Develop and Deploy Web Application for Amazon Native Database CRUD Operation

(LAB-M07-01)

Version Control	
Document	Develop and Deploy Web Application for Database CRUD Operation
Owner	Ahmad Majeed Zahoory
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Description of Change	Task steps updated

Lab duration: **60 minutes**

Lab scenario

You're preparing to host a Products web application in AWS that uses to store product details in database. As a development group, your team has decided to host a web application in AWS virtual machine and database in AWS RDS. For performance management development team needs to develop the code to write the data in Write SQL server and read the data from Read SQL Server. You also want to explore the AWS Native database for your services.

Objectives

After you complete this lab, you will be able to:

- Create virtual machine using the AWS UI.
- Create SQL database using the AWS UI.
- Perform the Read and Write operation from 2 different SQL Servers.
- Develop the Php Code to perform Read and Write operation from 2 different SQL Servers.

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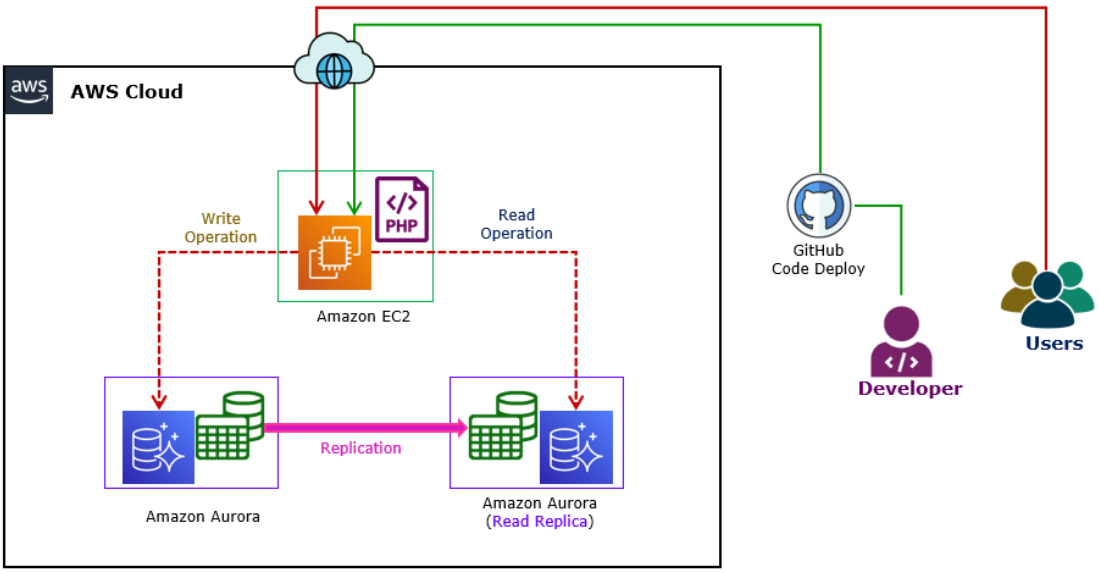

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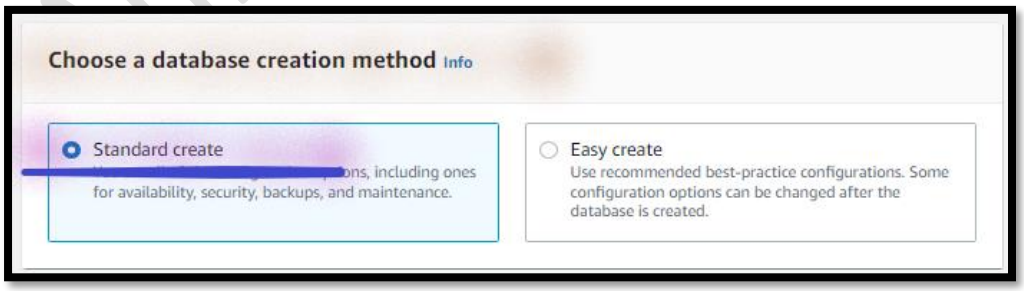
Task 1: Create a Database

In this task, you will create relational (amazon aurora) database.

Step 1: Create an Amazon RDS Instance

1. In the **AWS Management Console**, on the **Services** menu, search and select **RDS**.
2. Choose the **YOUR ALLOCATED REGION**, region list to the right of your account information on the navigation bar.
3. Select **Databases**.
    a. Select **Create database** and **Configure**:
        i. In the **Choose a database creation method** section:
            a) Select **Standard create**.



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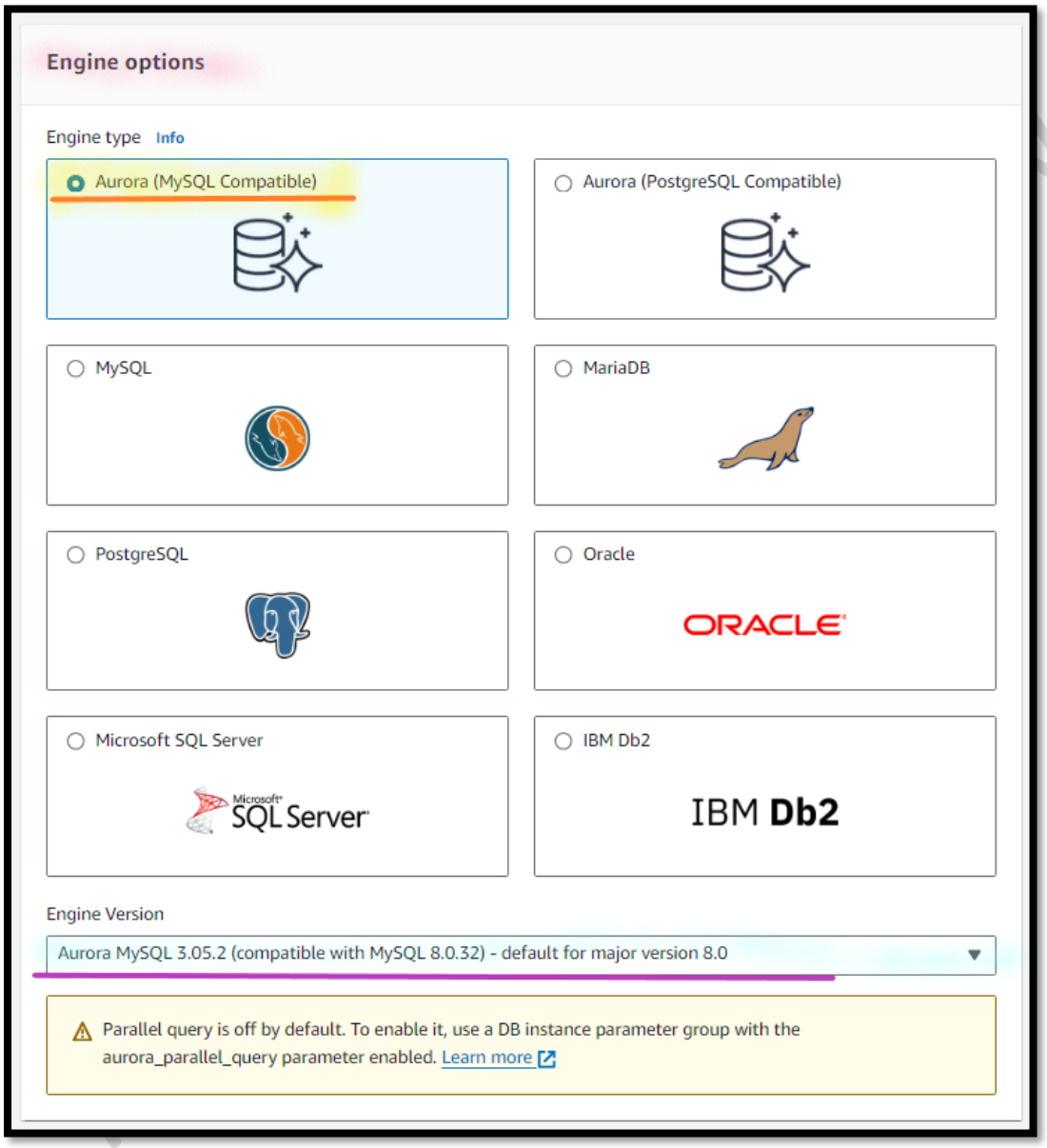
ii. In the **Engine options** section:

a) **Engine type**: Select **Amazon Aurora (MySQL-Compatible)**.

b) **Version**: Dropdown and select **Aurora MySQL [*Latest version 8.x*]**.



iii. In the **Templates** section:

a) Select **Dev/ Test**.

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iv. In the **Settings** section:

a) **DB instance identifier**: Write **inventory-db**.

b) **Expand** the **Credentials Settings**.

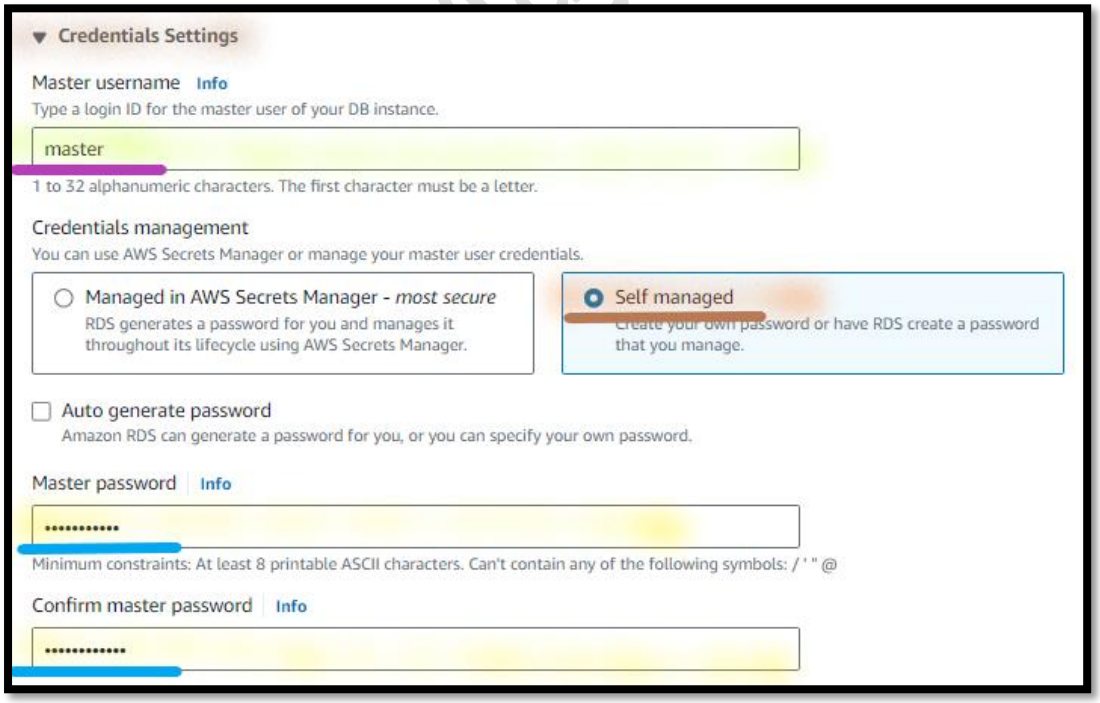
i. **Master username**: Write **master**.

ii. **Credentials management**: Select **Self managed**.

iii. **Master password**: Write **lab-password**.

iv. **Confirm password**: Write **lab-password**.

Note: This is the **username** and **password** you use to login and access your Aurora database instance.



