

## Configuring a virtual server and deploying of the web application

### 1. Provision of a Virtual Server

- Configure the VPC
  - Use the default VPC vpc-3ee17855
  - Add tag: Key: Name, Value: adx2VPC

vpc-3ee17855 / adx2VPC Actions ▼

**Details** [Info](#)

VPC ID vpc-3ee17855	State Available	DNS hostnames Enabled	DNS resolution Enabled
Tenancy Default	DHCP options set dopt-64f6850f	Main route table rtb-25f7d14e	Main network ACL acl-ee753185
Default VPC Yes	IPv4 CIDR 172.31.0.0/16	IPv6 pool -	IPv6 CIDR -
Route 53 Resolver DNS Firewall rule groups -	Owner ID 888742301715		

- Configure the Internet Gateway
  - Use the default Internet Gateway igw-ae0c37c6
  - Add tag: Key: Name, Value: adx2IGW

igw-ae0c37c6 / adx2IGW Actions ▼

**Details** [Info](#)

Internet gateway ID igw-ae0c37c6	State Attached	VPC ID vpc-3ee17855   adx2VPC	Owner 888742301715
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- Configure the Subnet
  - Use the default subnet: subnet-78890813
  - Add tag: Key: Name, Value: adx2Subnet

subnet-78890813 / adx2Subnet Actions ▼

**Details**

Subnet ID subnet-78890813	Subnet ARN arn:aws:ec2:us-east-2:888742301715:subnet/subnet-78890813	State Available	IPv4 CIDR 172.31.0.0/20
Available IPv4 addresses 4091	IPv6 CIDR -	Availability Zone us-east-2a	Availability Zone ID use2-az1
VPC vpc-3ee17855   adx2VPC	Route table rtb-25f7d14e	Network ACL acl-ee753185	Default subnet Yes
Auto-assign public IPv4 address Yes	Auto-assign IPv6 address No	Auto-assign customer-owned IPv4 address No	Customer-owned IPv4 pool -
Outpost ID -	IPv4 CIDR reservations -	IPv6 CIDR reservations -	Owner 888742301715

- Configure the Route Table
  - Use the default route table: rtb-25f7d14e
  - Add tag: Key: Name, Value: adx2RTB
  - The route table is automatically connected to adx2VPC and adx2IGW
  - Subnet associations: select: adx2Subnet

rtb-25f7d14e / adx2RTB Actions ▾

📘 You can now check network connectivity with Reachability Analyzer Run Reachability Analyzer ✕

**Details** Info

Route table ID 📄 rtb-25f7d14e	Main 📄 Yes	Explicit subnet associations <a href="#">subnet-78890813 / adx2Subnet</a>	Edge associations -
VPC <a href="#">vpc-3ee17855</a>   <a href="#">adx2VPC</a>	Owner ID 📄 888742301715		

**Routes** | Subnet associations | Edge associations | Route propagation | Tags

**Routes (2)** Edit routes

Both ▾ < 1 > ⚙️

Destination ▾	Target ▾	Status ▾	Propagated ▾
172.31.0.0/16	local	🟢 Active	No
0.0.0.0/0	<a href="#">igw-ae0c37c6</a>	🟢 Active	No

**Subnet associations** | Edge associations | Route propagation | Tags

**Explicit subnet associations (1)** Edit subnet associations

< 1 > ⚙️

Subnet ID ▾	IPv4 CIDR ▾	IPv6 CIDR ▾
<a href="#">subnet-78890813 / adx2Subnet</a>	172.31.0.0/20	-

- Configure the Security Group
  - Use the default security group: sg-db5e09ad
  - Add tag: Key: Name, Value: adx2SEG
  - Inbound rules:
    - HTTP Protocol TCP Port 80 Source 0.0.0.0/0
    - SSH Protocol TCP Port 22 Source 0.0.0.0/0
    - MYSQL/Aurora Protocol ICMP Port 3306 Source 0.0.0.0/0
    - All ICMP-IPv4 Protocol ICMP Port All Source sg-db5e09ad / default
  - Outbound rules:
    - All traffic Protocol All Port All Destination 0.0.0.0/0

