar at the bottom shows the date and time as "09-11-2023 01:41 PM".

Now we are connected with MySQL.



```
Instances | EC2 | us-east-1 x | RDS | us-east-1 x | EC2 Instance Connect | us-east-1 x | 54.204.118.216 x | +
```

aws Services Search [Alt+S]

EC2 EFS FSx CloudWatch Route 53 VPC S3 RDS DynamoDB Amazon Redshift Lambda Elastic Beanstalk OpsWorks CloudFormation API G

N. Virginia ABHINANDAN

Server version: 8.0.33 Source distribution

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

```
mysql> show databases;
```

Database
information_schema
intel
mysql
performance_schema
sys

5 rows in set (0.00 sec)

```
mysql>
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)

PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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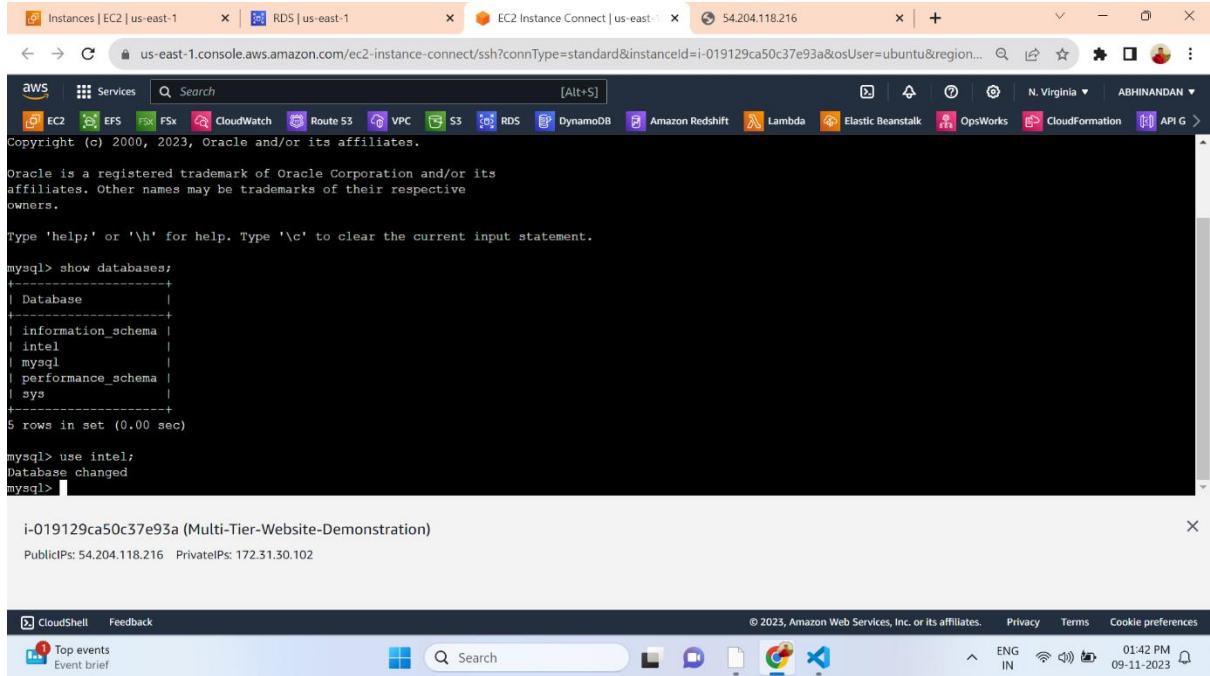
Top events Event brief

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Top events Event brief

ENG IN 01:42 PM 09-11-2023

Now we will use the mysql command to show databases. The command is mysql>show databases.



```
Instances | EC2 | us-east-1 x | RDS | us-east-1 x | EC2 Instance Connect | us-east-1 x | 54.204.118.216 x | +
```

aws Services Search [Alt+S]

EC2 EFS FSx CloudWatch Route 53 VPC S3 RDS DynamoDB Amazon Redshift Lambda Elastic Beanstalk OpsWorks CloudFormation API G

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

```
mysql> show databases;
```

Database
information_schema
intel
mysql
performance_schema
sys

5 rows in set (0.00 sec)

```
mysql> use intel;
```

Database changed

```
mysql>
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)

PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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ENG IN 01:42 PM 09-11-2023

Now we will be using the Intel database to do the task. The command is mysql>use Intel;

```
Instances | EC2 | us-east-1 RDS | us-east-1 EC2 Instance Connect | us-east-1 54.204.118.216 N. Virginia ABHINANDAN [Alt+S] Services Search affiliates. Other names may be trademarks of their respective owners. Type 'help;' or '\h' for help. Type '\c' to clear the current input statement. mysql> show databases; +-----+ | Database | +-----+ | information_schema | | intel | | mysql | | performance_schema | | sys | +-----+ 5 rows in set (0.00 sec) mysql> use intel; Database changed mysql> create table data(firstname varchar(30), email varchar(30)); Query OK, 0 rows affected (0.03 sec) mysql> i-019129ca50c37e93a (Multi-Tier-Website-Demonstration) PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102
```

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Here, we require two field names on the website. to know that we will get our code. We will have two data fields: "firstname" and "email". To know the table name, you have to go to our problem statement. The table name is "data". Here we will create a table. The command is

```
mysql>create table data(firstname varchar (30), email varchar (30));
```

```
Instances | EC2 | us-east-1 RDS | us-east-1 EC2 Instance Connect | us-east-1 54.204.118.216 N. Virginia ABHINANDAN [Alt+S] Services Search information_schema intel mysql performance_schema sys +-----+ 5 rows in set (0.00 sec) mysql> use intel; Database changed mysql> create table data(firstname varchar(30), email varchar(30)); Query OK, 0 rows affected (0.03 sec) mysql> select * from data; Empty set (0.01 sec) mysql> select * from data; Empty set (0.01 sec) mysql> insert into data values ('AWS', 'aws@support.com'); Query OK, 1 row affected (0.00 sec) mysql> i-019129ca50c37e93a (Multi-Tier-Website-Demonstration) PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102
```

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Now let's insert some data values. The command is

```
mysql>insert into data values ('AWS', 'aws@support.com');
```

The screenshot shows a terminal window within the AWS CloudShell interface. The user has run several MySQL commands:

```

mysql> use intel;
Database changed
mysql> create table data(firstname varchar(30), email varchar(30));
Query OK, 0 rows affected (0.03 sec)

mysql> select * from data;
Empty set (0.01 sec)

mysql> select * from data;
Empty set (0.01 sec)

mysql> insert into data values ('AWS', 'aws@support.com');
Query OK, 1 row affected (0.00 sec)

mysql> select * from data;
+----+-----+
| firstname | email   |
+----+-----+
| AWS      | aws@support.com |
+----+-----+
1 row in set (0.00 sec)

mysql>

```

Below the terminal, the AWS CloudShell interface shows the instance details:

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)  
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

At the bottom, the browser toolbar includes CloudShell, Feedback, and various system icons.

To show the inserted data, we will use this command: mysql>select \* from data;

The inserted data will be displayed.

The screenshot shows a simple HTML form with two input fields: "Name:" and "Email:", followed by a "Submit" button.

Below the form, the browser's developer tools show the generated SQL query:

```

connect_error) { die("Connection failed: ". $conn->connect_error); } if(isset($_POST['firstname']) && isset($_POST['email'])){ $sql = "INSERT INTO data (firstname,email) VALUES ('".$_firstname.", '".$_email."'); if ($conn->query($sql) === TRUE) { echo "New record created successfully"; } else { echo "Error: " . $sql . "
". $conn->error; } $conn->close(); } ?>

```

Some errors are still visible on the webpage below. so we resolve the errors using some commands.

Instances | EC2 | us-east-1    RDS | us-east-1    EC2 Instance Connect | us-east-1    54.204.118.216

aws Services Search [Alt+S]

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```

1 row in set (0.00 sec)

mysql> exit
Bye
ubuntu@ip-172-31-30-102:/var/www/html$ sudo nano index.php
ubuntu@ip-172-31-30-102:/var/www/html$ sudo add-apt-repository -y ppa:ondrej/php
PPA publishes dgsgym, you may need to include 'main/debug' component
Repository: 'deb https://ppa.launchpadcontent.net/ondrej/php/ubuntu/ jammy main'
Description:
Co-installable PHP versions: PHP 5.6, PHP 7.x, PHP 8.x and most requested extensions are included. Only Supported Versions of PHP (http://php.net/supported-versions.php) for Supported Ubuntu Releases (https://wiki.ubuntu.com/Releases) are provided. Don't ask for end-of-life PHP versions or Ubuntu release, they won't be provided.

Debian oldstable and stable packages are provided as well: https://deb.sury.org/#debian-dpa

You can get more information about the packages at https://deb.sury.org

IMPORTANT: The <foo>-backports is now required on older Ubuntu releases.

BUGS&FEATURES: This PPA now has a issue tracker:
https://deb.sury.org/#bug-reporting
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)

PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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Here, we have to change some content in our index.php code. We will go into the code and edit some contents. To go into code, we will use this command: \$sudo nano index.php. Let's change the servername. In \$servername, we will add the endpoint of our RDs database. \$servername="rds database endpoint".