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v. In the **Cloud Storage configuration** section:

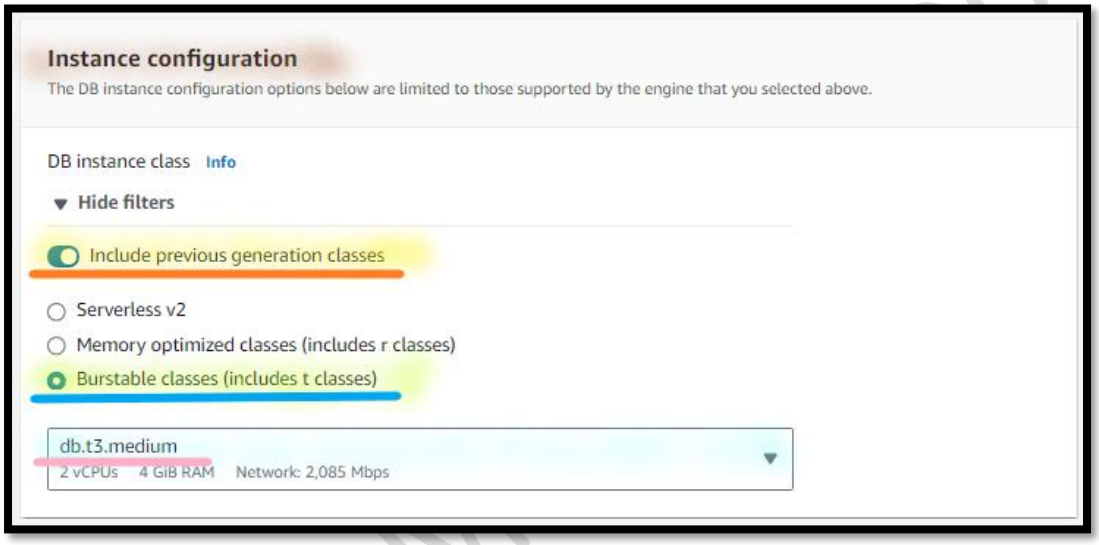
Note: Leave the details as default.

vi. In the **Instance configuration** section:

a) **Enable** **Include previous generation classes**.

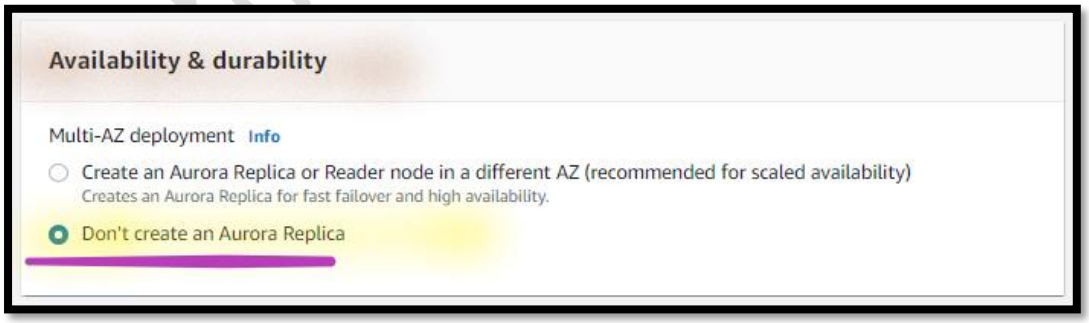
b) Select the **Burstable classes (includes t classes)**.

c) Dropdown and select **db.t3.medium** [*This instance type attract charges*].



vii. In the **Availability & durability** section:

a) **Multi-AZ deployment:** Select **Don't create an Aurora Replica**.



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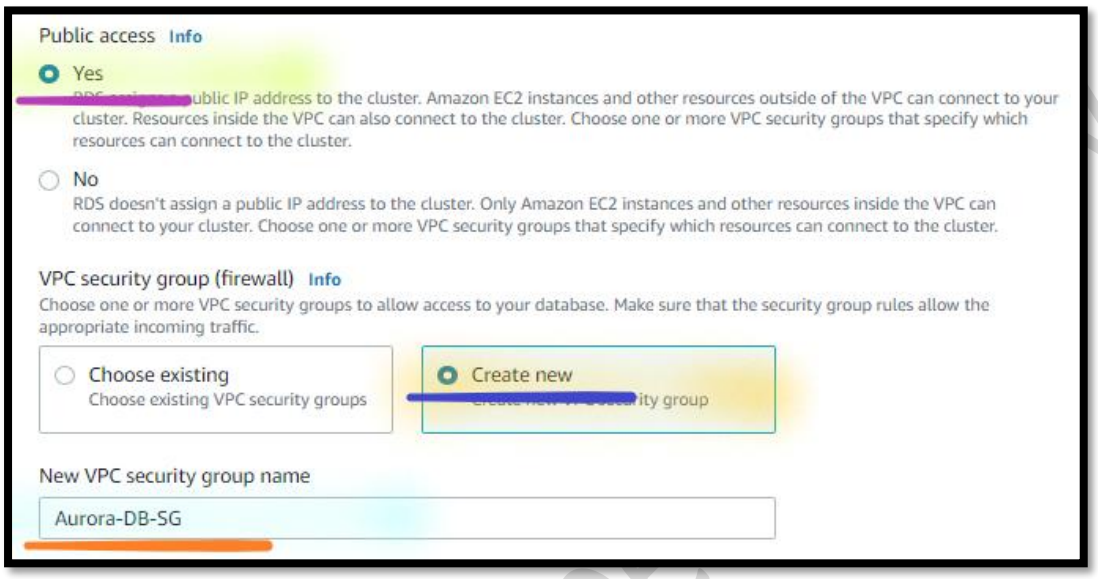
viii. In the **Connectivity** section:

a) **Public access**: Select **Yes**.

b) **VPC security groups**: Select **Create new**.

c) **New VPC security group name**: Write **Aurora-DB-SG**.



Note: Leave the other details as default.

ix. In the **Additional configuration** section (***at the bottom of the page***):

a) **Encryption**: **Unselect** the **Enable encryption**.

b) **Deletion protection**: **Unselect** the **Enable deletion protection**.

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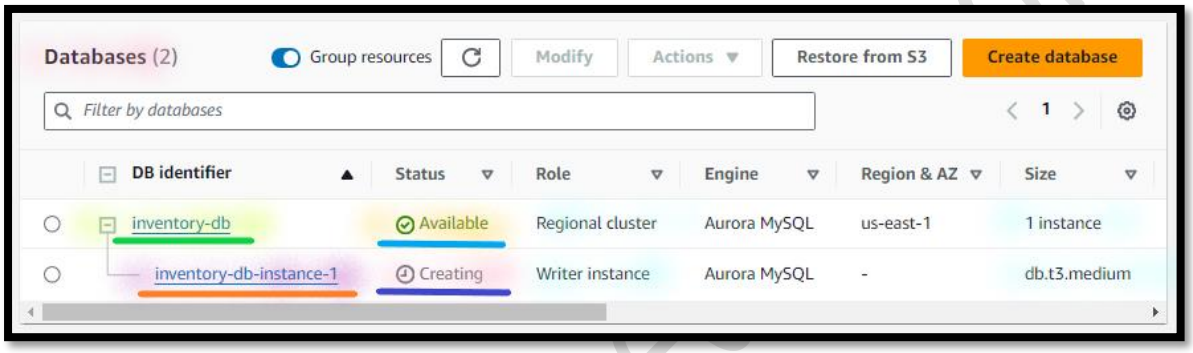
Note: Leave the other details as default.

b. Select **Create database**.

Note: You can see the "**Creating database inventory-db**" **message**.

Note: You can see the database instance **Status** as **Creating**.



Note: Database instance creation will take **~20 minutes**. **Don't wait**, **Go** to the **next task**.

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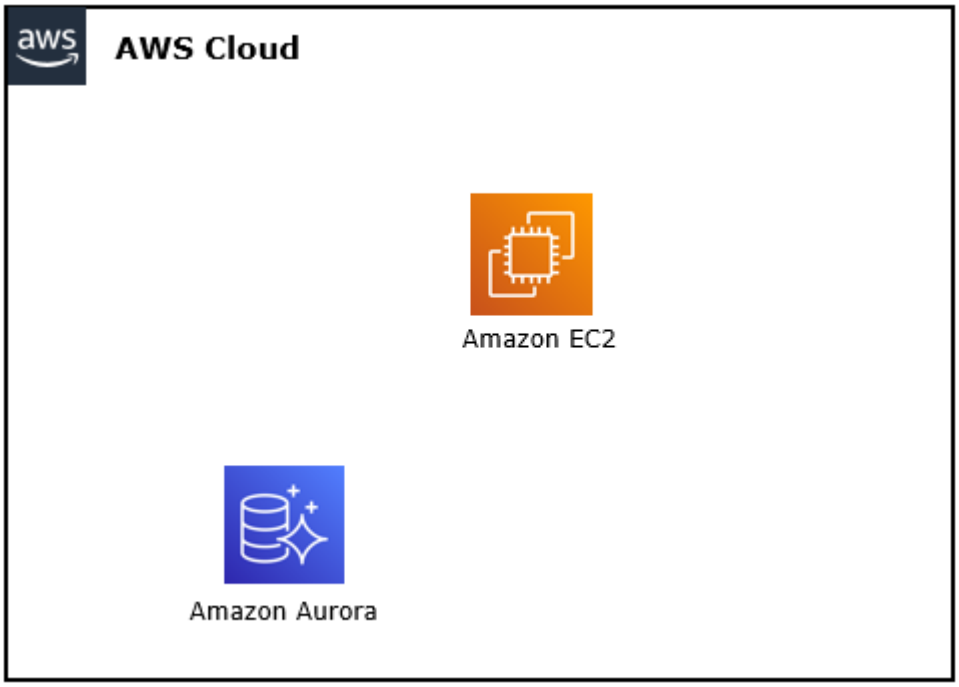
Task 2: Deploy the WebApp Server

In this task, you will create Ubuntu virtual machine.



Step 1: Create EC2 Instance

4. In the **AWS Management Console**, on the **Services** menu, search and select **EC2**.
5. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.
6. Select **Instances**.
7. Select **Launch Instances**.
   a. In the **Name and tags** section:
      i. **Name**: Write **Webapp Server**.
   b. In the **Application and OS Images** section:
      i. In the **Search box**:
         a) Type **Ubuntu Server 22.04**.
         b) Press **Enter** ***key***.

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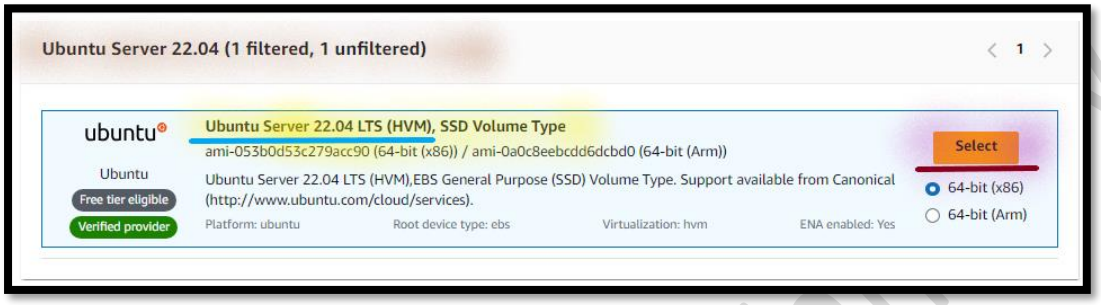
Note: You can see the **Choose an Amazon Machine Image** page.

c) **From** the **Choose an Amazon Machine Image** page:

1) Select **Ubuntu Server 22.04**.



Note: You can see the **Launch an Instance** page.

c. In the **Instance type** section:

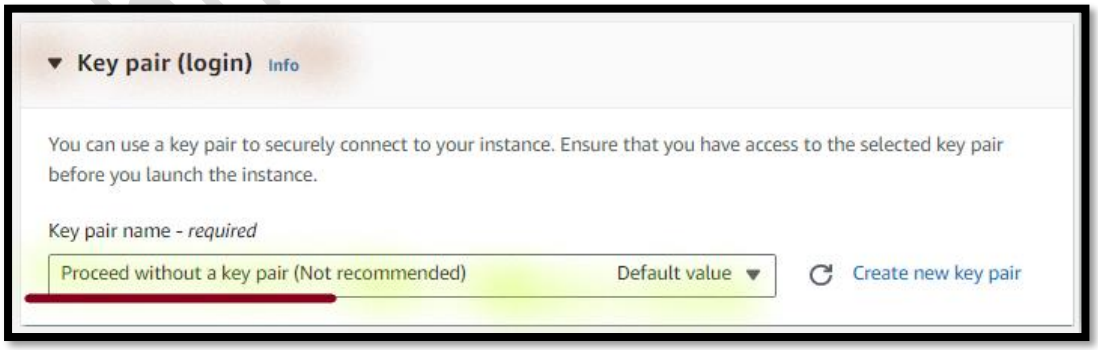
i. **Instance type**: Dropdown and in the **Search box**:

a) Type **t2.micro**.

b) Select **t2.micro**.

d. In the **Key pair (login)** section:

i. **Key pair name**: Dropdown and select **Proceed without a key pair**.



