LAMP STACK PROJECT IMPLEMENTATION

The main aim for this project is to explain the DevOps concepts and processes using a LAMP web stack. Some developers use this set of framework and tools to develop a software products .We would be carrying out this project in the AWS platform

LAMP is an acronym of sets of technology used to develop a technical software product.

Linux

Apache

MySQL

PHP

Please note : (P could also stand for Python or Perl)

Apache server used is the apache2 version

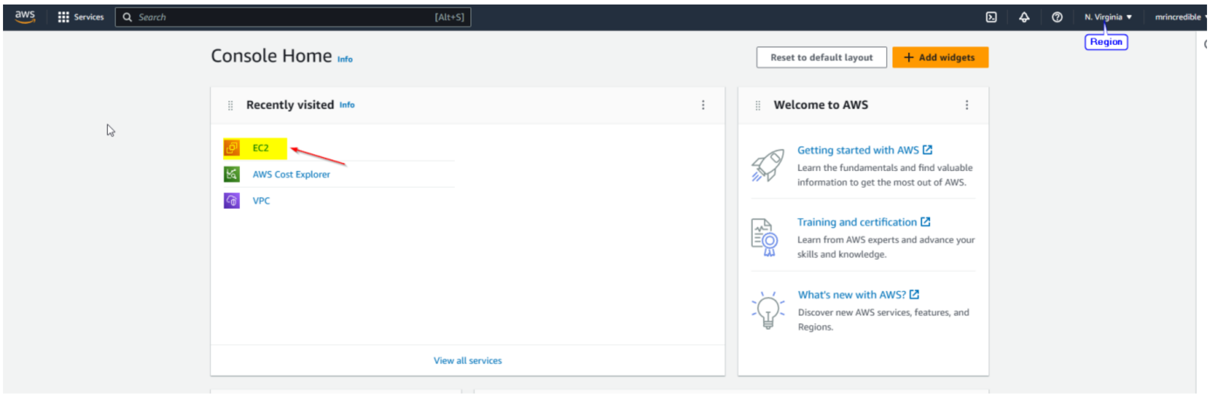
Pre-requisite for the projects is the following.

1) **Fundamental Knowledge of Installing and downloading software**
2) **Basic Understanding of Linux Commands**
3) **AWS account login with EC2 instance**
4) **Internet connection**

IMPLEMENTATION STEPS:

i) **Ensure you login with your details to your AWS console via the https://aws.amazon.com**

ii) **Click on the EC2 link to create instances.**

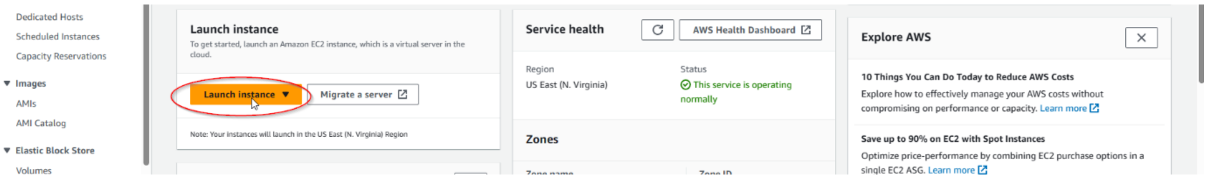


Learn the fundamentals and find valuable information to get the most out of AWS.

Learn from AWS experts and advance your skills and knowledge.

Discover new AWS services, features, and Regions.

iii)Click on launch instance dropdown button and select launch instance .



Launch instance

To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

Note: Your instances will launch in the US East (N. Virginia) Region

Region: US East (N. Virginia)

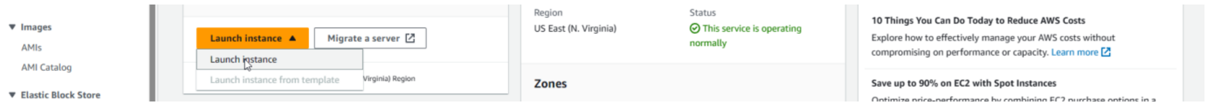
Status: This service is operating normally

10 Things You Can Do Today to Reduce AWS Costs

Explore how to effectively manage your AWS costs without compromising on performance or capacity. Learn more