Instances | EC2 | us-east-1    RDS | us-east-1    EC2 Instance Connect | us-east-1    54.204.118.216

aws Services Search [Alt+S]

N. Virginia ABHINANDAN

```

WARNING: add-apt-repository is broken with non-UTF-8 locales, see
https://github.com/erndnj/deb.sury.org/issues/56 for workaround:

# LC_ALL=C.UTF-8 add-apt-repository ppa:ondrej/php
More info: https://launchpad.net/~ondrej/+archive/ubuntu/php
Adding repository.
Adding deb entry to /etc/apt/sources.list.d/ondrej-ubuntu-php-jammy.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/ondrej-ubuntu-php-jammy.list
Adding key to /etc/apt/trusted.gpg.d/ondrej-ubuntu-php.gpg with fingerprint 14AA40EC0831756756D7F66C4F4EA0AAE5267A6C
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:5 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease [23.9 kB]
Get:6 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy/main amd64 Packages [115 kB]
Get:7 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy/main Translation-en [35.6 kB]
Fetched 404 kB in 2s (213 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-30-102:/var/www/html$ sudo apt install php5.6 mysql-client php5.6-mysqli
Reading package lists... Done
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)

PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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We will use this command to resolve webpage errors. The command is sudo add-apt-repository -y ppa:ondrej/php.

```
Scanning candidates...
Scanning linux images...
Running kernel seems to be up-to-date.
Restarting services...
systemctl restart packagekit.service polkit.service
Service restarts being deferred:
systemctl restart networkd-dispatcher.service
systemctl restart unattended-upgrades.service
No containers need to be restarted.
No user sessions are running outdated binaries.

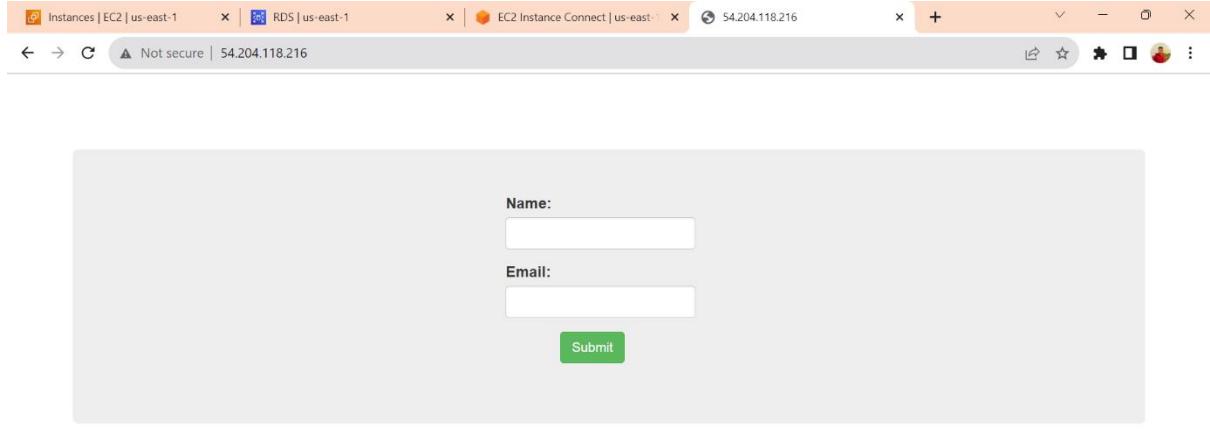
No VM guests are running outdated hypervisor (qemu) binaries on this host.

ubuntu@ip-172-31-30-102:/var/www/html$
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)  
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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We will use this command to resolve webpage errors. The command is \$sudo apt install php5.6 mysql-client php5.6-mysqli



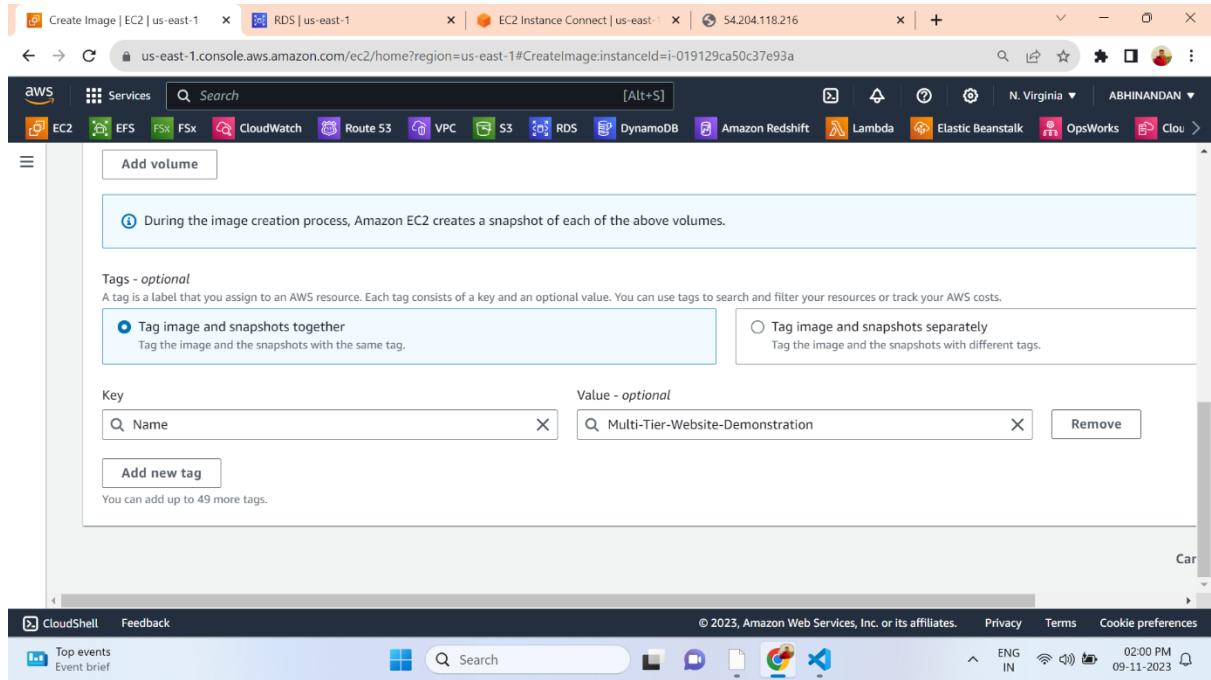
After resolving errors If we refresh our page, all the errors will be gone.

The screenshot shows the AWS Management Console with the EC2 service selected. The main pane displays a table of instances, with one row selected for 'Multi-Tier-Website-Demonstration'. On the right, a context menu is open under the 'Actions' heading, with 'Create image' being the highlighted option.

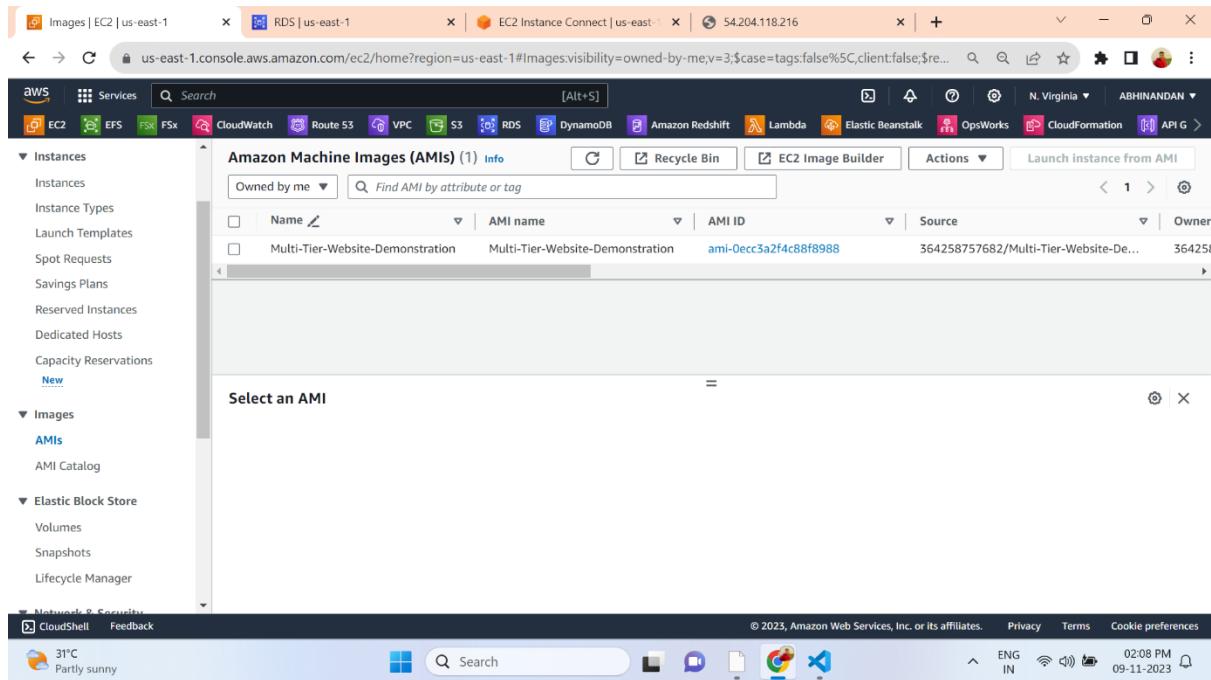
Here, we will create an AMI for autoscaling. Select instance; above the right side, click on actions. go to images and templates. Click on Create Image.

The screenshot shows the 'Create image' wizard step for the selected EC2 instance. The 'Image name' field is populated with 'Multi-Tier-Website-Demonstration'. The 'Image description - optional' field also contains 'Multi-Tier-Website-Demonstration'. The 'No reboot' checkbox is checked, while the 'Enable' checkbox is unchecked.

Giving an image name will give the same EC2 instance. and same, we will copy and paste it in the image description as well.



Click on add new tag key:name, value:EC2 name. click on create image, the image will be created.



Now the AMI has been created.

Load balancers | EC2 | us-east-1 | RDS | us-east-1 | EC2 Instance Connect | us-east-1 | 54.204.118.216

EC2 > Load balancers

Load balancers

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

Filter load balancers

Name	DNS name	State	VPC ID	Availability Zones	Type
No resources to display					

0 load balancers selected

Select a load balancer above.