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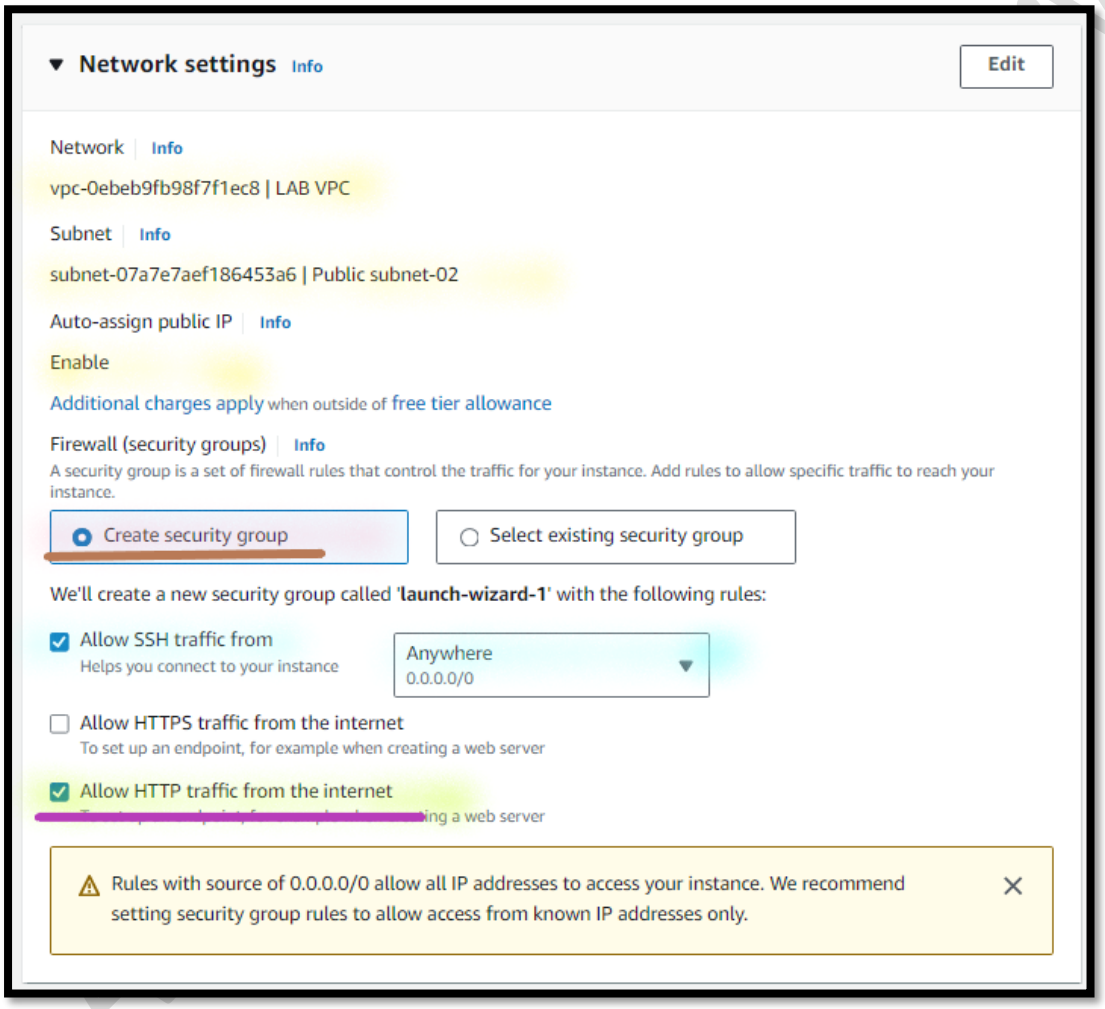
e. In the **Network setting** section:

Note: You can see "**Allow SSH traffic**" is already **enabled** from "**Anywhere**".

i. **Firewall**: Select **Create security group**.

a) **Allow HTTP traffic from the internet**: **Enable** the **Checkmark**.



Note: Leave the other details as default.

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f. In the **Advanced details** section (***Expand***):

i. **User data**: Copy the **below script**, to **set** the **Password**.

```
#!/bin/bash
echo ubuntu:lab-password | chpasswd
sed -i 's|[#]*KbdInteractiveAuthentication no|#KbdInteractiveAuthentication no|g' /etc/ssh/sshd_config
sed -i 's|[#]*#PasswordAuthentication yes|PasswordAuthentication yes|g' /etc/ssh/sshd_config
systemctl restart sshd.service
hostnamectl set-hostname webapp-server
```

Note: The script does the **following**:

1. **Set** the **Username** and **Password**.
2. **Set** the **Instance name** as **Webapp-Server**.

g. In the **Summary** section:

i. Select **Launch Instances**.

Note: **Wait**, till you can see the **message** "**Successfully initiated launch of instance**".

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8. Select **View all instances**

Note: **Wait**, till you can see the **Webapp Server** Instance **State** is **Running**.

Note: **Wait**, till you can see the **Webapp Server** Instance **Status check** is **2/2 check passed**.

Task 3: Connect to Linux Web Server

In this task, you will log into the Linux web server.

Step 1: Copy the IP Address of Linux Web Server

9. **From** the **EC2** console.
10. Select the **WebApp Server**.
    a. Select the **Details**.

Note: **Copy** the **Public IP address** of **WebApp Server** in the **Notepad**.

Step 2: Connect to Linux Web Server Instance

11. From the **Local Desktop/ Laptop** (Windows Desktop), **Open** the **MobaXterm**.
12. From the **MobaXterm**.
    a. Select **Session**.
    b. Select **SSH**.
        i. **Remote host**: Write **Public IP address** of the **WebApp Server**.
        ii. **Specify username**: **Enable** the **Checkmark**.
        iii. **Specify username**: Write **ubuntu**.
            a) Select **Ok**.

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Note: You can see the **Prompt** for **Password**.

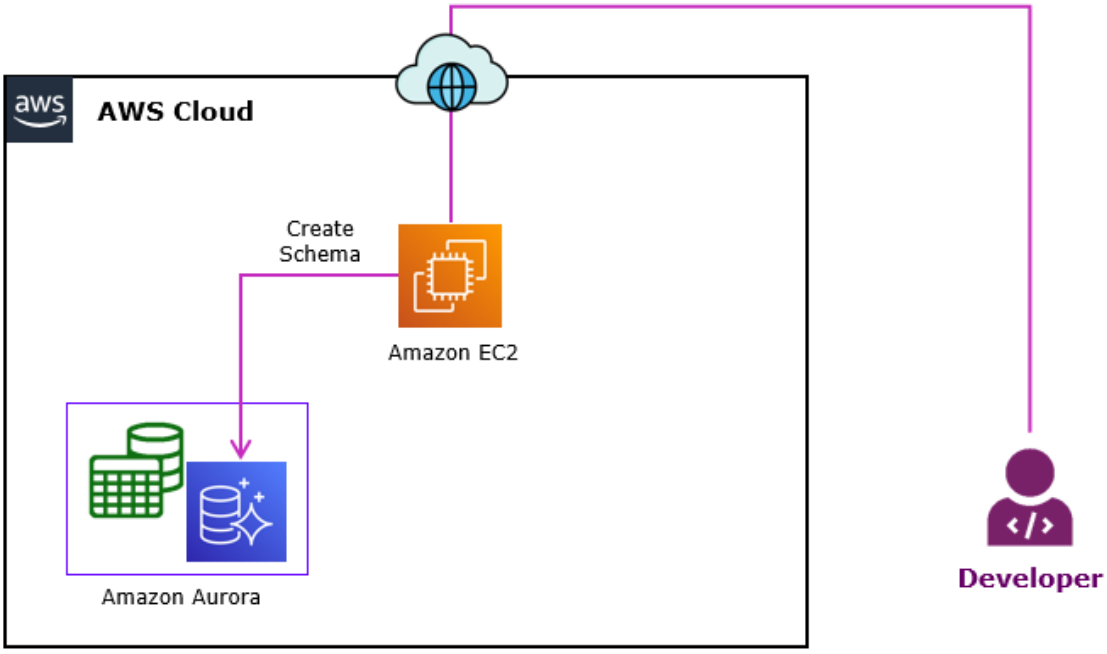
iv. **Password**: Type **lab-password**.

Note: You can see the **Linux Console**.

Note: Go to the next task, But **Don't close** the **Linux terminal**.

Task 4: Create Database and Table

In this task, you will create SQL database, table, and schema.



Step 1: Copy the Amazon Aurora Instance Endpoint

13. In the **AWS Management Console**, on the **Services** menu, search and select **RDS**.

14. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

15. Select **Databases**.

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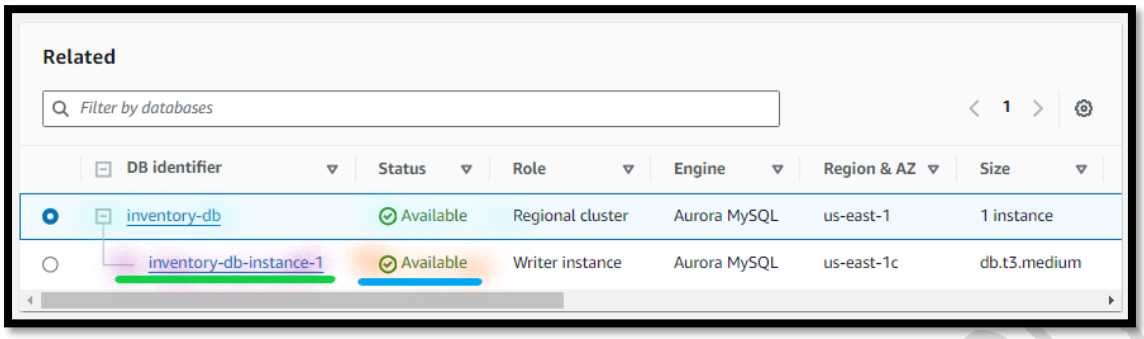
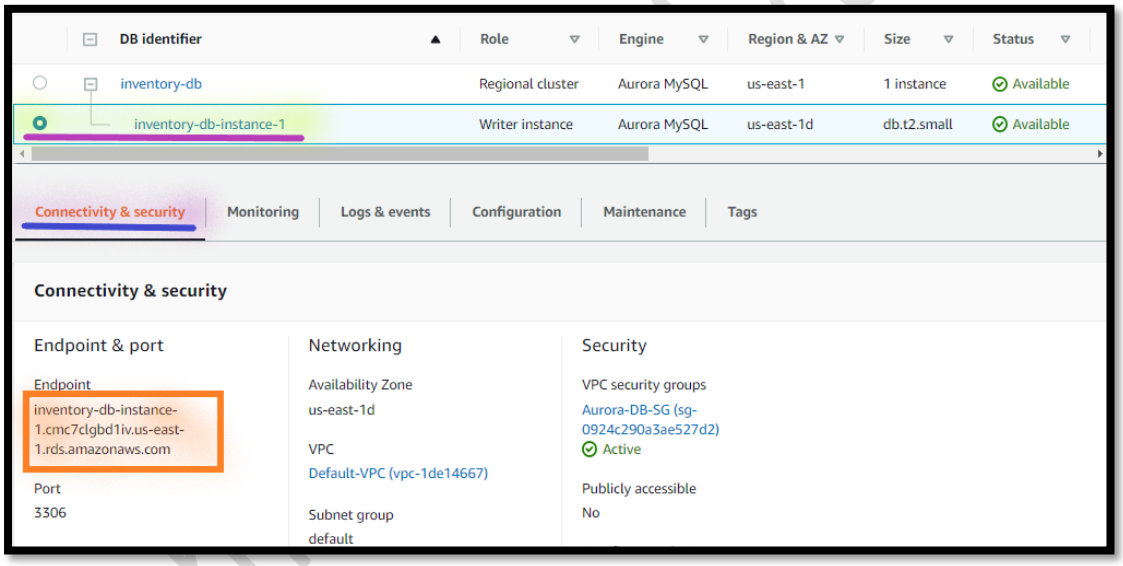
Note: **Wait**, till you can see the **inventory-db-instance-1** database instance **Status** as **Available**.



a. Open the **inventory-db-instance-1**.

i. Select the **Connectivity & security**.

a) **Copy** the **Endpoint** in the **Notepad**.