**sg-db5e09ad - default** Actions ▼

**Details**

Security group name default	Security group ID sg-db5e09ad	Description default VPC security group	VPC ID vpc-3ee17855
Owner 888742301715	Inbound rules count 4 Permission entries	Outbound rules count 1 Permission entry	

**Inbound rules** | Outbound rules | Tags

**Inbound rules (4)** Manage tags Edit inbound rules

Filter security group rules

Security group rule...	IP versi...	Type	Protocol	Port ra...	Source
sgr-041783d19f4de3a5c	–	All ICMP - IPv4	ICMP	All	sg-db5e09ad / default
sgr-01af22e10df33465c	IPv4	SSH	TCP	22	0.0.0.0/0
sgr-0c42a0b31660800...	IPv4	HTTP	TCP	80	0.0.0.0/0
sgr-08f84044044775b...	IPv4	MYSQL/Aurora	TCP	3306	0.0.0.0/0

**Inbound rules** | **Outbound rules** | Tags

**Outbound rules (1)** Manage tags Edit outbound rules

Filter security group rules

Security group rule...	IP versi...	Type	Protocol	Port ra...	Destination
sgr-0f47aba53bb988688	IPv4	All traffic	All	All	0.0.0.0/0

- Create an EC2 key pair
  - Navigate to EC2 Dashboard, click “Key Pairs”, “Create key pair”
  - Name: adx2Key, Type: RSA, Format: .ppk

**Key pairs (1)** Info Actions ▼ Create key pair

Filter key pairs

<input type="checkbox"/>	Name	Type	Fingerprint	ID
<input type="checkbox"/>	adx2Key	rsa	d5:20:a4:83:24:24:f2:08:d5:e6:a8:53:a...	key-08ddba0b9c54dd68a

- Launch an EC2 instance:
  - Nagivate to EC2 Dashboard, click “Instances”, “Launch instance”
  - Step 1: Select: Amazon Linux 2 AMI (HVM), SSD Volume Type 64-bit (x86)
  - Step 2: Choose an Instance Type: t2.micro
  - Step 3: Configure Instance Details
    - Network: adx2VPC
    - Subnet: adx2Subnet
  - Step 4: Add Storage: 8GiB General Purpose SSD (gp2)
  - Step 5: Add tags: Key: Name, Value: adx2EC2
  - Step 6: Select an existing security group: sg-db5e09ad / default
  - Step 7: Review Instance Launch
  - Select the key pair: adx2Key
  - Launch the adx2EC2

Instance summary for i-06995ffda04fb9810 (adx2EC2) <span>Info</span>		
Updated less than a minute ago		
Instance ID i-06995ffda04fb9810 (adx2EC2)	Public IPv4 address 3.141.12.18   <a href="#">open address</a>	Private IPv4 addresses 172.31.1.226
IPv6 address -	Instance state <span>Running</span>	Public IPv4 DNS ec2-3-141-12-18.us-east-2.compute.amazonaws.com   <a href="#">open address</a>
Private IPv4 DNS ip-172-31-1-226.us-east-2.compute.internal	Instance type t2.micro	Elastic IP addresses -
VPC ID vpc-3ee17855 (adx2VPC) <a href="#">vpc-3ee17855 (adx2VPC)</a>	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations.   <a href="#">Learn more</a>	IAM Role -
Subnet ID subnet-78890813 (adx2Subnet) <a href="#">subnet-78890813 (adx2Subnet)</a>		

## 2. OS Update and Database

- Accessing adx2EC2 via SSH PuTTY using adx2EC2 public IPv4: [ec2-user@3.141.12.18](#)
- Update the OS

sudo su

yum update -y

```

root@ip-172-31-1-226:/home/ec2-user
Using username "ec2-user".
Authenticating with public key "adx2Key"
Last login: Fri Sep 17 06:01:14 2021 from 1.144.110.180

 _ _ | ( _ _ )
 _ | ( _ _ /   Amazon Linux 2 AMI
 _/_\ _/_/_/

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-1-226 ~]$ sudo su
[root@ip-172-31-1-226 ec2-user]# yum update -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core                               | 3.7 kB      00:00
No packages marked for update
[root@ip-172-31-1-226 ec2-user]#