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Now we will create a load balancer, and we will try to map it. Go to load balancers, click on create a Load balancer.

Compare and select load balancer | RDS | us-east-1 | EC2 Instance Connect | us-east-1 | 54.204.118.216

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#SelectCreateELBWizard:

aws Services Search [Alt+S]

Application Load Balancer Info

Choose an Application Load Balancer when you need a flexible feature set for your applications with HTTP and HTTPS traffic. Operating at the request level, Application Load Balancers provide advanced routing and visibility features targeted at application.

Network Load Balancer Info

Choose a Network Load Balancer when you need ultra-high performance, TLS offloading at scale, centralized certificate deployment, support for UDP, and static IP addresses for your applications. Operating at the connection level, Network Load

Gateway Load Balancer Info

Choose a Gateway Load Balancer when you need to deploy and manage a fleet of third-party virtual appliances that support GENEVE. These appliances enable you to improve security, compliance, and policy controls.

Create

CloudShell Feedback 31°C Partly sunny ENG IN 02:08 PM 09-11-2023

Click on Create an application Load Balancer.

The screenshot shows the AWS CloudShell interface with multiple tabs open. The active tab is 'Create Application Load b...' under the EC2 service. The sidebar on the left lists various AWS services and navigation links. The main content area displays the 'Create Application Load Balancer' wizard, specifically the 'Basic configuration' step. It asks for a 'Load balancer name' (set to 'Multi-tier-load-balancer'), specifies an 'Internet-facing' scheme, and shows the selected VPC and subnets for network mapping.

Give a load balancer name as "multi-tier load balancer".

This screenshot continues the 'Create Application Load b...' wizard. The 'Network mapping' step is shown, where the user has selected the 'us-east-1a' and 'us-east-1b' Availability Zones in the 'use1-az4' subnet. The VPC dropdown shows 'vpc-0f7babac6fce4ee32' with 'IPv4: 172.31.0.0/16'. The 'Mappings' section shows the selected subnets for each AZ.

In network mapping, VPC will be the default.

The screenshot shows the 'Mappings' step of the 'Create application load balancer' wizard. On the left, a sidebar lists various AWS services: EC2, EFS, FSx, CloudWatch, Route 53, VPC, S3, RDS, DynamoDB, Amazon Redshift, Lambda, Elastic Beanstalk, OpsWorks, CloudFormation, and API Gateway. The main pane is titled 'Mappings' and contains the following information:

- us-east-1a (use1-az4)**  
Subnet: subnet-0e6ee709de7e5e1f1
- us-east-1b (use1-az6)**  
Subnet: subnet-0c368eff13d2b8178
- us-east-1c (use1-az1)**  
Subnet: subnet-031288905275724e7

Below each subnet entry, it says 'IPv4 address' and 'Assigned by AWS'.

Here, we will randomly enable three availability zones. after knowing our EC2 machine AZ for autoscalling.

The screenshot shows the 'Security groups' step of the 'Create application load balancer' wizard. The sidebar on the left is identical to the previous screenshot. The main pane is titled 'Security groups' and contains the following information:

- Security groups**  
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](#).
- Selected security group**: website-deploy-security-group (sg-0e5b3317d23669f6d) VPC: vpc-0f7babac5dce4ee53

Below this, there is a section titled 'Listeners and routing' with a table for defining listeners. The table has columns for 'Protocol', 'Port', 'Default action', and 'Info'. One row is visible for 'Listener HTTP:80' with 'HTTP' in the protocol column and '80' in the port column.

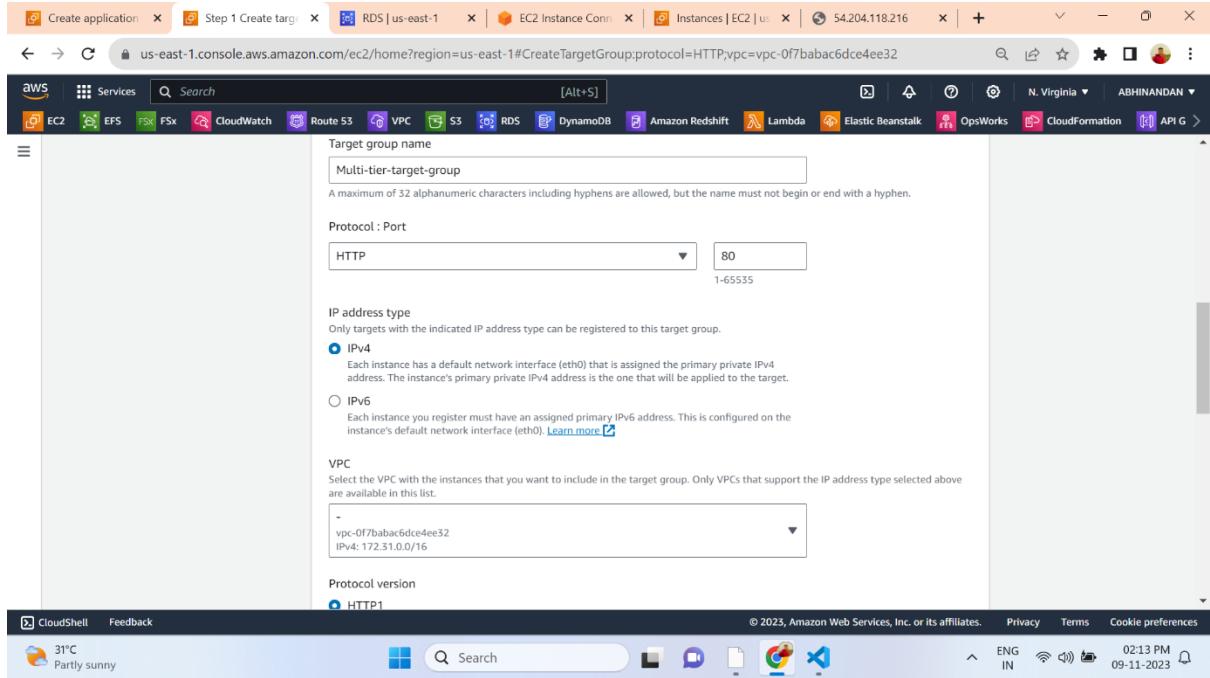
Select the security group that we created for our project.

The screenshot shows the AWS CloudWatch interface with the URL <https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard>. The left sidebar shows navigation options like AMI Catalog, Elastic Block Store, Network & Security, Load Balancing, and Auto Scaling. The main content area is titled 'Listeners and routing' and shows a configuration for a listener on port 80. The 'Protocol' dropdown is set to 'HTTP' and the 'Port' is '80'. The 'Default action' dropdown is set to 'Forward to' with the value 'Select a target group'. A button 'Create target group' is visible. Below this, there's a section for 'Listener tags - optional' with a 'Add listener tag' button.

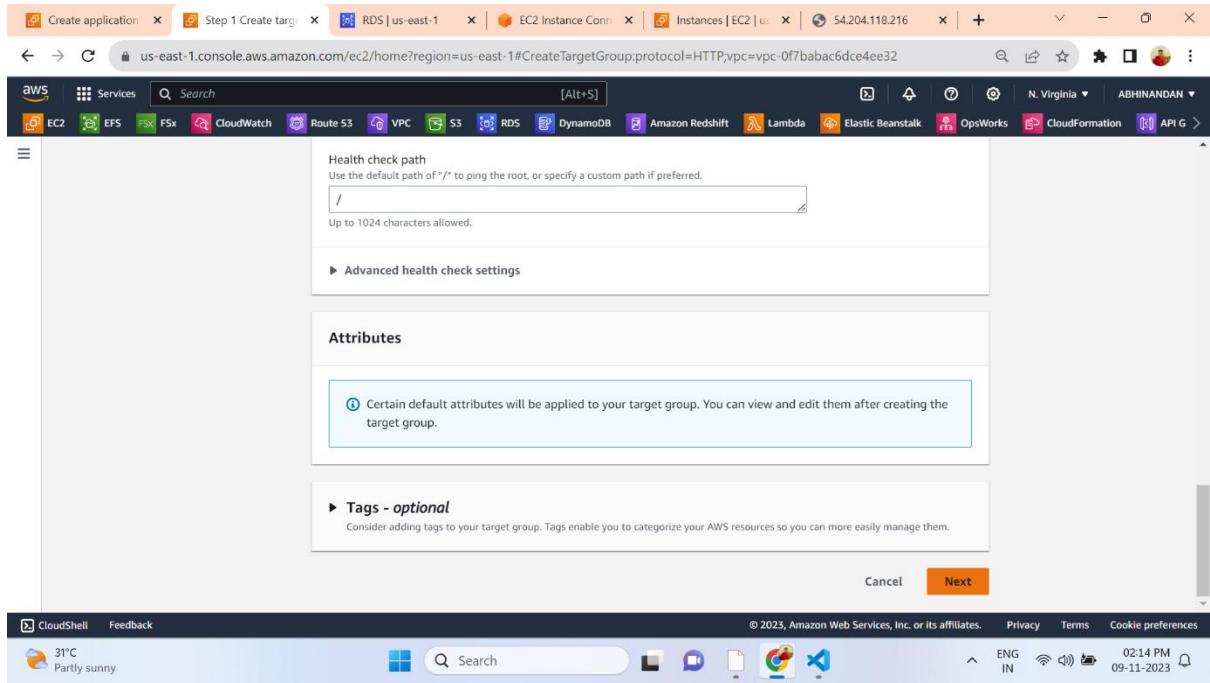
Here, we do not have a target group. First, we will create a target group.