Step 2: Update Security Group for Database

16. From the **inventory-db** console.

17. Open the **inventory-db-instance-1**.

a. Select **Connectivity & security**.

Note: You can see the **Aurora-DB-SG** under **VPC security groups**.

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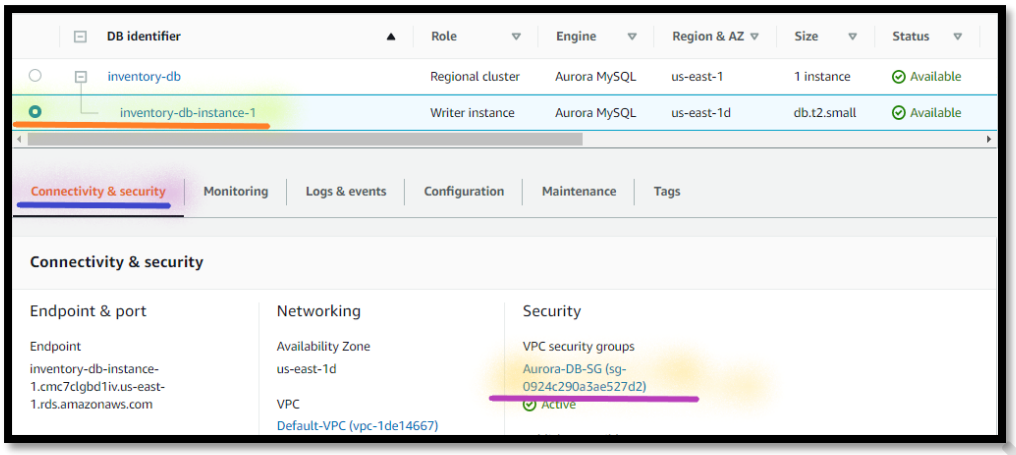
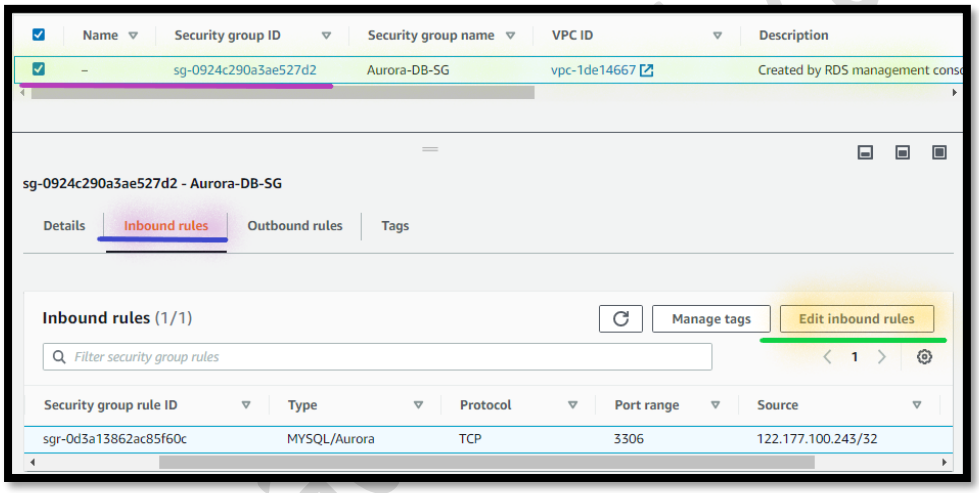


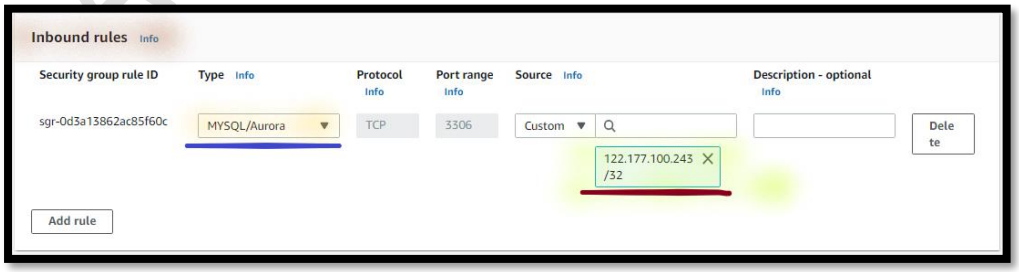
i. Open the **Aurora-DB-SG** security group.

a) Select **Inbound rules**.

b) Select **Edit inbound rules**.



Note: You can see the **Public IP address** under **Source**.



1) **Source**: Dropdown and select **Anywhere IPv4**.

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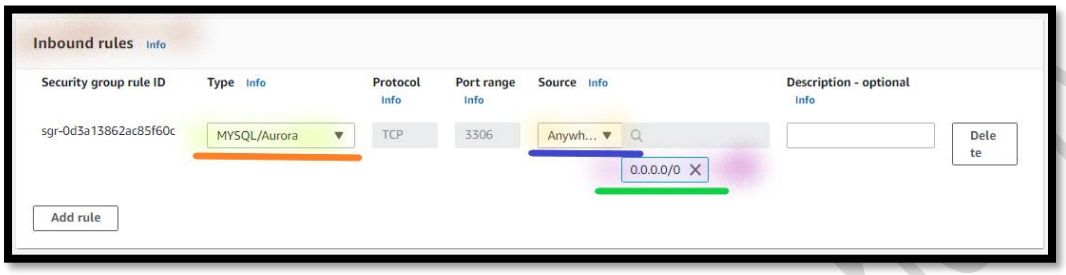
Note: You can see the **0.0.0.0/0** under **Source**.

Note: **0.0.0.0/0** allow the Aurora database instance to accept the traffic from **anywhere.**



2) Select **Save rules**

Step 4: Install the MySQL Client

18. **Return** to the **WebApp Server**.

19. **From** the **Linux terminal**:

    a. **Execute** the ***below command*** to **update** the **packages**:

```
sudo apt-get -y update
```

    b. **Execute** the ***below command*** to **install** the **mysql client**:

```
sudo apt-get install -y mysql-client
```

Step 5: Connect to MySQL Instance

20. **From** the **Linux terminal**:

    a. **Execute** the ***below command*** to **update** the **packages**:

```
mysql -u master -p -h Hostname
```

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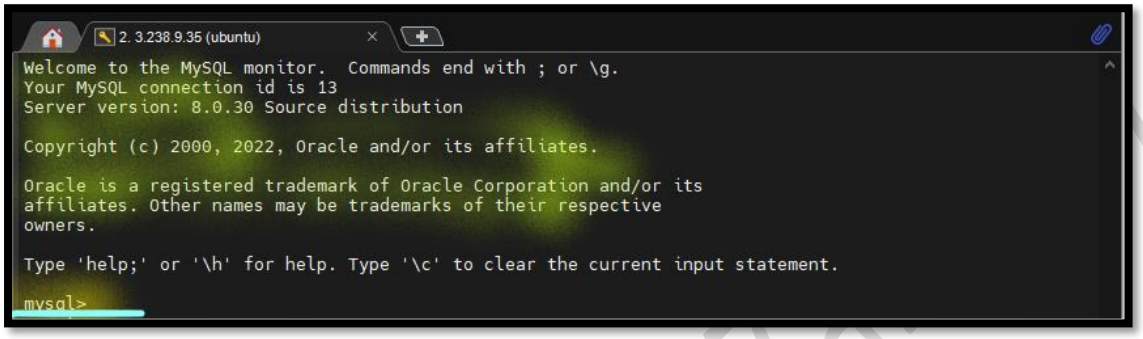
Note: **Replace** the **Hostname** with **inventory-db-instance-1** database instance **endpoint**, which you have copied in the previous step.

Note: You can see the **mysql>** prompt.



Step 6: Create Database, Table and Table Schema

21. **From** the **MySQL console**:

a. **Execute** the ***below command*** to **create** the **databases**.

```
create database inventory;
```

Note: In the Output you can see **Query OK, 1 row affected** message.

b. **Execute** the ***below command*** to **list** the **existing databases**.

```
show databases;
```

Note: You can see the **inventory** database.

c. **Execute** the ***below command*** to **use** the **inventory databases**.

```
use inventory;
```

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Note: You can see the **database changed** message.

d. **Execute** the ***below command*** to **create** the **products table**.

```
create table `products` (
  `id` int(11) not null auto_increment,
  `name` varchar(45) not null,
  `quantity` varchar(45) not null,
  `price` varchar(45) not null,
  primary key (`id`),
  unique key `id_unique` (`id`));
```

Note: You can see the **Query OK, 0 rows affected** message.

e. **Execute** the ***below command*** to **show** the **products table**.

```
show tables;
```

Note: You can see the **products** table.

f. **Execute** the ***below command*** to **show** the **products table**.

```
describe products;
```

Note: You can see the **products table** schema.

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g. **Execute** the ***below command*** to **insert** the **row** in the **products table**.

```
insert into products (name, quantity, price) VALUES ('Keyboard', '17', '1800');
```

Note: You can see the **Query OK, 1 rows affected** message.

h. **Execute** the ***below command*** to **insert** the **row** in the **products table**.

```
insert into products (name, quantity, price) VALUES ('Monitor', '11', '7900');
```

Note: You can see the **Query OK, 1 rows affected** message.

i. **Execute** the ***below command*** to **exit** the **MySQL**.

```
exit
```

Note: You can see the **linux** prompt.

Note: Go to the next task, But **Don't close** the **Linux terminal**.

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Task 5: Develop the Php Application

In this task, you will develop the Php code who can perform read and write operation from single database server.

Step 1: Develop the Code to Perform CRUD Operation

22. **Unzip** the **LAB-m05-01-Code-A.zip** (*Php code*).

Note: **lab-m05-01-code-a**.zip is available with the **Lab manual**.

Note: You can see the **index.php** and **data.php** files.

a. Open the **data.php** file in the **Notepad**.

i. **Replace** the **TO DO 1** with the **inventory-db-instance-1** ***database*** instance **endpoint** (*which you have copied in the previous step*).

Note: **Don't remove** the **starting** and **end** quote (**' '**)and semicolon (**;**).

ii. **Replace** the **TO DO 2** with the **database instance user name** **master**.

iii. **Replace** the **TO DO 3** with the **database instance password** **lab-password**.

iv. **Replace** the **TO DO 4** with the **database name** **inventory**.

v. **Replace** the **TO DO 5** with the **inventory database table name** **products**.

```
$servername = 'inventory-db-instance-1.cmc7clgbd1iv.us-east-1.rds.amazonaws.com';
$username = 'master';
$password = 'lab-password';
$database = 'inventory';
$table = 'products';
```

b. Select **File**.

i. Select **Save**.

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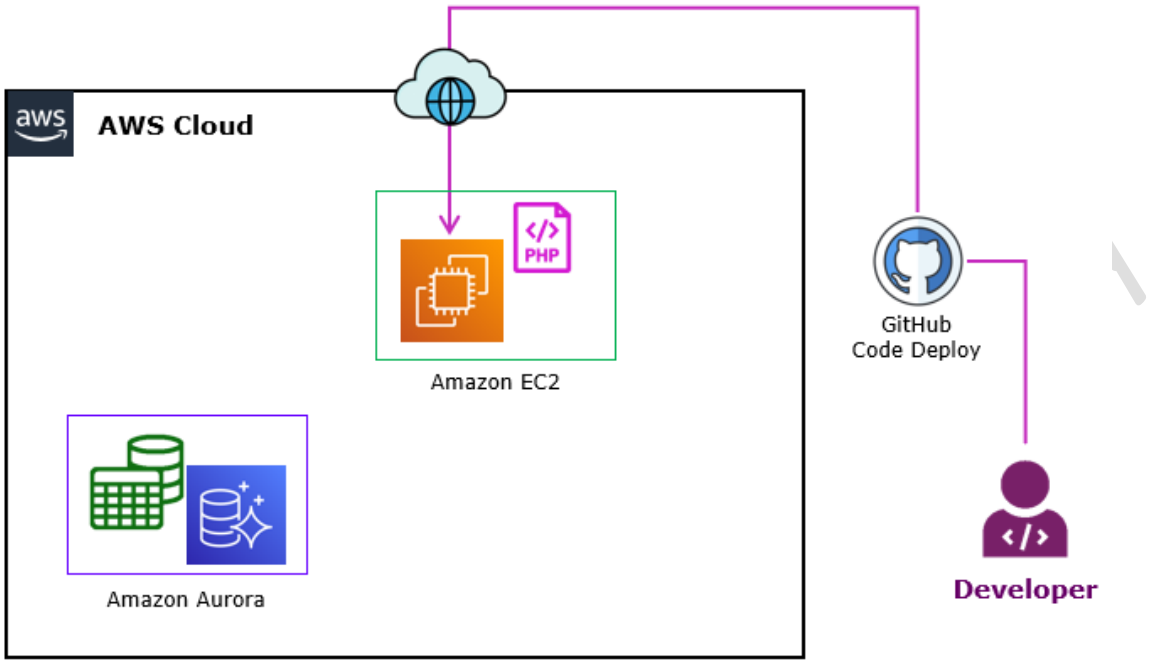
Task 5: Deploy the Php Application

In this task, you will deploy the Php code into Aws virtual machine and configure the runtime environment.