```

- Install a web server application

yum install httpd

systemctl start httpd

systemctl enable httpd

systemctl status httpd

```

root@ip-172-31-1-226:/home/ec2-user
[root@ip-172-31-1-226 ec2-user]# systemctl enable httpd
Created symlink from /etc/systemd/system/multi-user.target.wants/httpd.service to /usr/lib/systemd/system/httpd.service.
[root@ip-172-31-1-226 ec2-user]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2021-09-17 08:47:37 UTC; 16s ago
     Docs: man:httpd.service(8)
    Main PID: 760 (httpd)
   Status: "Total requests: 0; Idle/Busy workers 100/0; Requests/sec: 0; Bytes served/sec: 0 B/sec"
    CGroup: /system.slice/httpd.service
            └─760 /usr/sbin/httpd -DFOREGROUND
              └─761 /usr/sbin/httpd -DFOREGROUND
                └─762 /usr/sbin/httpd -DFOREGROUND
                  └─763 /usr/sbin/httpd -DFOREGROUND
                    └─764 /usr/sbin/httpd -DFOREGROUND
                      └─765 /usr/sbin/httpd -DFOREGROUND

Sep 17 08:47:36 ip-172-31-1-226.us-east-2.compute.internal systemd[1]: Starti...
Sep 17 08:47:37 ip-172-31-1-226.us-east-2.compute.internal systemd[1]: Starte...
Hint: Some lines were ellipsized, use -l to show in full.
[root@ip-172-31-1-226 ec2-user]#

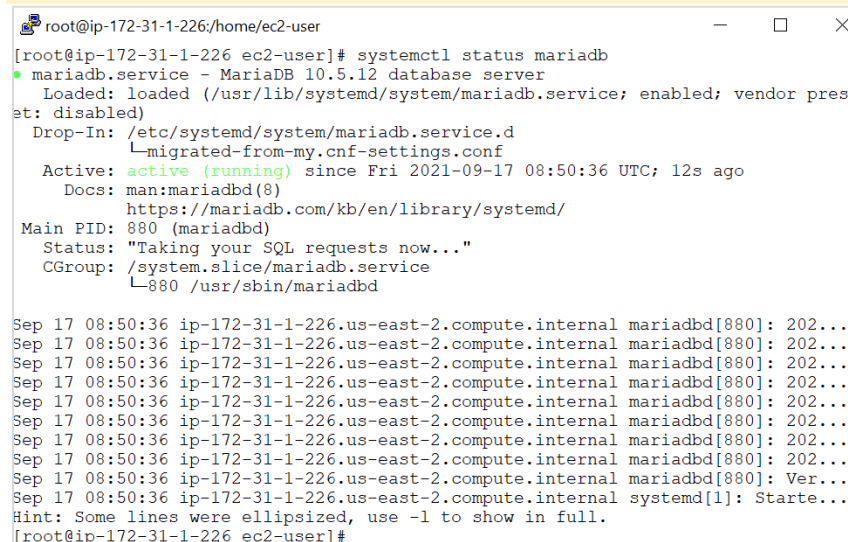
```

- Check Maria DB availability and add the official RPM repository

```
sudo amazon-linux-extras | grep mariadb
sudo tee /etc/yum.repos.d/mariadb.repo<<EOF
[mariadb]
name = MariaDB
baseurl = http://yum.mariadb.org/10.5/centos7-amd64
gpgkey=https://yum.mariadb.org/RPM-GPG-KEY-MariaDB
gpgcheck=1
EOF
```