Save up to 90% on EC2 with Spot Instances

Optimize price-performance by combining EC2 purchase options in a single EC2 ASG. Learn more



Region: US East (N. Virginia)

Status: This service is operating normally

10 Things You Can Do Today to Reduce AWS Costs

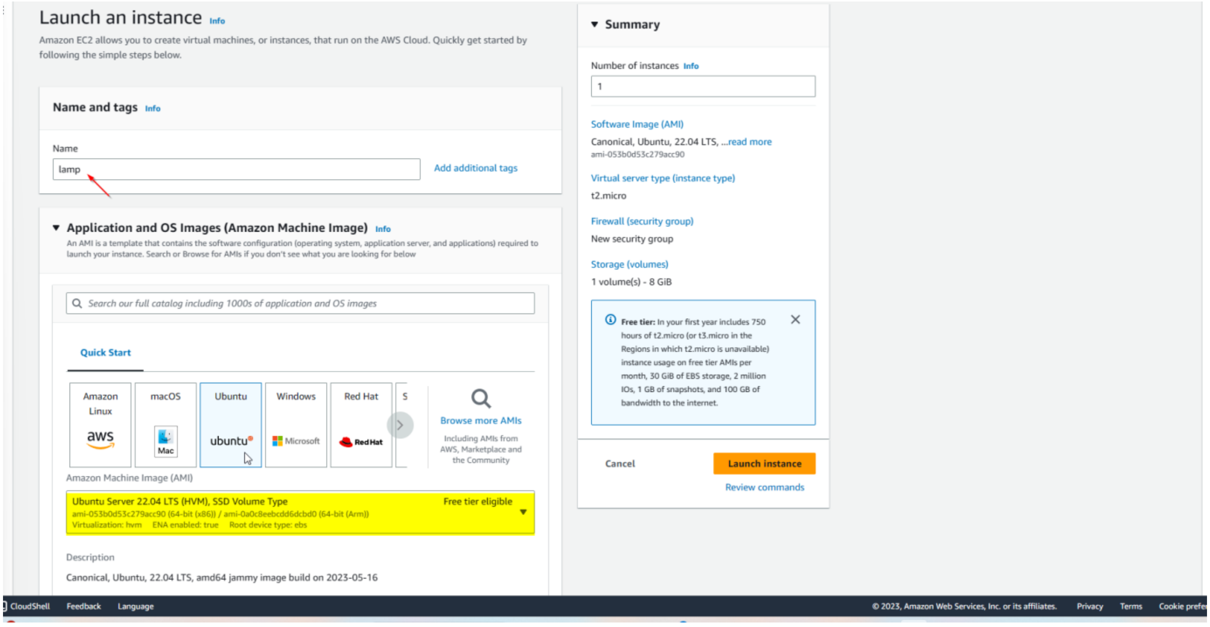
Explore how to effectively manage your AWS costs without compromising on performance or capacity. Learn more

Save up to 90% on EC2 with Spot Instances

iv)Fill in all relevant details to the lamp project such as :

Type in the name and additional tag to the project (lamp) .Selected ubuntu from the quick start option .Also note that the Amazon machine image selection varies from user to user

Select Ubuntu server 22.04 LTS (HVM),SSD Volume Type (Free Tier)



Launch an instance

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

Name and tags

Name: lamp

▼ Application and OS Images (Amazon Machine Image)

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

Amazon Machine Image (AMI)

Ubuntu Server 22.04 LTS (HVM), SSD Volume Type — Free tier eligible
ami-053b0d53c279acc90 (64-bit (x86)) / ami-0a0c8eebcdd6dcbd0 (64-bit (Arm))
Virtualization: hvm   ENA enabled: true   Root device type: ebs

Description

Canonical, Ubuntu, 22.04 LTS, amd64 jammy image build on 2023-05-16

▼ Summary

Number of instances: 1

Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ...read more
ami-053b0d53c279acc90

Virtual server type (instance type): t2.micro

Firewall (security group): New security group

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

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, and 100 GB of bandwidth to the internet.