Step 1: Upload the Code to GitHub Repository

23. **Open** your **GitHub account**.
    a. Select the **+** sign.
        i. **From** the **Create a new repository** page:
            a) **Repository name**: Write **lab-07-01**.
            b) Select the **Public**.
                1) Select the **Create repository**.

Note: You can see the **lab-07-01** repository page.

    b. **From** the **lab-07-01** repository:
        i. Select the **Uploading an existing file**.
            1) **Drag and drop** the **Code** in the **GitHub Repository**.

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Note: You need to **Upload** the **index.php** and **data.php** files.

Note: You can see the **files to be uploaded**.

ii. Select the **Commit Changes**.

Note: After code **uploaded successfully**, you can see them in repository.

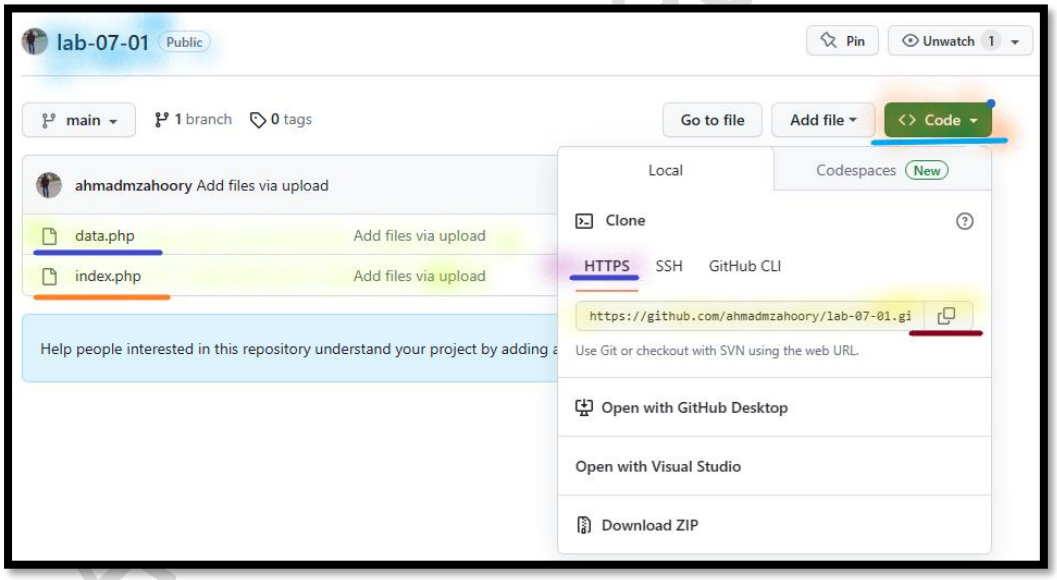
Step 2: Clone the GitHub Repository

24. **Open** the **lab-07-01** ***GitHub repository***.

a. Select the **Code**.

i. Select the **HTTPS**.

a) **Copy** the **Clone URL** in **Notepad**.



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Step 3: Build the Runtime Environment

25. **Return** to the **Webapp Server**.

26. **From** the **Linux terminal**:

    a. **Execute** the ***below command*** to **install** the **apache**:

```
sudo apt-get install -y apache2
```

    b. **Execute** the ***below command*** to **add** the **php repository**:

```
sudo add-apt-repository -y ppa:ondrej/php
```

    c. **Execute** the ***below command*** to **update** the **package**:

```
sudo apt-get -y update
```

    d. **Execute** the ***below command*** to **install** the **php 8.2**:

```
sudo apt-get install -y php8.2
```

    e. **Execute** the ***below command*** to **install** the **mysql module for php 8.2**:

```
sudo apt-get install -y php8.2-mysql
```

    f. **Execute** the ***below command*** to **install** the **git**:

```
sudo apt-get install -y git
```

Note: Go to the next task, But **Don't close** the **Linux terminal**.

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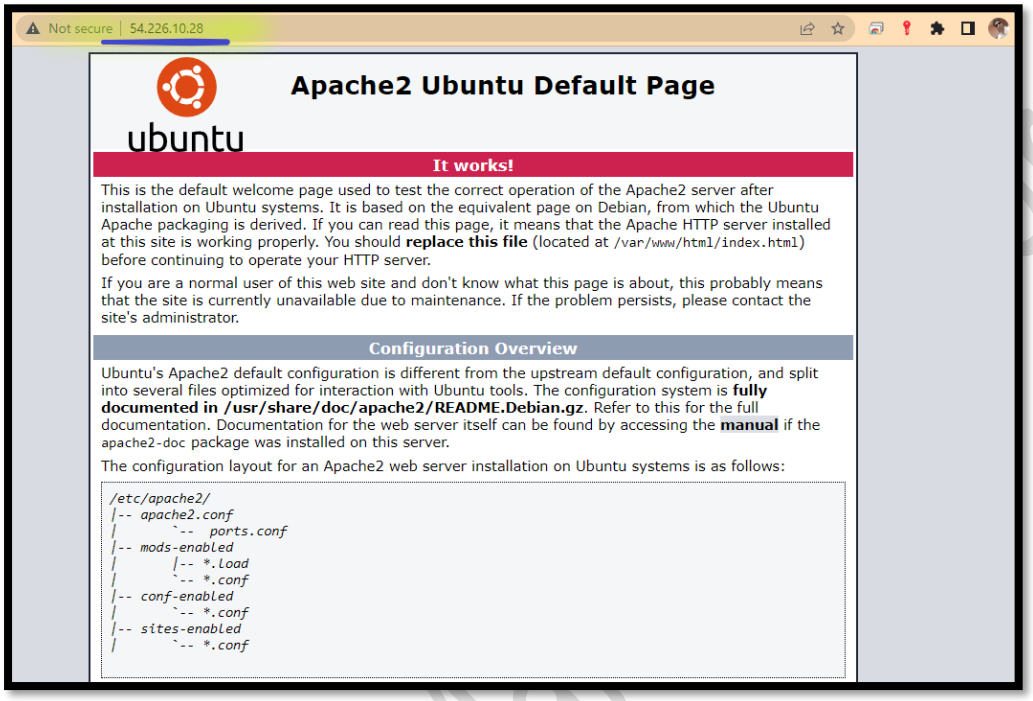
Step 4: Access the Web App Server

27. **From** your **Local Desktop/ Laptop**, open the **Browser**, write **Public IP Address** of the **WebApp server**, to access the **website**.

Note: You can see the **Default Apache Ubuntu page**.



Note: Go to the next task, But **Don't close** the **Webapp page**.

Step 6: Deploy the Php Code

28. **Return** to the **Webapp Server**.

29. **From** the **Linux terminal**:

    a. **Execute** the ***below command*** to **change** the **directory path**:

```
cd /var/www/html/
```

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b. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **index.html** (**Default Apache Ubuntu page**).

c. **Execute** the ***below command*** to **remove** the **default apache page**:

```
sudo rm index.html
```

d. **Execute** the ***below command*** to **clone** the **git**:

```
sudo git clone CLONE-WEBAPP-URL
```

Note: **Replace** the **CLONE-WEBAPP-URL** with the **LAB-07-01 GitHub Repository URL**, which have copied in the previous step.

e. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **lab-07-01** folder.

f. **Execute** the ***below command*** to **change** the **directory path**:

```
cd lab-07-01
```

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g. **Execute** the ***below command*** to **move** the **code files** to **default directory**:

```
sudo mv -v /var/www/html/lab-07-01/* /var/www/html/
```

h. **Execute** the ***below command*** to **change** to the **parent directory path**:

```
cd ..
```

i. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **data.php** and **index.php** files.

j. **Execute** the ***below command*** to **restart** the **apache service**:

```
sudo systemctl restart apache2.service
```

Note: Go to the next task, But **Don't close** the **Linux terminal**.

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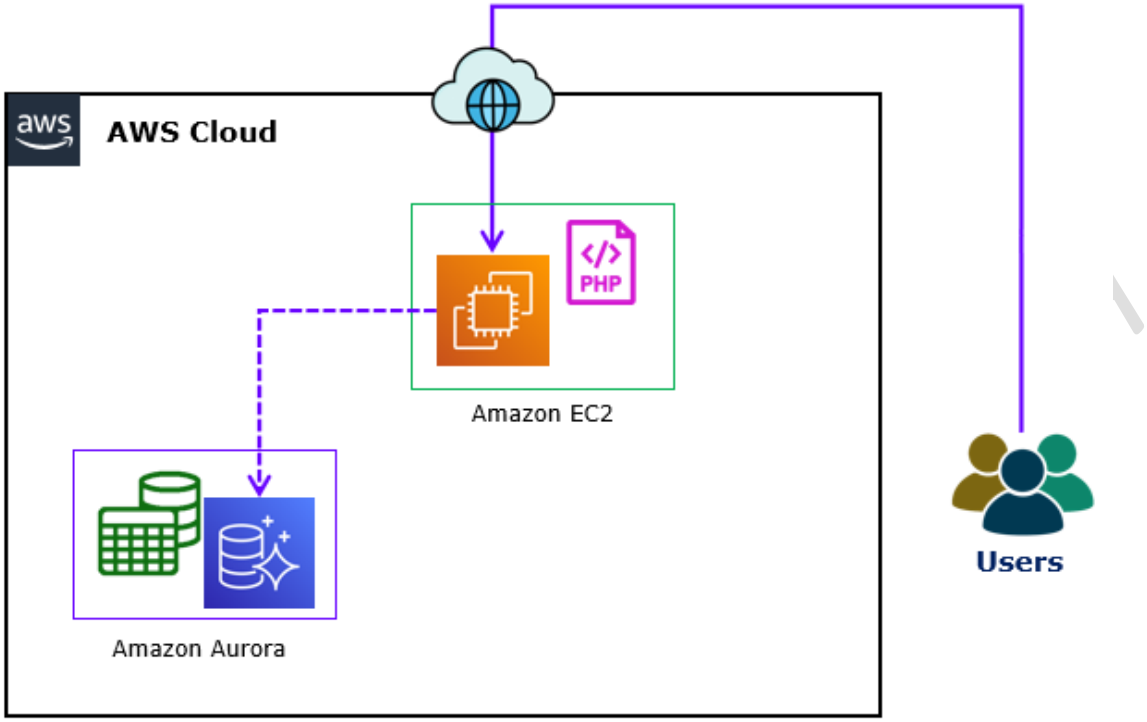
Task 6: Access the Web Application

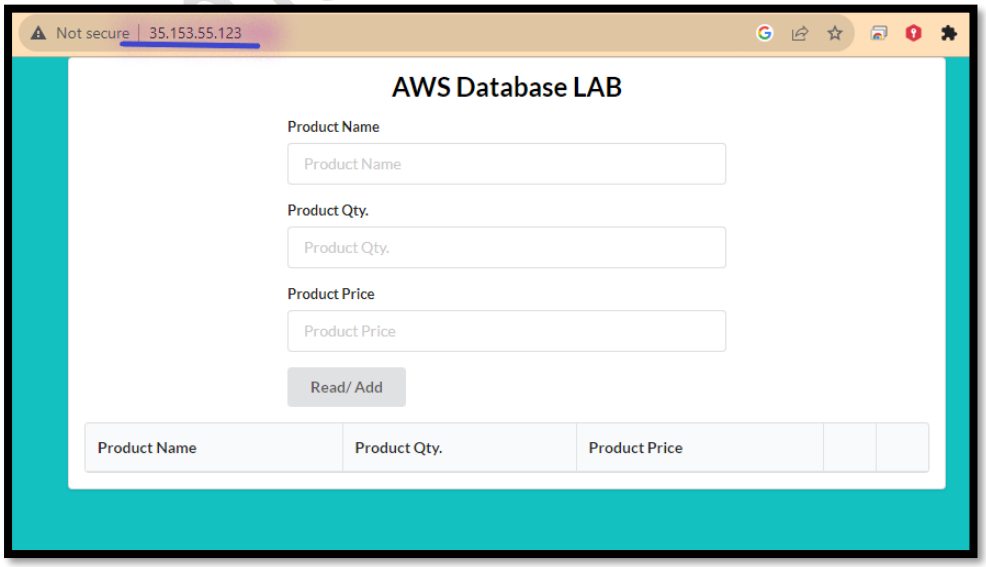
In this task, you will test your deployment by performing the CRUD operation.