- Update OS package cache index, confirm available repositories and install MariaDB

```
sudo yum makecache
sudo yum repolist
sudo yum install MariaDB-server MariaDB-client
systemctl start mariadb
systemctl enable mariadb
systemctl status mariadb
```



```
root@ip-172-31-1-226/home/ec2-user
[root@ip-172-31-1-226 ec2-user]# systemctl status mariadb
● mariadb.service - MariaDB 10.5.12 database server
   Loaded: loaded (/usr/lib/systemd/system/mariadb.service; enabled; vendor preset: disabled)
   Drop-In: /etc/systemd/system/mariadb.service.d
            └─migrated-from-my.cnf-settings.conf
   Active: active (running) since Fri 2021-09-17 08:50:36 UTC; 12s ago
     Docs: man:mariabdd(8)
           https://mariadb.com/kb/en/library/systemd/
  Main PID: 880 (mariabdd)
    Status: "Taking your SQL requests now..."
   CGroup: /system.slice/mariadb.service
           └─880 /usr/sbin/mariabdd

Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: 202...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal mariabdd[880]: Ver...
Sep 17 08:50:36 ip-172-31-1-226.us-east-2.compute.internal systemd[1]: Starte...
Hint: Some lines were ellipsized, use -l to show in full.
[root@ip-172-31-1-226 ec2-user]#
```

- Run the database and set password

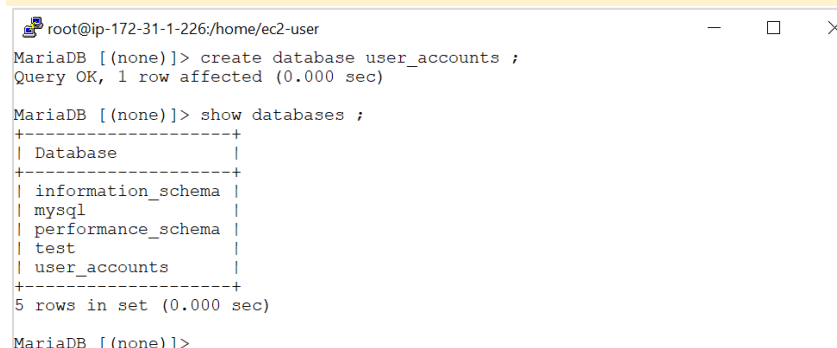
```
sudo mysql_secure_installation
// enter password: root
```

- Confirm I can log in as root user with the set password

```
mysql -u root -p
```

- Create and show the databases

```
create database user_accounts ;
show databases ;
```



```
root@ip-172-31-1-226/home/ec2-user
MariaDB [(none)]> create database user_accounts ;
Query OK, 1 row affected (0.000 sec)

MariaDB [(none)]> show databases ;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| test |
| user_accounts |
+-----+
5 rows in set (0.000 sec)

MariaDB [(none)]>
```

- Install PHP and PHP-Mysqli

```
yum install php
yum install php-mysqli
systemctl stop httpd
systemctl start httpd
systemctl status httpd
```

```
root@ip-172-31-1-226:/home/ec2-user
[root@ip-172-31-1-226 ec2-user]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2021-09-17 09:01:19 UTC; 5s ago
     Docs: man:httpd.service(8)
   Main PID: 1094 (httpd)
   Status: "Processing requests..."
   CGroup: /system.slice/httpd.service
           └─1094 /usr/sbin/httpd -DFOREGROUND
             └─1095 /usr/sbin/httpd -DFOREGROUND
               └─1096 /usr/sbin/httpd -DFOREGROUND
                 └─1097 /usr/sbin/httpd -DFOREGROUND
                   └─1098 /usr/sbin/httpd -DFOREGROUND
                     └─1099 /usr/sbin/httpd -DFOREGROUND

Sep 17 09:01:19 ip-172-31-1-226.us-east-2.compute.internal systemd[1]: Starti...
Sep 17 09:01:19 ip-172-31-1-226.us-east-2.compute.internal systemd[1]: Starte...
Hint: Some lines were ellipsized, use -l to show in full.
[root@ip-172-31-1-226 ec2-user]#
```

- Update the Dynamic Extensions in php.ini

```
find / -name php.ini
cd /etc
vi php.ini
.extension=
// Remove ; in front of extension=mysqli.so and press ESC+Shift+ZZ to save
vim php.ini
```

```
;;;;;;
; Dynamic Extensions ;
;;;;;;

; If you wish to have an extension loaded automatically, use the following
; syntax:
;
; extension=module.extension
;
; For example, on Windows:
;
; extension=mysqli.dll
;
; ... or under UNIX:
extension=mysqli.so
;
; ... or with a path:
;
; extension=/path/to/extension=mysqli.so
```