The screenshot shows the AWS EC2 Target Groups interface with the URL <https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateTargetGroupProtocol=HTTP;vpc=vpc-0f7babac6dce4ee32>. The left sidebar shows 'EC2 > Target groups > Create target group'. The main content area is titled 'Specify group details' and shows the 'Basic configuration' section. Under 'Choose a target type', the 'Instances' option is selected, indicated by a blue border. A list of benefits for using instances is provided: 'Supports load balancing to instances within a specific VPC.' and 'Facilitates the use of [Amazon EC2 Auto Scaling](#) to manage and scale your EC2 capacity.' Other options like 'IP addresses' and 'Lambda function' are also listed but not selected.

Here, we will choose the target type as an instance only.



Give the target group name "multi-tier target-group". vpc will be the default only. No changes are to be made.



Then click on Next.

This screenshot shows the AWS CloudFront console during the 'Create target group' process. The 'Register targets' step is active. A single EC2 instance, 'i-019129ca50c37e93a', is listed under 'Available instances'. Its port '80' is selected for routing traffic. The status is 'Running' and it belongs to security groups 'ec2-rds-2' and 'website-deploy-security-group'. A button 'Include as pending below' is visible.

In the available instances, choose the instance that we created for our project. Click on include as pending below.

This screenshot shows the 'Review targets' step. The previously selected EC2 instance is now listed as 'Pending' in the 'Targets' table. The port '80' is also listed. A message at the bottom indicates '1 selection is now pending below. Include more or register targets when ready.' A 'Create target group' button is visible at the bottom right.

Click on Create Target Group, and the target group will be created.

The screenshot shows the AWS Management Console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard). The left sidebar includes sections for EC2, EBS, CloudWatch, Route 53, VPC, S3, RDS, DynamoDB, Amazon Redshift, Lambda, Elastic Beanstalk, OpsWorks, CloudFormation, and API G. The main content area is titled 'Listeners and routing' and shows a configuration for a 'Listener HTTP:80'. The 'Protocol' is set to 'HTTP' and the 'Port' is '80'. The 'Default action' is 'Forward to' a 'Multi-tier-target-group' (Target type: Instance, IPv4). A 'Create target group' button is present. Below this, there's a section for 'Listener tags - optional' with a 'Add listener tag' button.

Then we will go to our load balancer in the AWS management console. If we refresh, we will get our target group that we recently created.

The screenshot shows the AWS Management Console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard). The left sidebar includes sections for EC2, EBS, CloudWatch, Route 53, VPC, S3, RDS, DynamoDB, Amazon Redshift, Lambda, Elastic Beanstalk, OpsWorks, CloudFormation, and API G. The main content area is titled 'Summary' and shows the configuration for a 'Multi-tier-load-balancer'. It includes sections for 'Basic configuration', 'Security groups', 'Network mapping', 'Listeners and routing', 'Add-on services', 'Tags', and 'Attributes'. A note at the bottom states: 'Certain default attributes will be applied to your load balancer. You can view and edit them after creating the load balancer.'

Here we will check the summary for creating a load balancer.

Create application | Target group details | RDS | us-east-1 | EC2 Instance Conn | Instances | EC2 | us- | 54.204.118.216 | +

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateALBWizard:

Services Search [Alt+S]

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AMI Catalog

Elastic Block Store Volumes Snapshots Lifecycle Manager

Network & Security Security Groups Elastic IPs Placement Groups Key Pairs Network Interfaces

Load Balancing Load Balancers Target Groups

Auto Scaling Auto Scaling Groups

Basic configuration Edit

Multi-tier-load-balancer

- Internet-facing
- IPv4

Security groups Edit

- website-deploy-security-group sg-0e5b3517d23669f6d

Network mapping Edit

VPC vpc-0f7babac6dce4ee32

- us-east-1a subnet-0e6ee709de7e5e1f1
- us-east-1b subnet-0c368eff13d2b8178
- us-east-1c subnet-031288905275724e

Listeners and routing Edit

- HTTP:80 defaults to Multi-tier-target-group

Add-on services Edit

None

Tags Edit

None

Attributes

Certain default attributes will be applied to your load balancer. You can view and edit them after creating the load balancer.

Cancel Create load balancer

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Rain coming In about 2.5 hours ENG IN 02:15 PM 09-11-2023

Next, we will click on Create Load Balancer.

Load Balancer cre | Target group details | RDS | us-east-1 | EC2 Instance Conn | Instances | EC2 | us- | 54.204.118.216 | +

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateLBWizardSuccess:loadBalancerArn=arn:aws:elasticloadbalancing:u...| Search

Services Search [Alt+S]

N. Virginia ABHINANDAN

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Rain coming In about 2.5 hours ENG IN 02:16 PM 09-11-2023

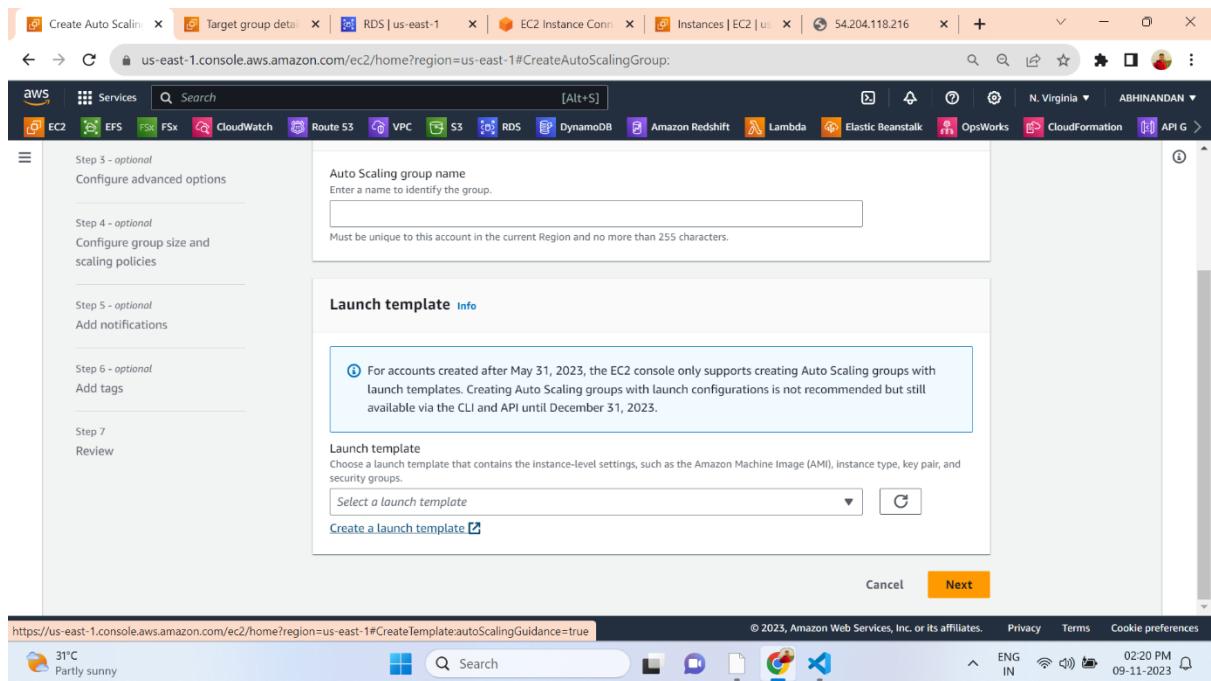
If we click on View Load Balancer, we can view the created load balancer.

The screenshot shows the AWS CloudWatch Metrics console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LoadBalancers](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LoadBalancers). The left sidebar is collapsed, and the main content area displays the 'Load balancers' section. A table lists one load balancer named 'Multi-tier-load-balancer...' with the status 'Active'. Below the table, a message says '0 load balancers selected' and 'Select a load balancer above.' The top right corner shows the user 'ABHINANDAN'.

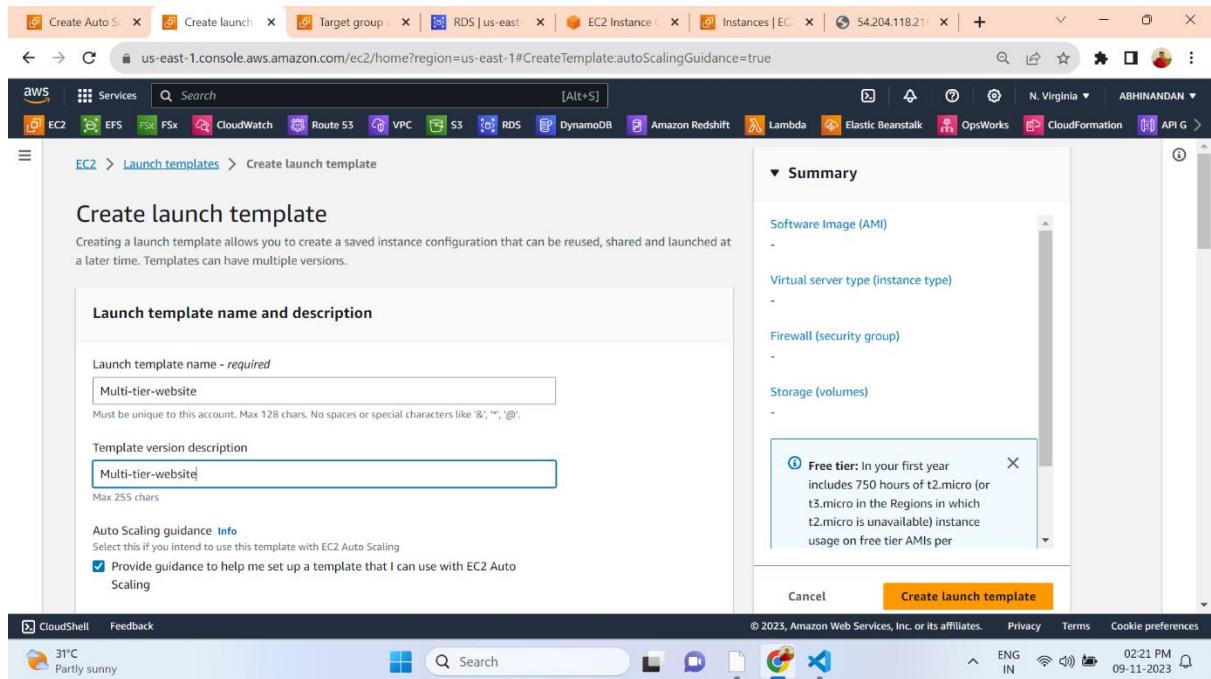
Now the load balancer has been created.