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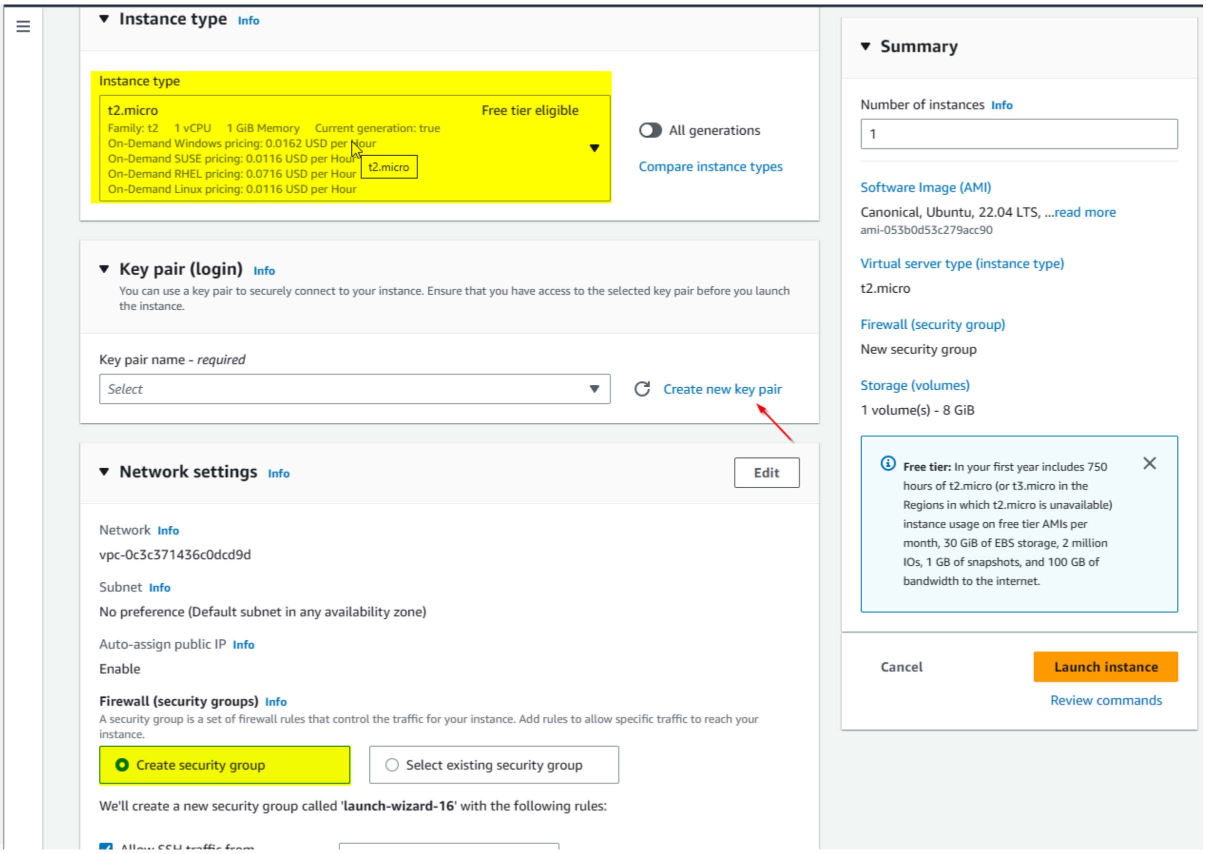
v)The instance type selected in the configuration is the t2 micro -free tier.

Click on the “Create new key pair” link.

Ensure the Checkbox remains on the “Create security group”.



▼ Instance type Info

Instance type

t2.micro Free tier eligible

Family: t2 1 vCPU 1 GiB Memory Current generation: true
On-Demand Windows pricing: 0.0162 USD per Hour
On-Demand SUSE pricing: 0.0116 USD per Hour
On-Demand RHEL pricing: 0.0716 USD per Hour
On-Demand Linux pricing: 0.0116 USD per Hour

▼ 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 - *required*

Select ▼

▼ Network settings Info

Network Info
vpc-0c3c371436c0dcd9d

Subnet Info
No preference (Default subnet in any availability zone)

Auto-assign public IP Info
Enable

Firewall (security groups) Info
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

● Create security group ○ Select existing security group

We'll create a new security group called '**launch-wizard-16**' with the following rules:

☑ Allow SSH traffic from

▼ Summary

Number of instances Info
1

Software Image (AMI)
Canonical, Ubuntu, 22.04 LTS, ...read more
ami-053b0d53c279acc90