- Change DirectoryIndex in 'httpd.conf' to point to the web application

```
cd /etc/httpd/conf
vi httpd.conf
/.DirectoryIndex
// Change 'index.html' to 'login.php' and press ESC+Shift+ZZ to save
vim httpd.conf
```

```
</Directory>
#
# DirectoryIndex: sets the file that Apache will serve if a directory
# is requested.
#
<IfModule dir_module>
    DirectoryIndex login.php
</IfModule>
```

### 3. Database Files from GitHub

- Download the web application and database files from GitHub

```
wget https://github.com/nooruzaman/CSE2ADX_A2/raw/main/Web_Application_CSE2ADX.zip
mv *.zip /var/www/html
cd /var/www/html
unzip Web_Application_CSE2ADX
cd Web_Application_CSE2ADX
mv *.* /var/www/html
wget https://github.com/nooruzaman/CSE2ADX_A2/raw/main/user_accounts.sql
```

```
root@ip-172-31-1-226:/var/www/html
[root@ip-172-31-1-226 html]# ls
home.php      logout.php      validation.php
image11.jpg   register.php    Web_Application_CSE2ADX
image12.jpg   registration.php Web_Application_CSE2ADX.zip
image1.jpg    stylesheet.css
login.php     user_accounts.sql
[root@ip-172-31-1-226 html]#
```

- Restore data from the database file to the MariaDB database

```
mysql -u root -p user_accounts < user_accounts.sql
mysql -u root -p
use user_accounts ;
show tables ;
select * from user ;
```

```
MariaDB [user_accounts]> show tables ;
+-----+
| Tables_in_user_accounts |
+-----+
| user                     |
+-----+
1 row in set (0.000 sec)

MariaDB [user_accounts]> select * from user ;
+-----+-----+
| username | password |
+-----+-----+
| noor     | noor1234 |
+-----+-----+
1 row in set (0.000 sec)

MariaDB [user_accounts]>
```