Step 1: Access the Php App Server

30. **Refresh** to the **Web browser**, from where you have opened the **WebApp page**.

Note: You can see the **WebApp Page**.



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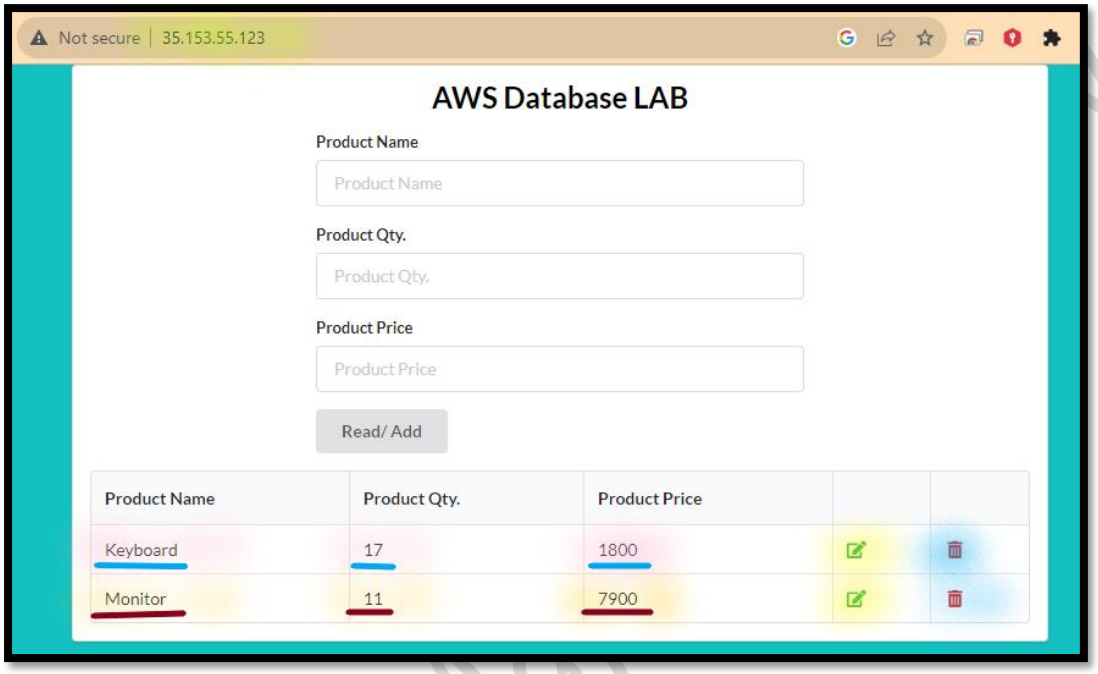
Step 2: Perform the CRUD Operation

31. **From** the **WebApp application**.

    a. Click on the **Read** to get the data from the database.

Note: You can see the **rows** added via **mysql**.



32. **From** the **webapp application**:

    a. **Add *Inventory data***:

        i. **Product name**: Write **HP Digital Tab**.

        ii. **Product quantity**: Write **14**.

        iii. **Product price**: Write **4200**.

        iv. Select **Add**.

Note: **Inventory data** gets **stored** in the **MySQL database**. You can **see** the same under **details**.

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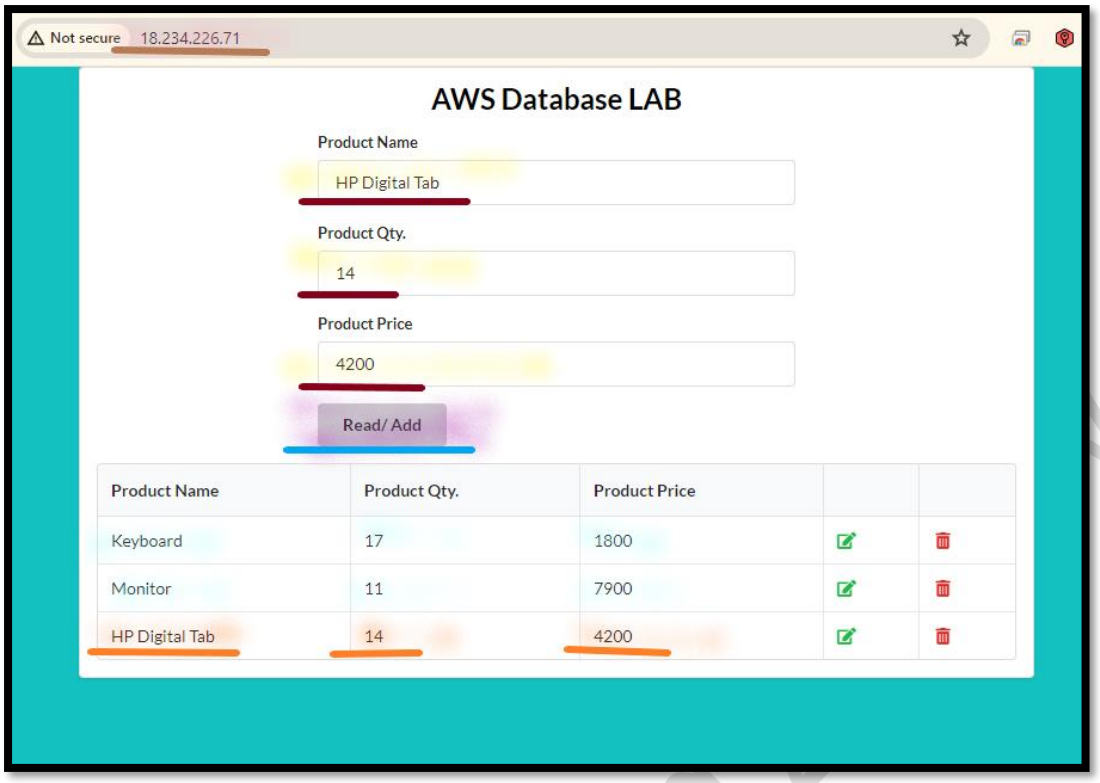

Note: You can also **update** or **delete** the rows.

Note: Go to the next task, But **Don't close** the **Webapp page**.

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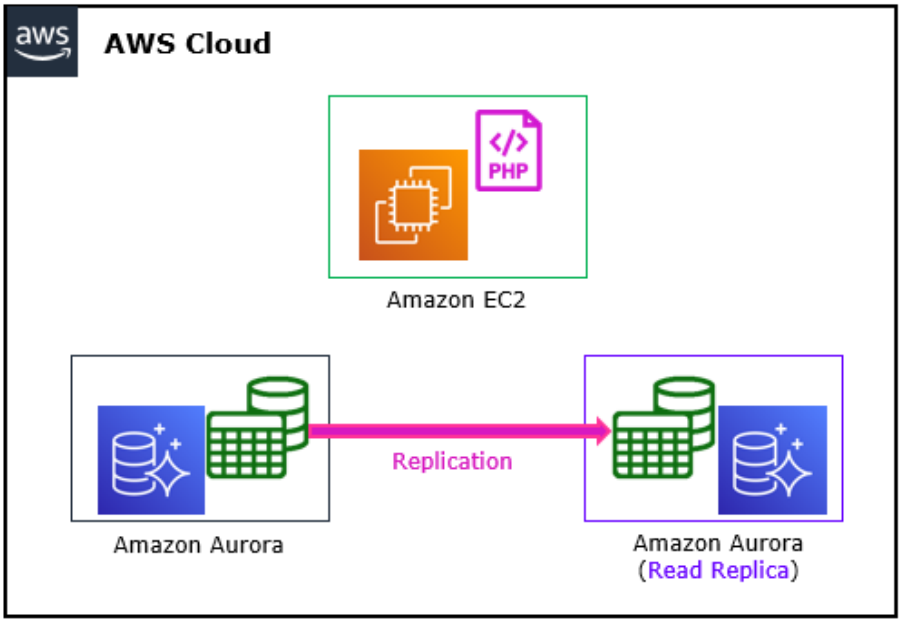
Task 7: Create Database Read Replica

In this task, you will create the database (Amazon Aurora) read replica.



Step 1: Copy the Amazon Aurora Instance Details

33. In the **AWS Management Console**, on the **Services** menu, search and select **RDS**.

34. Choose the **YOUR ALLOCATED REGION** list to the right of your account information on the navigation bar.

35. Select **Databases**.

    a. Select **inventory-db**.

        i. Select **Actions**.

            a) Select **Add Reader**.

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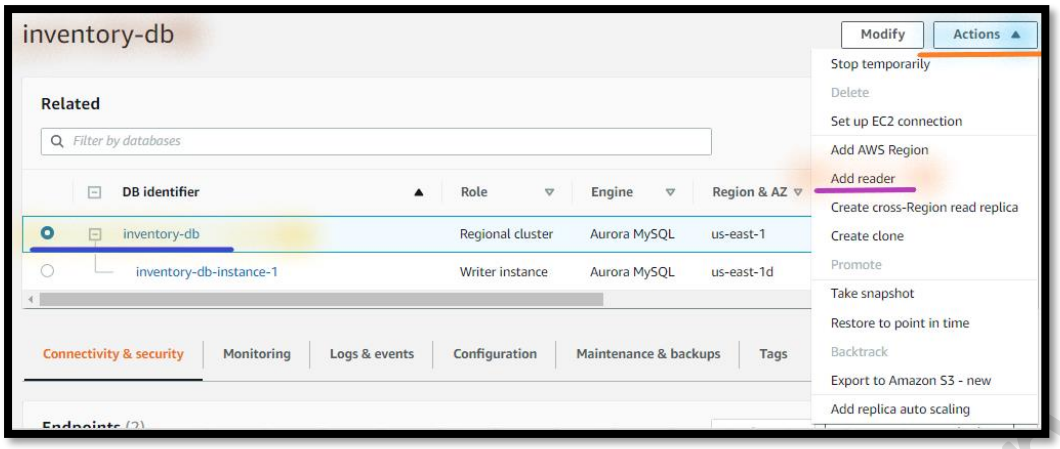
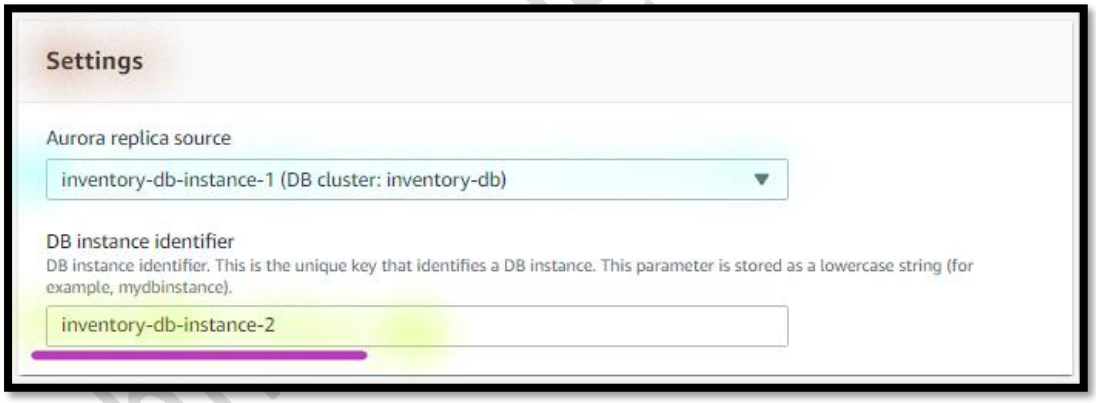


Note: You can see the **Add reader** page.

ii. From the **Settings** section:

a) **DB instance identifier**: Write **inventory-db-instance-2**.