The screenshot shows the AWS CloudWatch Metrics console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#AutoScalingGroups](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#AutoScalingGroups). The left sidebar is collapsed, and the main content area displays the 'Amazon EC2 Auto Scaling' landing page. It features a large heading, a call-to-action button 'Create Auto Scaling group', and sections for 'How it works' and 'Pricing'. The top right corner shows the user 'ABHINANDAN'.

Here now, we will be creating an autoscaling group.



But for creating an autoscaling group, we will require a launch template.



Now we will create a launch template. The launch template name will be "Multi-tier-website". Give the same in the description as well.

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

Search our full catalog including 1000s of application and OS images

Recents | My AMIs | Quick Start

Owned by me | Shared with me

Browse more AMIs

Amazon Machine Image (AMI)

Multi-Tier-Website-Demonstration  
ami-0ecc5a2f4c88f988  
2023-11-09T08:50:46.00Z Virtualization: hvm ENA enabled: true Root device type: ebs

Description  
Multi-Tier-Website-Demonstration

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ENG IN 02:21 PM 09-11-2023

Now click on my AMIs and choose our created AMI named "Multi-tier-website-demonstration".

Instance type Info

Advanced

Instance type

t2.micro

Family: t2 1 vCPU 1 GiB Memory Current generation: true Free tier eligible

On-Demand Windows base pricing: 0.0162 USD per Hour

On-Demand SUSE base pricing: 0.0116 USD per Hour

On-Demand RHEL base pricing: 0.0716 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

project1-key-pair

Create new key pair

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ENG IN 02:22 PM 09-11-2023

choose instance type as t2.micro, and choose key pairs that we created for our project.

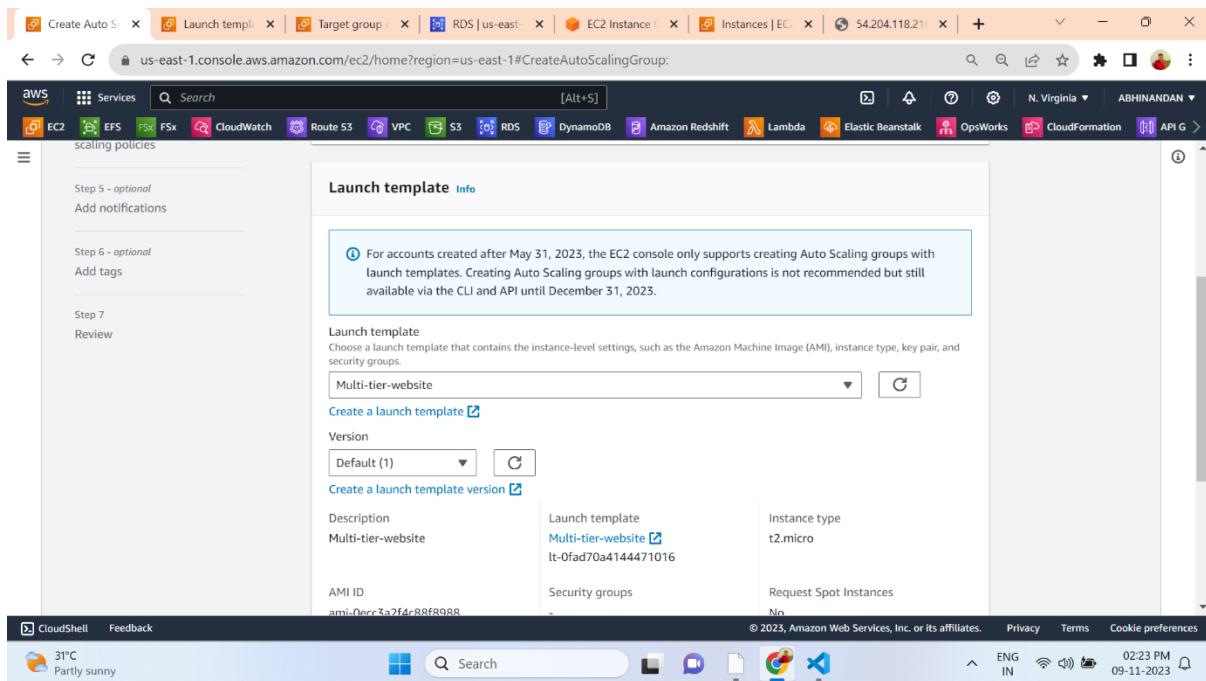
The screenshot shows the AWS CloudFormation console with a tab for 'Create Auto Scaling group' selected. The main content area is titled 'Choose launch template' and contains a step-by-step wizard. Step 1: 'Choose launch template' has a sub-section 'Name' where 'Multi-tier-Auto-scaling' is entered. Step 2: 'Choose instance launch options' is collapsed. Step 3: 'Configure advanced options' is collapsed. Step 4: 'Configure group size and scaling policies' is collapsed. Step 5: 'Add notifications' is collapsed. Step 6: 'Add tags' is collapsed. Step 7: 'Review' is collapsed. On the right side, there is a 'Summary' panel showing the selected software image (Multi-Tier-Website-Demonstrati...), virtual server type (t2.micro), and storage (1 volume(s) - 8 GiB). A tooltip for the free tier indicates it includes 750 hours of t2.micro or t3.micro usage. At the bottom right is a large orange 'Create launch template' button.

In network settings, choose the security group that we created for our project.

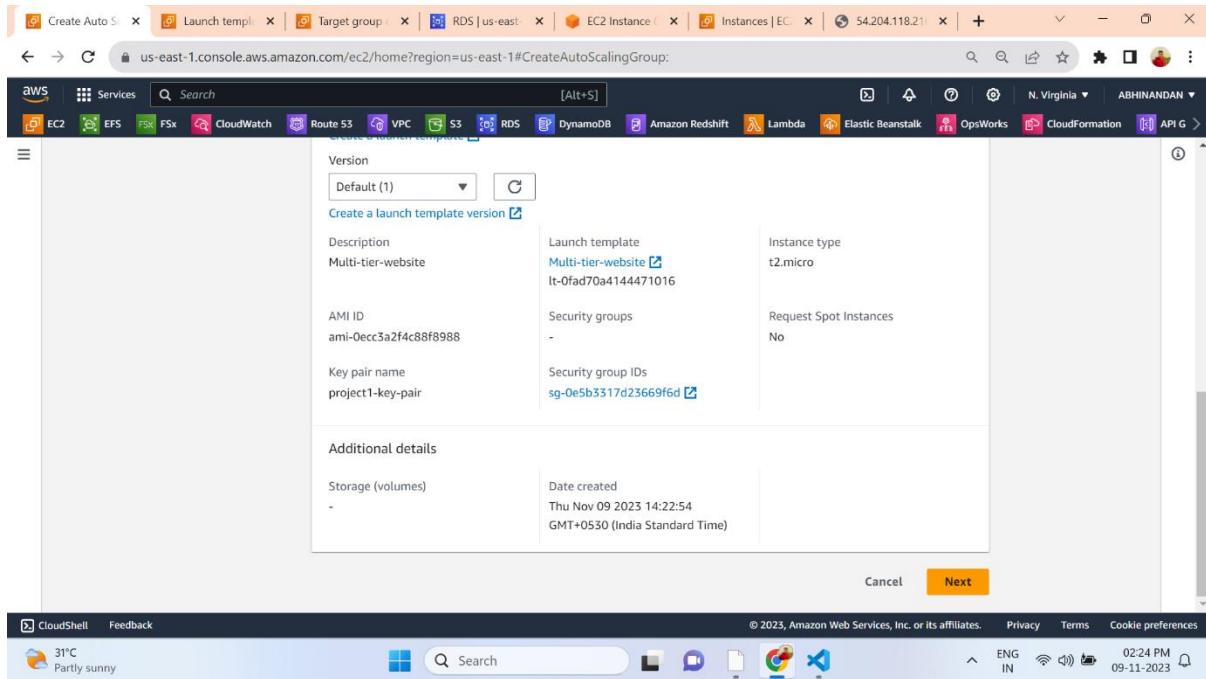
Next, click on Create Launch Template.

This screenshot shows the same 'Create Auto Scaling group' configuration page as the previous one, but with a different URL in the address bar: 'us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateAutoScalingGroup'. The 'Choose launch template' step is still active, showing the 'Name' field with 'Multi-tier-Auto-scaling'. The other steps (2-7) are collapsed. The right-hand summary panel and the large orange 'Create launch template' button are also present.