- Grant all privileges for the user 'root' to access the database 'user\_accounts'

```
grant all privileges on user_accounts.* to 'root'@'localhost' identified via mysql_native_password
using password('root') ;
show grants for 'root'@'localhost' ;
```

```
MariaDB [user_accounts]> show grants for 'root'@'localhost' ;
+-----+
| Grants for root@localhost |
+-----+
| GRANT ALL PRIVILEGES ON *.* TO 'root'@'localhost' IDENTIFIED BY PASSWORD '*81F5E21E35407D884A6CD4A731AEBFB6AF209E1B' WITH GRANT OPTION |
| GRANT ALL PRIVILEGES ON `user_accounts`.* TO 'root'@'localhost' |
| GRANT PROXY ON ''@'%' TO 'root'@'localhost' WITH GRANT OPTION |
+-----+
3 rows in set (0.000 sec)

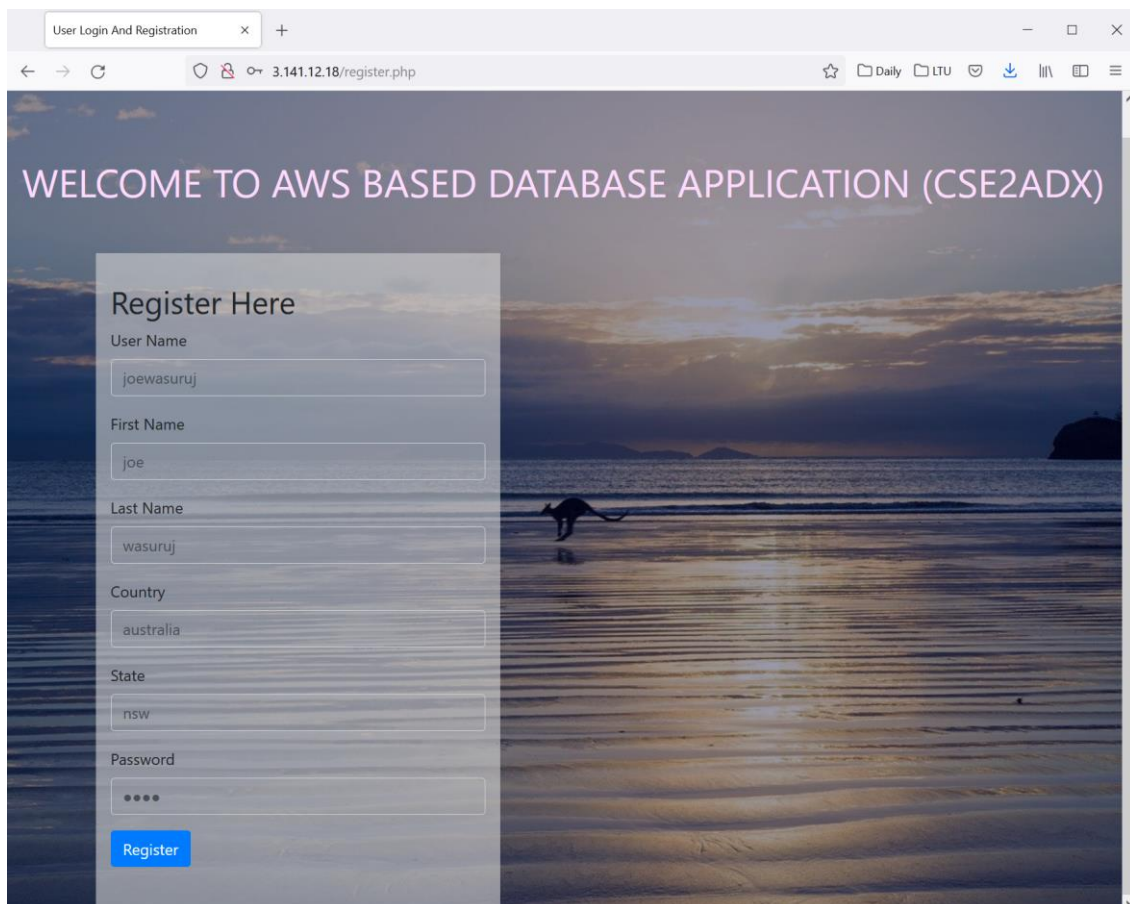
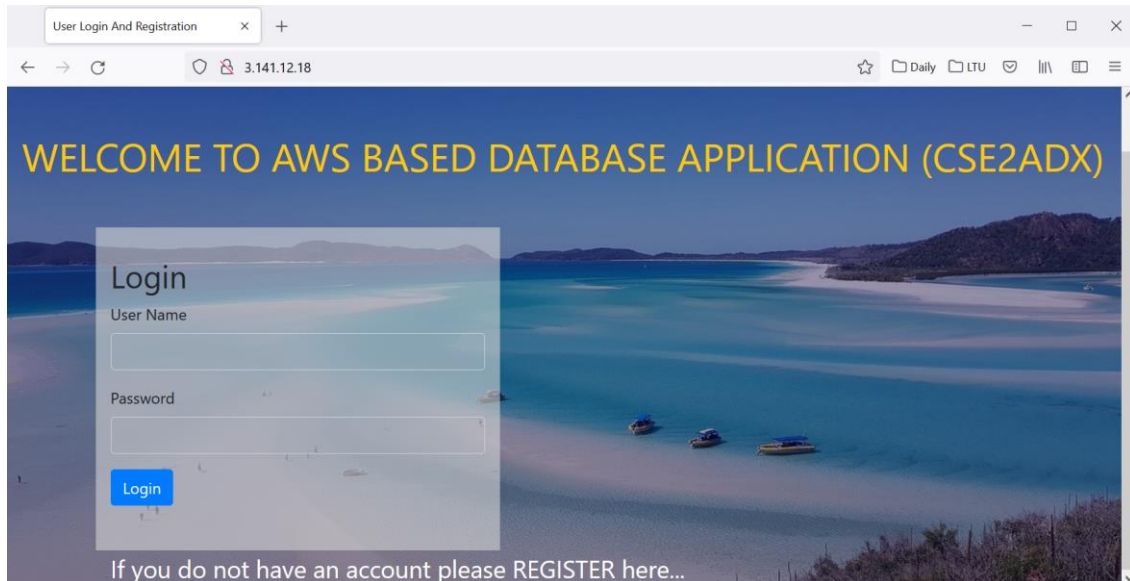
MariaDB [user_accounts]>
```