Note: Leave the other details as default.



iii. From the **Connectivity** section:

a) **Public access**: Select **Publicly accessible**.

Note: Leave the other details as default.

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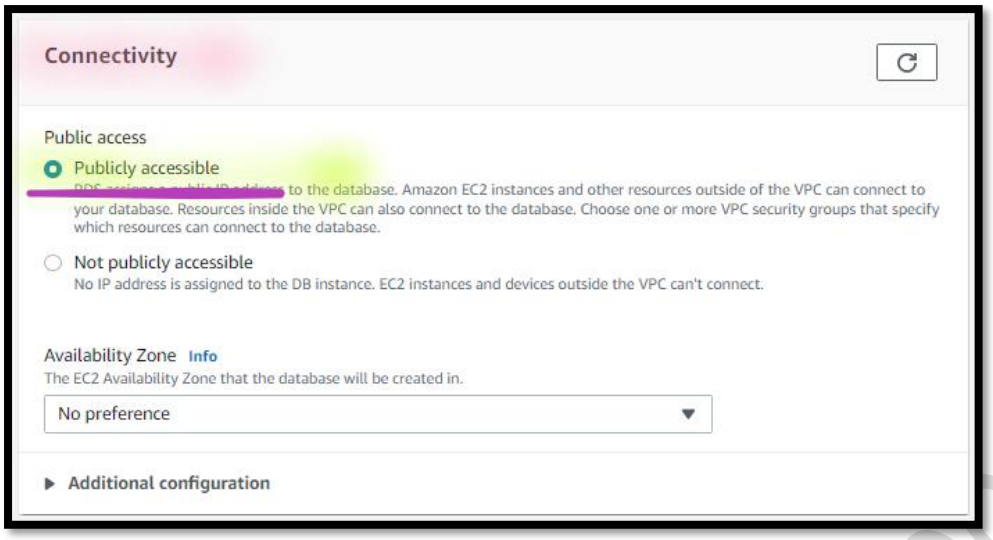


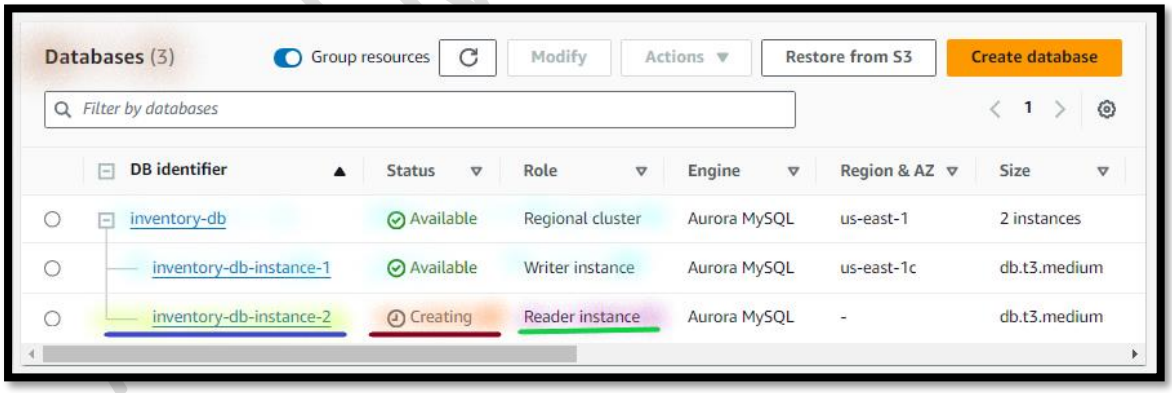
iv. In the **Additional configuration** section:

a) **Encryption**: **Unselect** the **Enable encryption**.

Note: Leave the other details as default.

v. Select **Add reader**.

Note: You can see the **Reader database** instance **Status** as **Creating**.



Note: **Wait** (**~10 mnts.**), till **Reader database** instance **Status** as **Available**.

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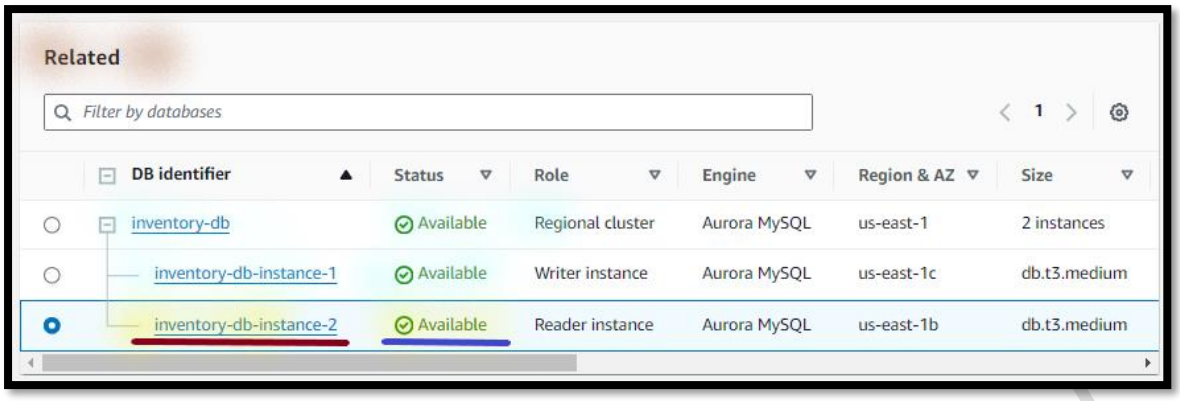

Task 8: Develop the Php Application

In this task, you will develop the Php code who can perform read and write operation from two different database servers.

Step 1: Copy the Amazon Aurora Read Instance Endpoint

36. In the **AWS Management Console**, on the **Services** menu, click **RDS**.
37. Select **Databases**.
    a. Open the **inventory-db-instance-2**.
        ii. Select the **Connectivity & security**.
            a) **Copy** the **Endpoint** in the **Notepad**.

Step 2: Develop the Code to Perform CRUD Operation

38. **Unzip** the **Lab-m05-01-Code-B.zip** (*Php code*).

Note: **lab-m05-01-code-b**.zip is available with the **Lab manual**.

Note: You can see the **index.php** and **data.php** files.

a. Open the **data.php** file in the **Notepad**.
    i. **Replace** the **TO DO 1** [**RW Database**] with the **inventory-db-instance-1** ***database*** instance **endpoint**.

Note: **Don't remove** the **starting** and **end** quote (**' '**)and semicolon (**;**).

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ii. **Replace** the **TO DO 1** [**Read Database**] with the **inventory-db-instance-2** ***database*** instance **endpoint**.

Note: **Don't remove** the **starting** and **end** quote (**' '**)and semicolon (**;**).

iii. **Replace** the **TO DO 2** with the **database instance username** **master**.

iv. **Replace** the **TO DO 3** with the **database instance password** **lab-password**.

v. **Replace** the **TO DO 4** with the **database name** **inventory**.

vi. **Replace** the **TO DO 5** with the **inventory database table name** **products**.

```
$write_servername = 'inventory-db-instance-1.cmc7clgbd1iv.us-east-1.rds.amazonaws.com';
$read_servername = 'inventory-db-instance-2.cmc7clgbd1iv.us-east-1.rds.amazonaws.com';
$username = 'master';
$password = 'lab-password';
$database = 'inventory';
$table = 'products';
```

b. Select **File**.

c. Select **Save**.

Ahmad Majed Zahery

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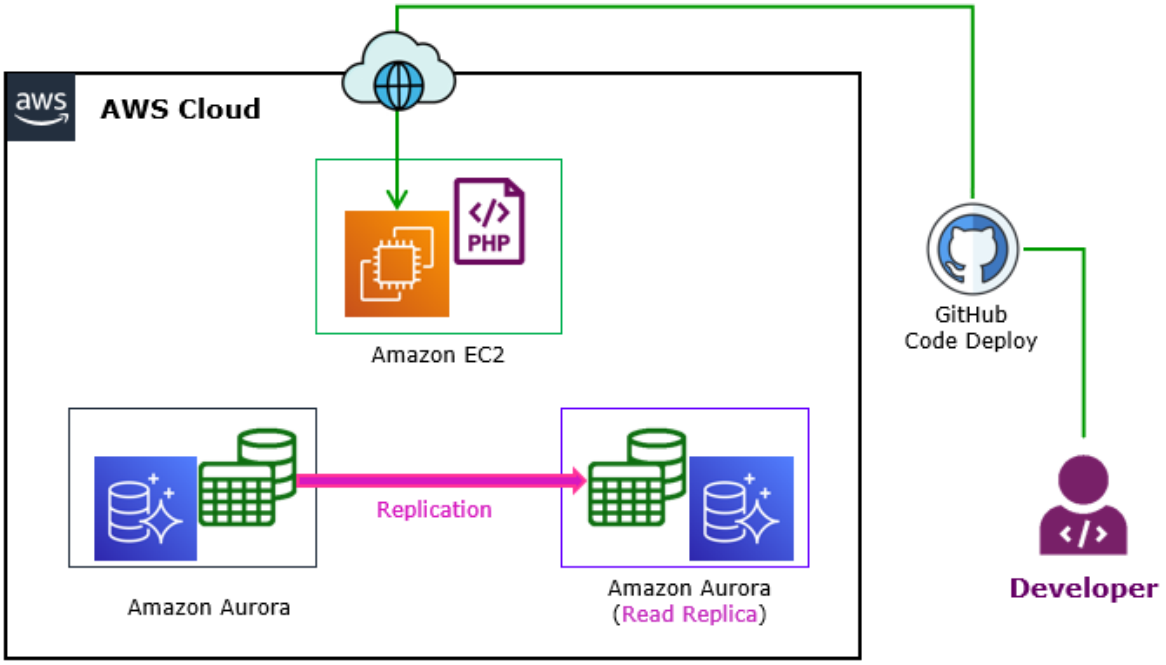
Task 9: Deploy the Php Application

In this task, you will be updating the existing Php code with Php Code (Second version) on AWS virtual machine.



Step 1: Upload the Code to GitHub Repository

39. **Open** your **GitHub account**.

    a. **Open** the **lab-07-01** repository.

Note: You can see the **index.php** and **data.php** files of **Code-A**.

    i. **From** the **lab-07-01** repository:

Note: You are **updating** the older code files with **new code files**.

        a) Select **Add file**.

            1) Select **Upload files**.

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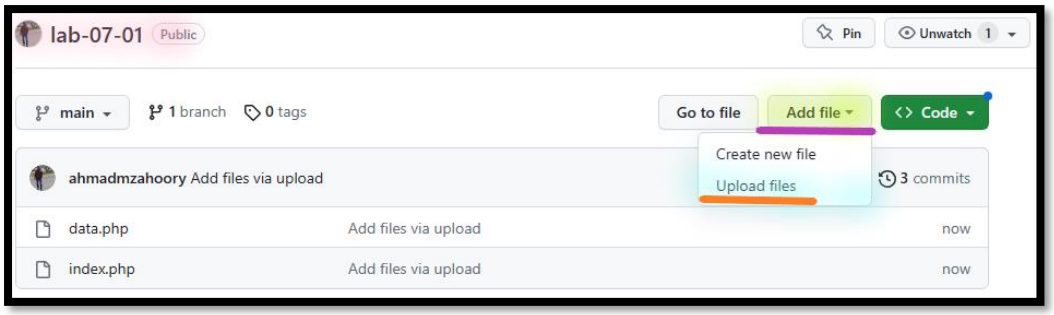

b) **Drag and drop** the **Code** (**Code-B**) in the **GitHub Repository**.

Note: You need to **Upload** the **index.php** and **data.php** files of **Code-B**.

Note: You can see the **files to be uploaded**.

c) Select the **Commit Changes**.