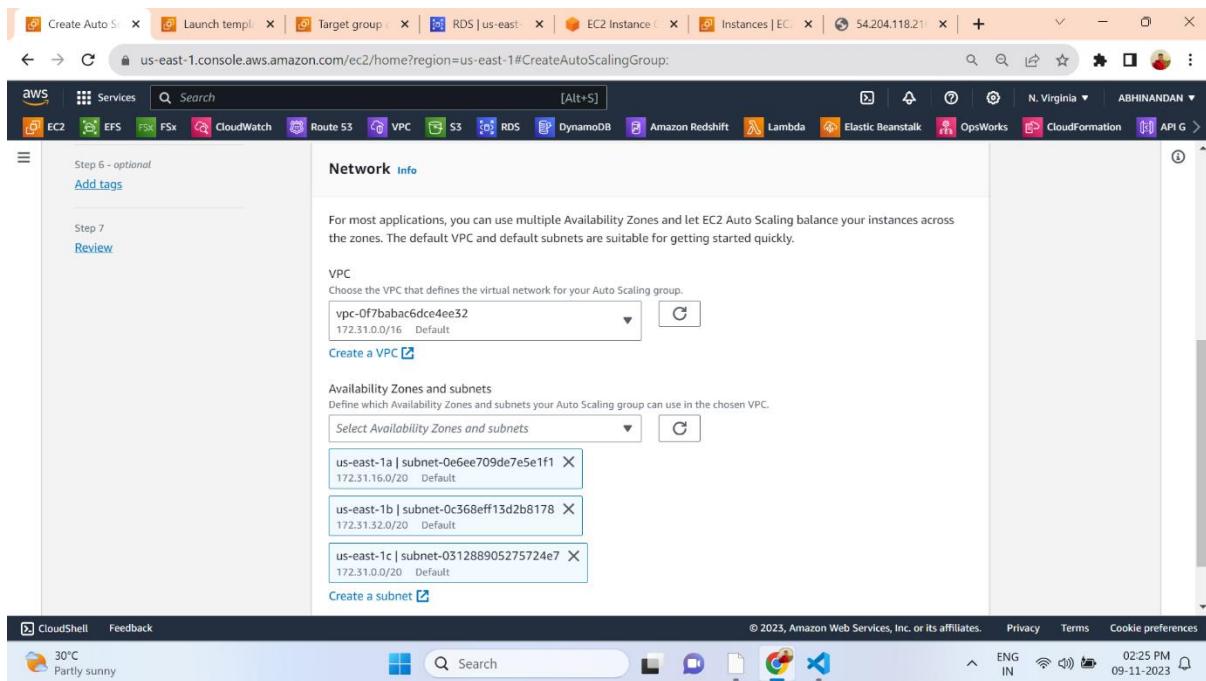
Now the template is created.



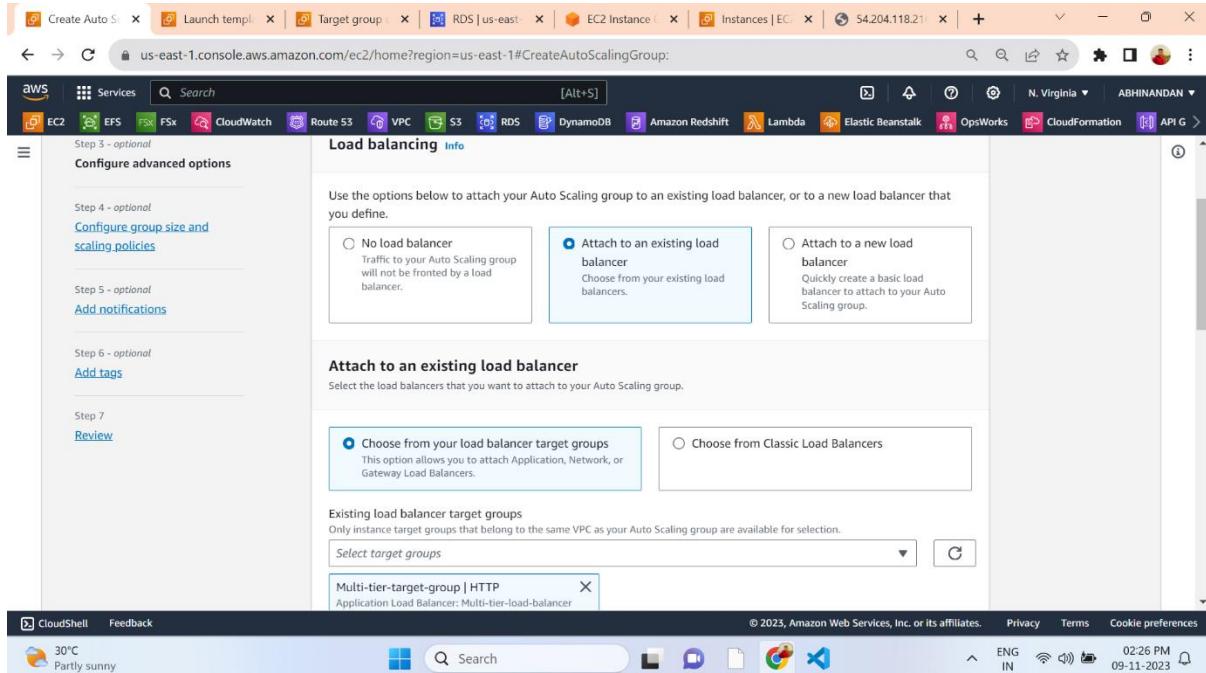
Now choose the launch template that we created recently.



Now click on next.



Now in the network, we will choose the default VPC. Next we will choose three availability zones.



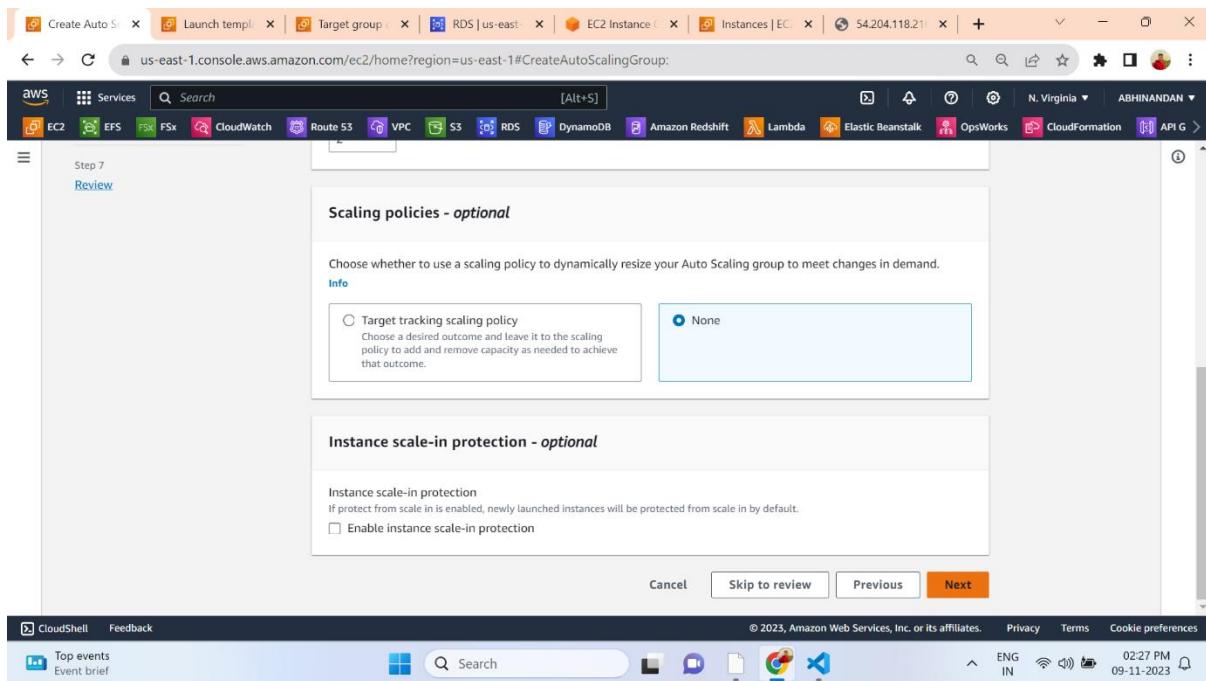
Next, in load balancing, we will click on Attach to an existing load balancer. and next choose existing load balancer target groups.

The screenshot shows the AWS CloudWatch Metrics console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateAutoScalingGroup](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateAutoScalingGroup). The top navigation bar includes tabs for Create Auto S..., Launch templ..., Target group..., RDS | us-east..., EC2 Instance..., Instances | EC..., and 54.204.118.21... . The main content area is titled "Additional settings". It contains two sections: "Monitoring" and "Default instance warmup". Under "Monitoring", there is a checkbox for "Enable group metrics collection within CloudWatch". Under "Default instance warmup", there is a checkbox for "Enable default instance warmup". At the bottom right of the content area are buttons for "Cancel", "Skip to review", "Previous", and "Next". The status bar at the bottom shows "CloudShell Feedback", the date "09-11-2023", and the time "02:26 PM".