Virtual server type (instance type)
t2.micro

Firewall (security group)
New security group

Storage (volumes)
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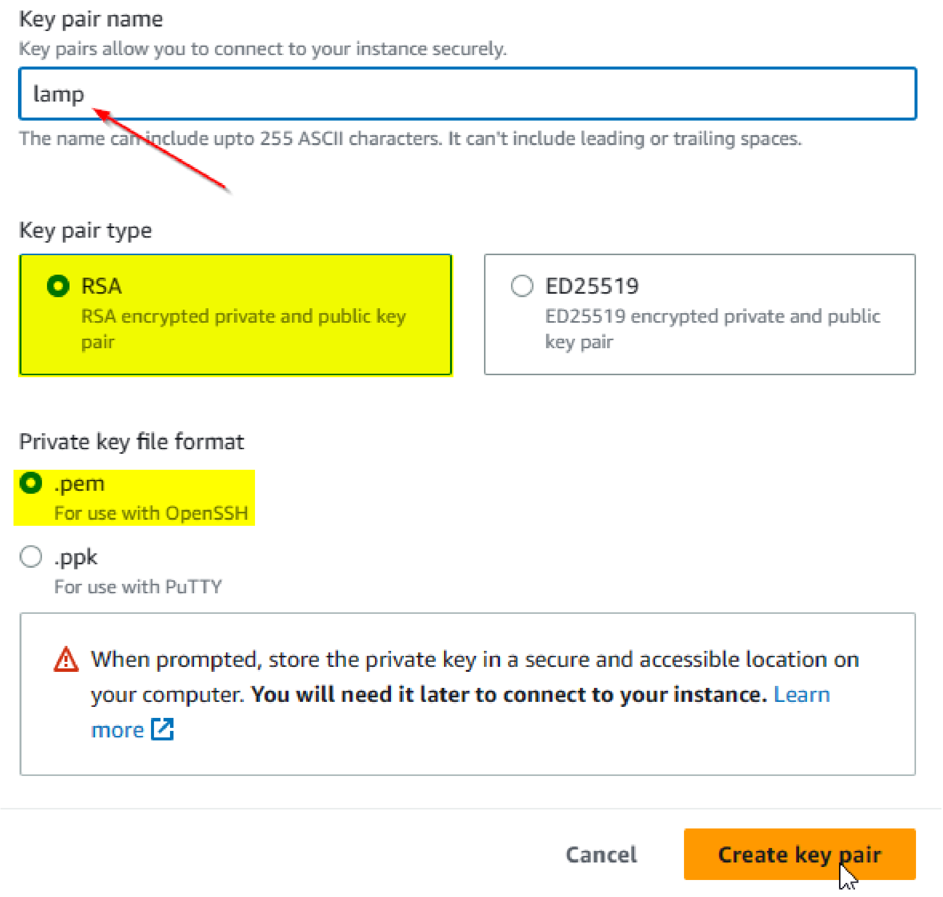
vi)Typed in the key pair name, chose the default key pair type and private key file format (rsa and .pem) and clicked the “Create key pair button”



Key pair name

Key pairs allow you to connect to your instance securely.