Note: After code **uploaded successfully**, you can see them in repository.

Step 2: Clone the GitHub Repository

40. **Open** the **lab-07-01** ***GitHub repository***.

    a. Select the **Code**.

        i. Select the **HTTPS**.

            a) **Copy** the **Clone URL** in **Notepad**.

Step 3: Deploy the Updated Code

41. **Return** to the **WebApp Server**.

42. **From** the **Linux terminal**:

    i. **Execute** the ***below command*** to **change** the **directory path**:

```
cd /var/www/html/
```

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ii. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **data.php** and **index.php** files.

iii. **Execute** the ***below command*** to **remove** the **files and directory**:

```
sudo rm -r *
```

iv. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **all files** and **folders** gets **deleted**.

v. **Execute** the ***below command*** to **clone** the **git**:

```
sudo git clone CLONE-WEBAPP-URL
```

Note: **Replace** the **CLONE-WEBAPP-URL** with the **LAB-05-01 GitHub Repository URL** you have copied in the previous step.

vi. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **lab-07-01** folder.

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vii. **Execute** the ***below command*** to **change** the **directory path**:

```
cd lab-07-01
```

viii. **Execute** the ***below command*** to **move** the **code files** to **default directory**:

```
sudo mv -v /var/www/html/lab-07-01/* /var/www/html/
```

ix. **Execute** the ***below command*** to **change** to the **parent directory path**:

```
cd ..
```

x. **Execute** the ***below command*** to **list** the **file and folders**:

```
ls -l
```

Note: You can see the **data.php** and **index.php** files.

xi. **Execute** the ***below command*** to **restart** the **apache service**:

```
sudo systemctl restart apache2.service
```

xii. **Execute** the ***below command*** to **exit** the **linux terminal**:

```
exit
```

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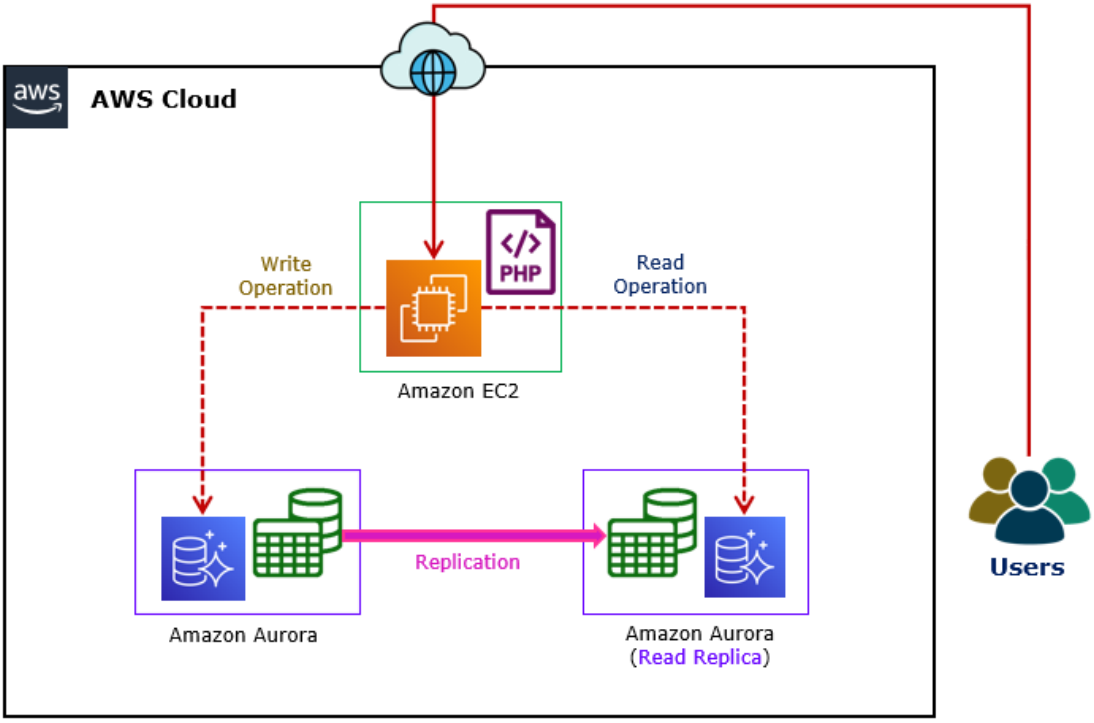
Task 10: Test your Deployment

In this task, you will test your deployment by performing the CRUD operation.



Step 1: Access the Web App Server

43. **Refresh** to the **Web browser**, from where you have opened the **Webapp page**.

Note: You can see the **new Web page**.

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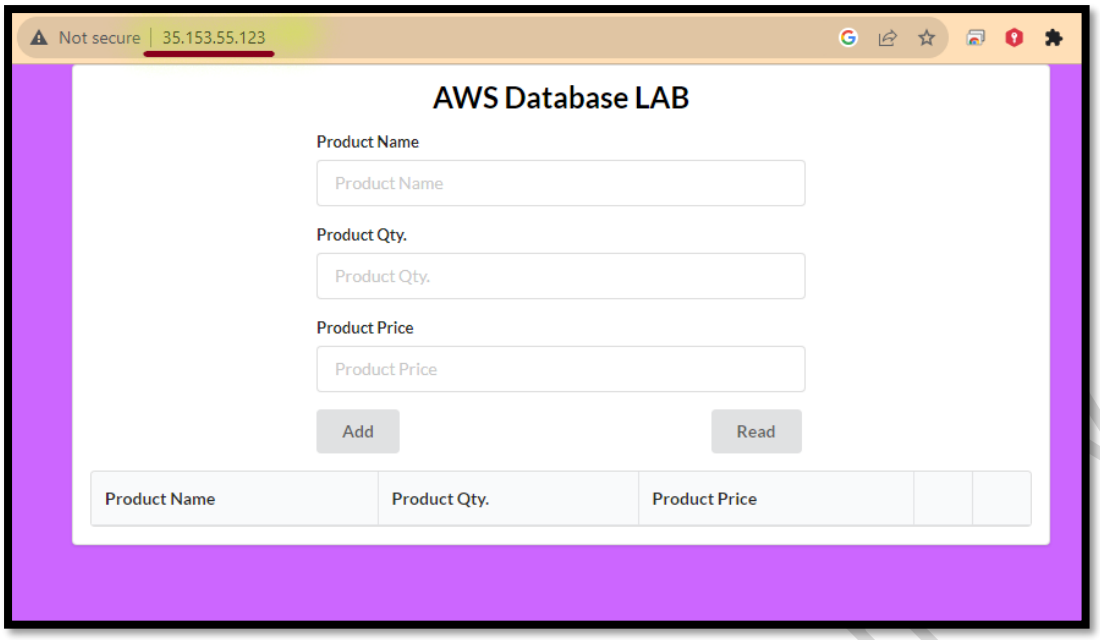


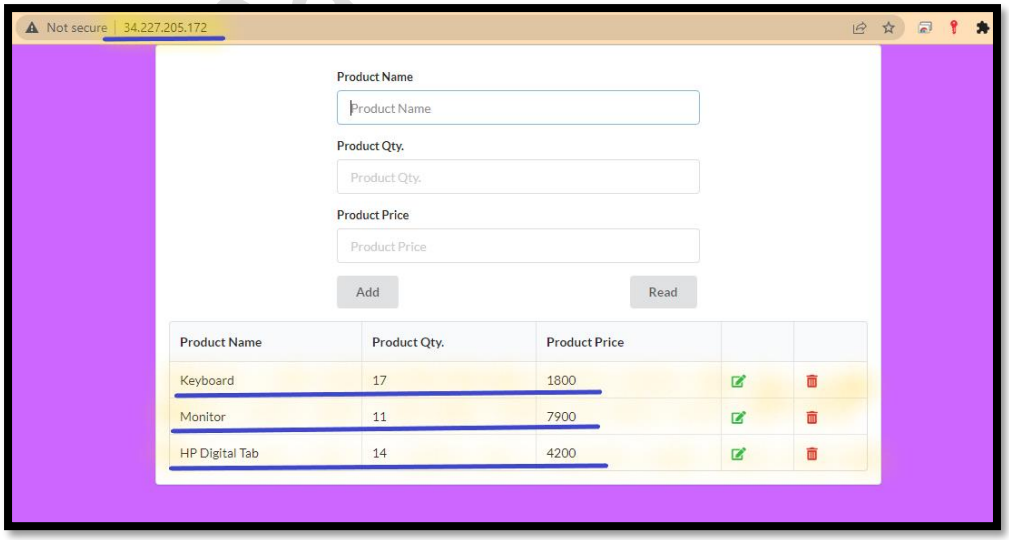
Step 2: Perform the CRUD Operation

44. **From** the **Webapp application**.

    a. Click on the **Read** to get the data from the database.

Note: You can see the **rows** added in **previous steps**.

Note: Read operation is performed via Amazon **Aurora Reader**.



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45. **From** the **webapp application**:

    a. **Add *Inventory data***:

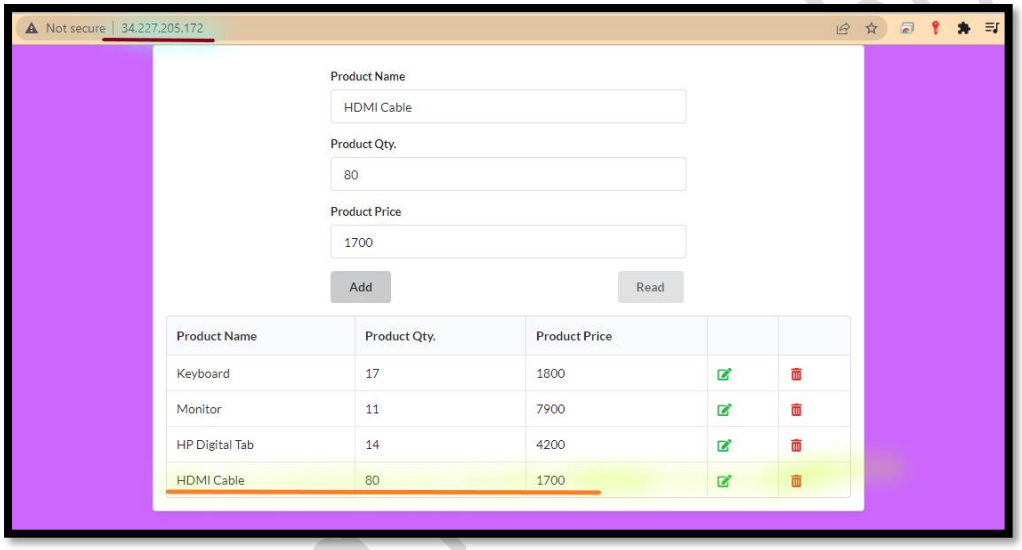
        i. **Product name**: Write **HDMI Cable**.

        ii. **Product quantity**: Write **80**.

        iii. **Product price**: Write **1700**.

        iv. Select **Add**.

Note: Write operation is performed via Amazon **Aurora Writer**.



Note: You can also **update** or **delete** the rows.

Task 12: Clean up the Environment

Step 1: Terminate EC2 Instances

46. In the **AWS Management Console**, on the **Services** menu, click **EC2**.

47. Click **Instances**.

48. Select **WebApp Server**.

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a. Select the **Instance state**.

i. Select **Terminate instance**.

a) Select **Terminate**.

Step 2: Terminate an RDS

49. In the **AWS Management Console**, on the **Services** menu, click **RDS**.

50. Select **Databases**.

a. Select **inventory-db-instance-1**.

i. Select **Actions**.

a) Select **Delete**.

1) When you **get prompt**, type **delete me**.

2) Select **Delete**.

b. Select **inventory-db-instance-2**.

i. Select **Actions**.

b) Select **Delete**.

1) When you **get prompt**, type **delete me**.

2) Select **Delete**.

c. Select **inventory-db**.

i. Select **Actions**.

c) Select **Delete**.

1) **Create final snapshot**: **Uncheck** the **Checkmark**.

2) **I acknowledge that upon instance deletion**: **Enable** the **Checkmark**.

3) When you **get prompt**, type **delete me**.

4) Select **Delete DB Cluster**.

Ahmad Majeed Zahoory

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