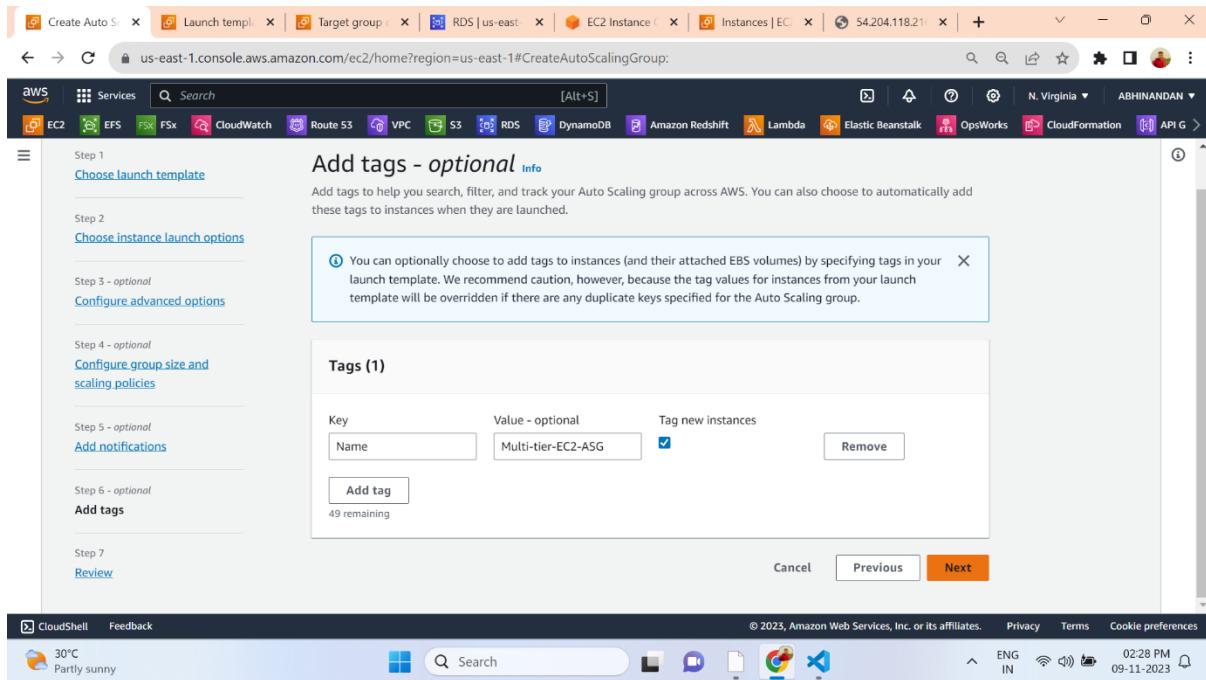
Click on next.

The screenshot shows the AWS CloudWatch Metrics console with the URL [us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateAutoScalingGroup](https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateAutoScalingGroup). The top navigation bar includes tabs for Create Auto S..., Launch templ..., Target group..., RDS | us-east..., EC2 Instance..., Instances | EC..., and 54.204.118.21... . The main content area is titled "Configure group size and scaling policies - optional". It lists steps from 1 to 7. Step 1 is "Choose launch template", Step 2 is "Choose instance launch options", Step 3 is "Configure advanced options", Step 4 is "Configure group size and scaling policies", Step 5 is "Add notifications", Step 6 is "Add tags", and Step 7 is "Review & launch". A sub-section titled "Group size - optional" is expanded, showing fields for Desired capacity (set to 2), Minimum capacity (set to 1), and Maximum capacity (set to 2). At the bottom right of the content area are buttons for "Cancel", "Skip to review", "Previous", and "Next". The status bar at the bottom shows "CloudShell Feedback", the date "09-11-2023", and the time "02:26 PM".

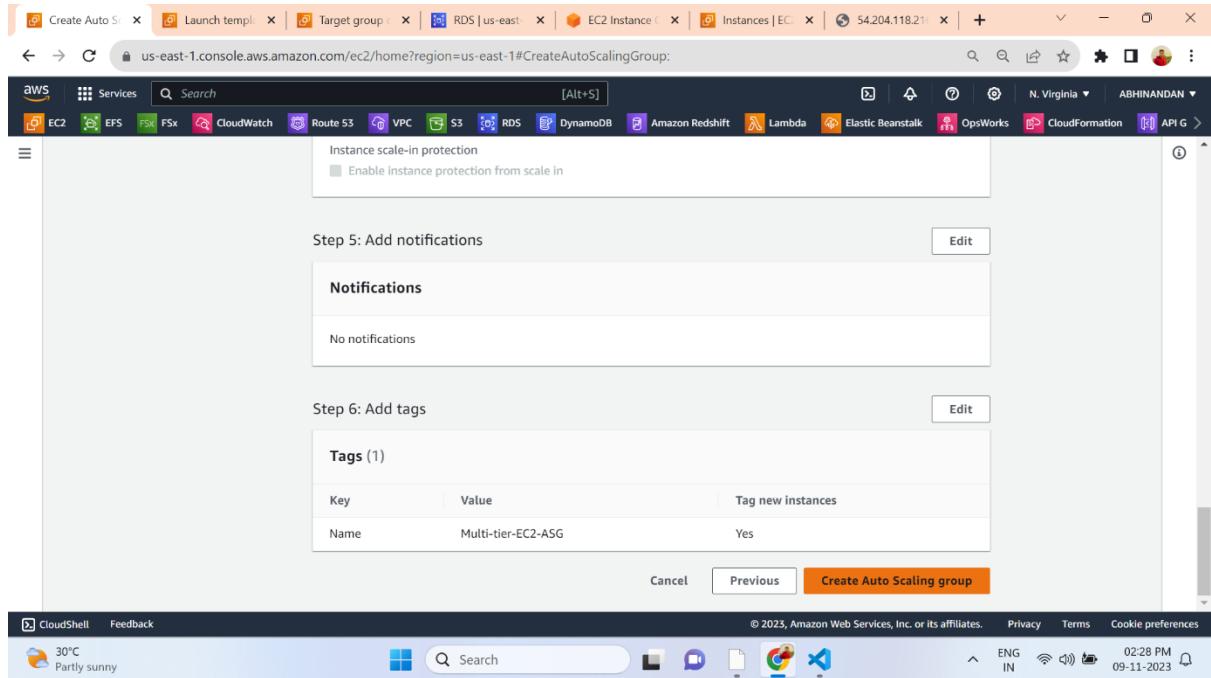
Group size: desired capacity: 2; minimum capacity: 1; maximum capacity: 2



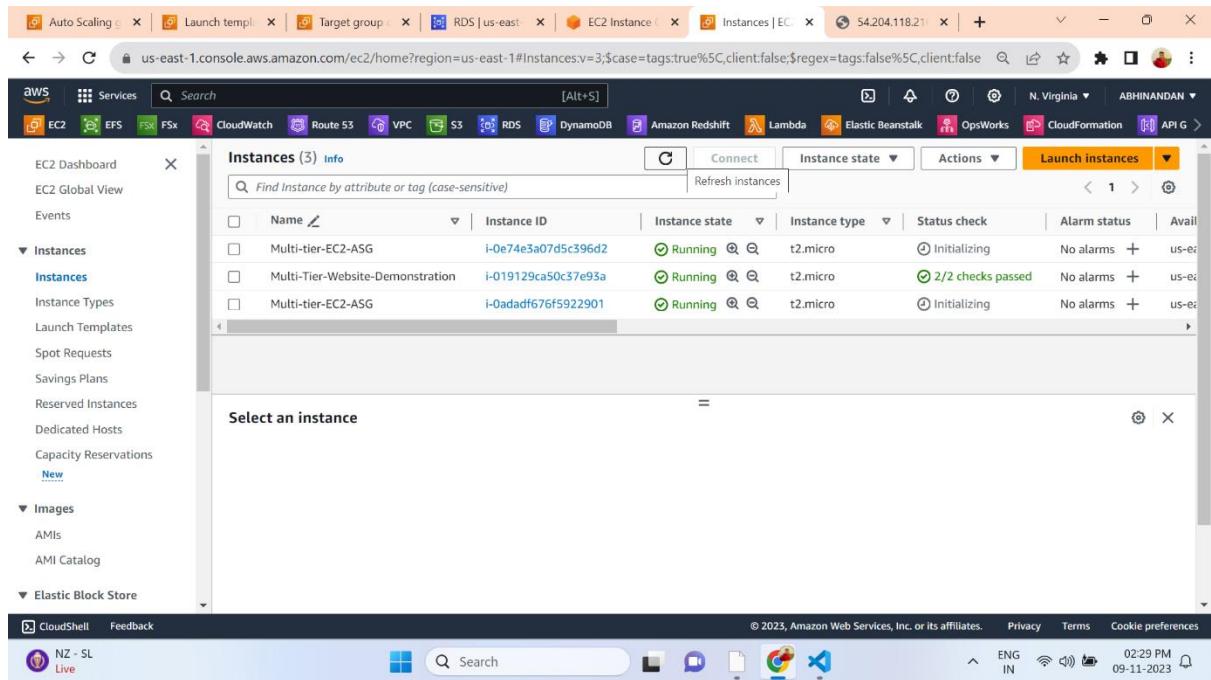
Click on next.



Click on add tags key-name, value-multi-tier-ec2-asg. Then Click on next.



Next, click on Create an auto-scaling group.



Go to the EC2 instances console. Refresh it automatically; instances are being created. Copy their public IPs and check them in the browser.

The screenshot shows the AWS CloudWatch Metrics console with a multi-tier load balancer configuration. The main pane displays the 'Multi-tier-load-balancer' details, including the VPC (vpc-0f7babac6dce4ee52), IP address type (IPv4), and Availability Zones (us-east-1a, us-east-1c, us-east-1d). The 'DNS name copied' button is highlighted. The left sidebar lists various AWS services and regions.

Now copy the DNS name of the load balancer.

The screenshot shows a browser window with a contact form. The 'Name:' field contains 'Abhi' and the 'Email:' field contains 'abhi@gmail.com'. A green 'Submit' button is visible at the bottom. The browser status bar indicates the URL is 'Not secure | multi-tier-load-balancer-1463015961.us-east-1.elb.amazonaws.com'.