lamp

The name can include upto 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

● RSA
RSA encrypted private and public key pair

○ ED25519
ED25519 encrypted private and public key pair

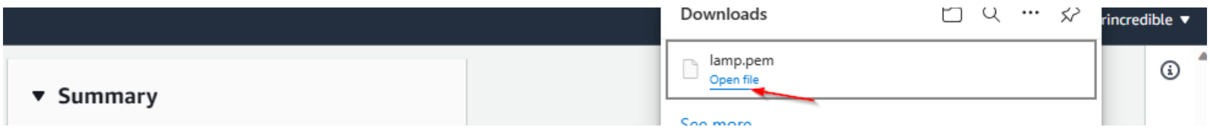
Private key file format

● .pem
For use with OpenSSH

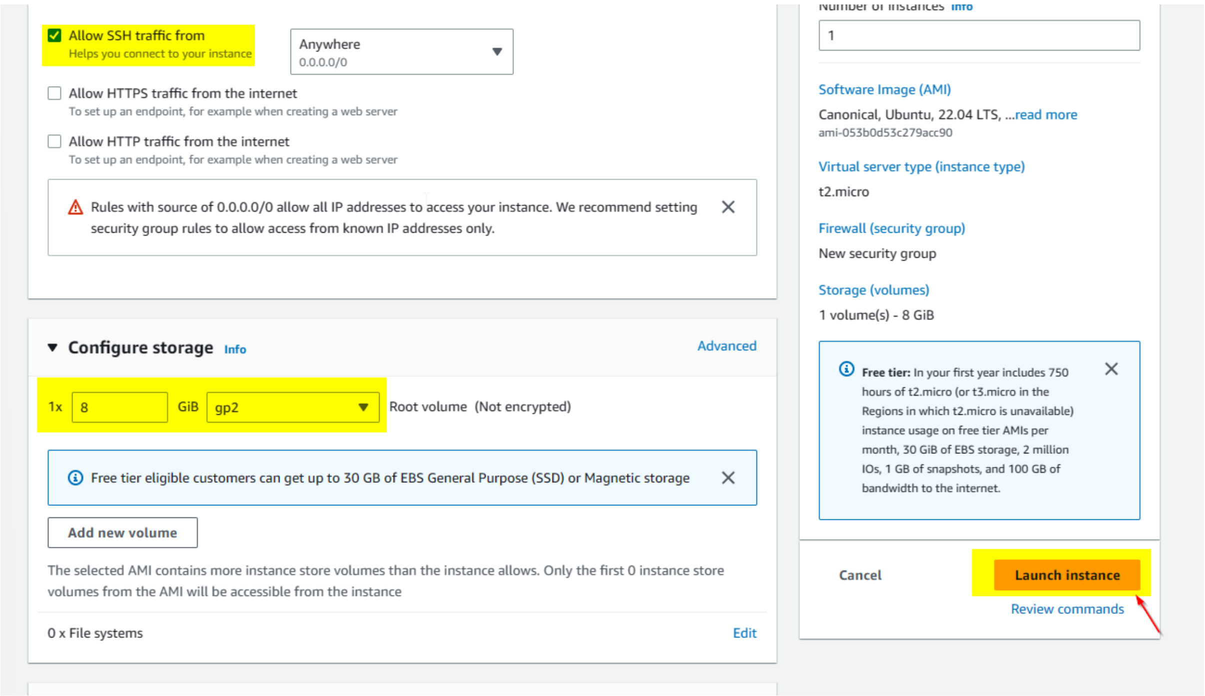
○ .ppk
For use with PuTTY

⚠ When prompted, store the private key in a secure and accessible location on your computer. **You will need it later to connect to your instance.** Learn more

vii)The .pem file was downloaded successfully.



viii)I have deliberately chosen default settings to allow SSH traffic from anywhere as well as the storage volume given by AWS. Then proceed to launch our instance finally.



☑ Allow SSH traffic from
Helps you connect to your instance

Anywhere
0.0.0.0/0

□ Allow HTTPS traffic from the internet
To set up an endpoint, for example when creating a web server

□ Allow HTTP traffic from the internet
To set up an endpoint, for example when creating a web server

⚠ Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

▼ Configure storage Info

Advanced

1x 8 GiB gp2 Root volume (Not encrypted)

ⓘ Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage

Add new volume

The selected AMI contains more instance store volumes than the instance allows. Only the first 0 instance store volumes from the AMI will be accessible from the instance

0 x File systems Edit

Number of instances Info

1

Software Image (AMI)
Canonical, Ubuntu, 22.04 LTS, ...read more
ami-053b0d53c279acc90