- Restart PHP

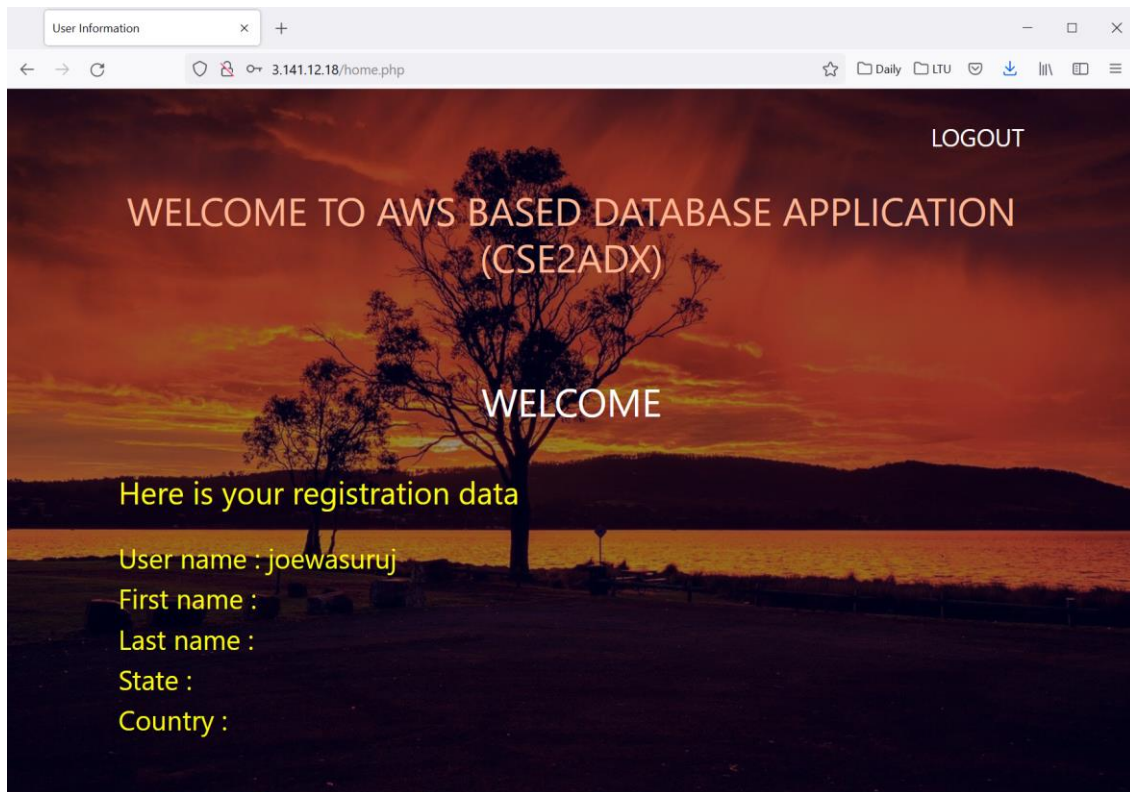
```
systemctl restart httpd
```

### Task 3.4 Application Testing

- Test the web application by opening the adx2EC2 public IPv4 address 3.141.12.18 in a browser







### Task 3.5 Create Golden AMI

- Create an AMI of the adxEC2 instance in the EC2 Dashboard
  - Click: Instances, adxEC2, Actions, Image and templates, Create image
  - Image name: adx2AMI

Launch

EC2 Image Builder

Actions

Owned by me

Filter by tags and attributes or search by keyword

1 to 1 of 1

<input type="checkbox"/>	Name	AMI Name	AMI ID	Source	Owner	Visibility	Status	Creation Date
<input checked="" type="checkbox"/>	adx2AMI	adx2AMI	ami-0d55c9f223717c7d5	888742301715/...	888742301715	Private	available	September 17, 2021 ...