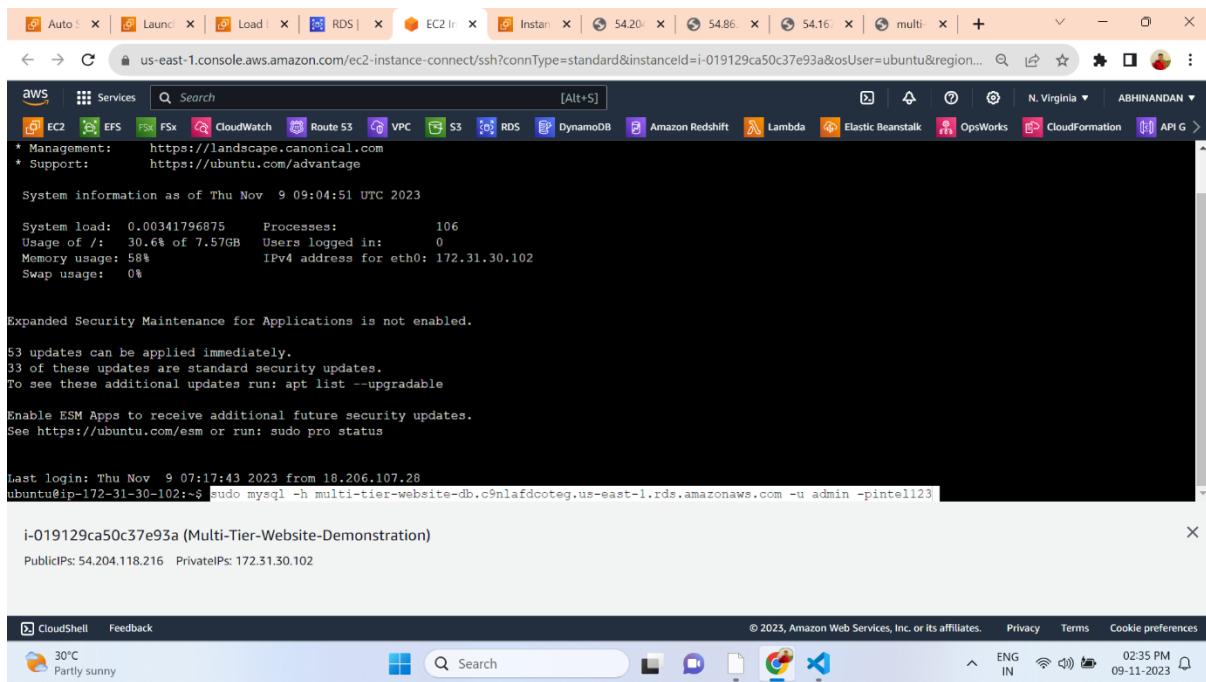
Paste it in the browser. Here our webpage is displayed successfully. Now we will try to add content from here. Give Name as “Abhi”, and Email as [abhi@gmail.com](mailto:abhi@gmail.com) and submit it.



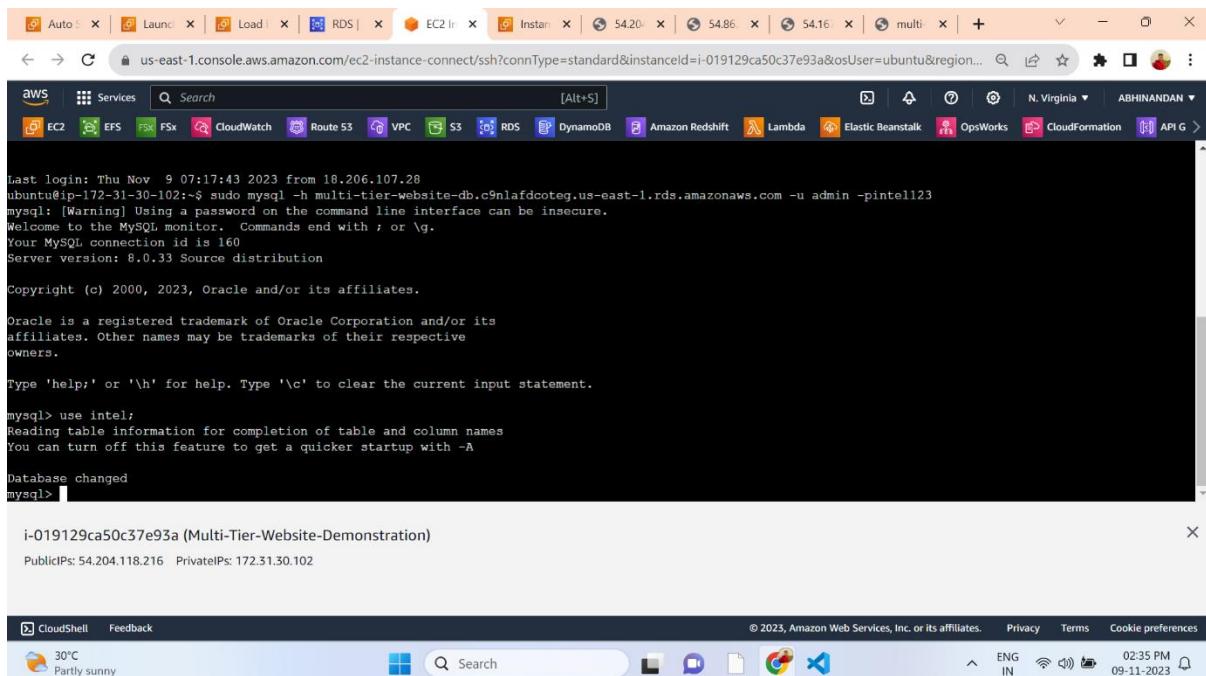
New record created successfully



Now the record was created successfully.



Now I have added one data in the web browser. Now we will check it in the EC2 instance to see if it displays the data or not.



```
Last login: Thu Nov  9 07:17:43 2023 from 18.206.107.28
ubuntu@ip-172-31-30-102:~$ sudo mysql -h multi-tier-website-db.c9nlafdcoteg.us-east-1.rds.amazonaws.com -u admin -pintell123
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 160
Server version: 8.0.33 Source distribution

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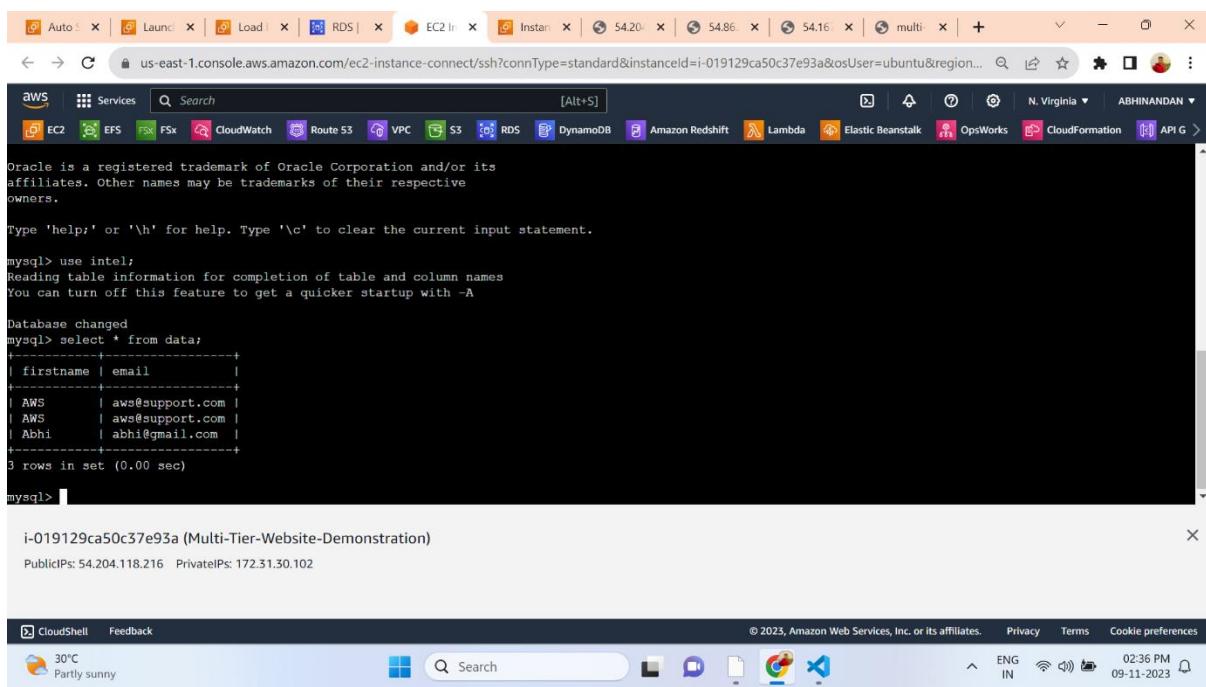
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use intel;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql>

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102
```

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```
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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use intel;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> select * from data;
+-----+-----+
| firstname | email      |
+-----+-----+
| AWS       | aws@support.com |
| AWS       | aws@support.com |
| Abhi     | abhi@gmail.com  |
+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

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Here, the data we added in the web browser is displayed successfully.

Name: Adarsh

Email: adarsh@gmail.com

Submit

New record created successfully



Now again, we will add more data to our web browser, and again, we will check.

```

mysql> select * from data;
+----+-----+
| id | data |
+----+-----+
| 1  | AWS  | aws@support.com |
| 2  | AWS  | aws@support.com |
| 3  | Abhi | abhi@gmail.com |
+----+-----+
3 rows in set (0.00 sec)

mysql> select * from data;
+----+-----+
| id | firstname | email      |
+----+-----+
| 1  | AWS       | aws@support.com |
| 2  | AWS       | aws@support.com |
| 3  | Abhi     | abhi@gmail.com |
| 4  | Sachin   | sachin@gmail.com |
| 5  | Adarsh   | adarsh@gmail.com |
| 6  | Deekshith | deekshith@gmail.com |
| 7  | Vybhav   | vybhav@gmail.com |
| 8  | Sagar    | sagar@gmail.com |
+----+-----+
8 rows in set (0.00 sec)

mysql>

```

i-019129ca50c37e93a (Multi-Tier-Website-Demonstration)  
PublicIPs: 54.204.118.216 PrivateIPs: 172.31.30.102

After adding more data in our web browser, it added all the data successfully, and the data is being displayed over here.

**Now we have successfully completed our AWS Project (Capstone Project).**