Virtual server type (instance type)
t2.micro

Firewall (security group)
New security group

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

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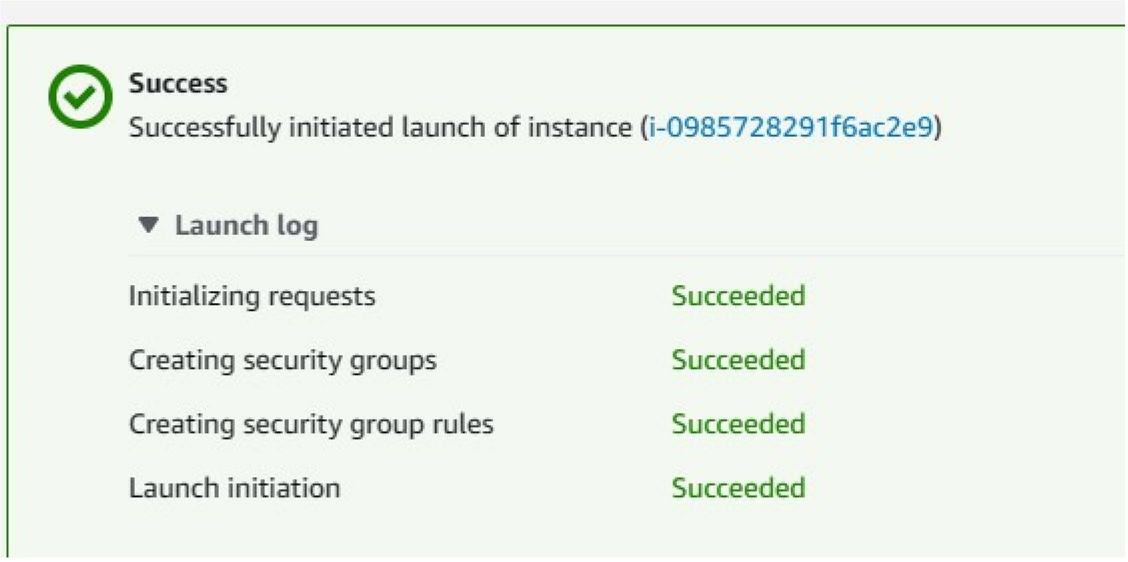
Cancel

Launch instance

Review commands

ix)Instance successfully launched.

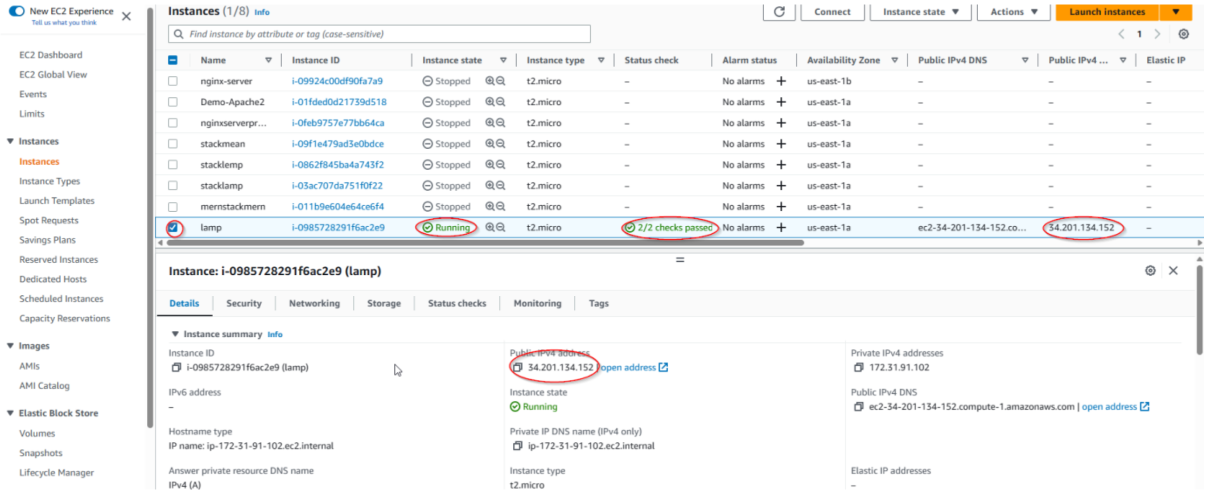


Success
Successfully initiated launch of instance (i-0985728291f6ac2e9)

▼ Launch log

```
Initializing requests              Succeeded
Creating security groups           Succeeded
Creating security group rules      Succeeded
Launch initiation                  Succeeded
```

x)Select checkboxes to view more details about the instance created.



Instances (1/8) Info

Find instance by attribute or tag (case-sensitive)

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...	Elastic IP
□	nginx-server	i-09924c00df90fa7a9	Stopped	t2.micro	–	No alarms	us-east-1b	–	–	–
□	Demo-Apache2	i-01fded0d21739d518	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
□	nginxserverpr...	i-0feb9757e77bb64ca	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
□	stackmean	i-09f1e479ad3e0bdce	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
□	stacklemp	i-0862f845ba4a743f2	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
□	stacklamp	i-03ac707da751f0f22	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
□	mernstackmern	i-011b9e604e64ce6f4	Stopped	t2.micro	–	No alarms	us-east-1a	–	–	–
☑	lamp	i-0985728291f6ac2e9	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a	ec2-34-201-134-152.co...	34.201.134.152	–

Instance: i-0985728291f6ac2e9 (lamp)

▼ Instance summary Info

Instance ID
i-0985728291f6ac2e9 (lamp)

Public IPv4 address
34.201.134.152 | open address

Private IPv4 addresses
172.31.91.102

IPv6 address
–

Instance state
Running

Public IPv4 DNS
ec2-34-201-134-152.compute-1.amazonaws.com | open address

Hostname type
IP name: ip-172-31-91-102.ec2.internal

Private IP DNS name (IPv4 only)
ip-172-31-91-102.ec2.internal

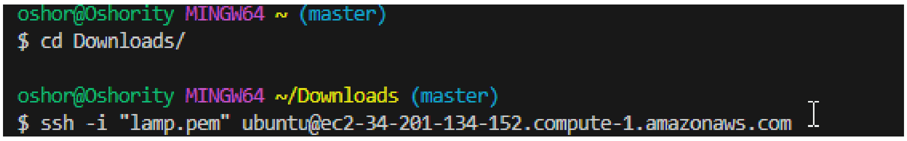
Answer private resource DNS name
IPv4 (A)

Instance type
t2.micro

Elastic IP addresses
–

The public IP address shown on the screenshot should be copied as we would be using it on the console.
Open git bash on visual studio code or whichever console is convenient to use .

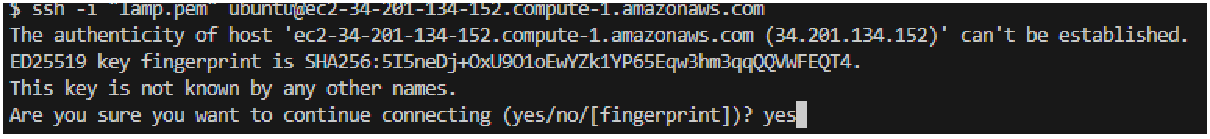
We are using git bash here with Visual Studio Code



```
oshor@Oshority MINGW64 ~ (master)
$ cd Downloads/

oshor@Oshority MINGW64 ~/Downloads (master)
$ ssh -i "lamp.pem" ubuntu@ec2-34-201-134-152.compute-1.amazonaws.com
```

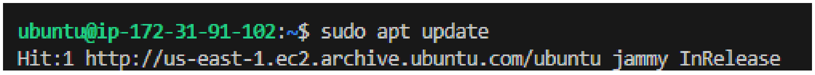
Type YES ,to connect



```
$ ssh -i "lamp.pem" ubuntu@ec2-34-201-134-152.compute-1.amazonaws.com
The authenticity of host 'ec2-34-201-134-152.compute-1.amazonaws.com (34.201.134.152)' can't be established.
ED25519 key fingerprint is SHA256:5I5neDj+OxU9O1oEwYZk1YP65Eqw3hm3qqQQVWFEQT4.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

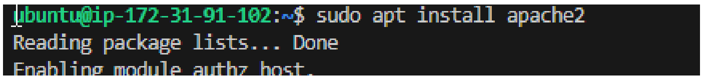
You have successful connected to the EC2 instance launched on AWS via ssh

Type clear to have a clear console and proceed to updating the lists of packages in the package manager



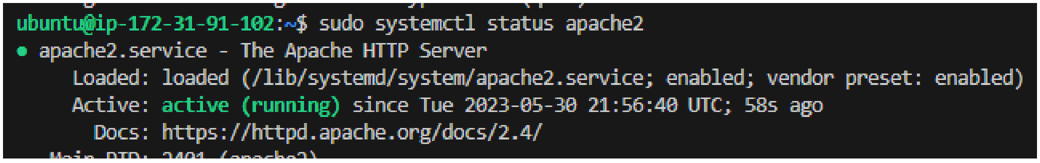
```
ubuntu@ip-172-31-91-102:~$ sudo apt update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
```

Then we run apache2 installation and click yes to complete installation



```
ubuntu@ip-172-31-91-102:~$ sudo apt install apache2
Reading package lists... Done
Enabling module authz_host.
```

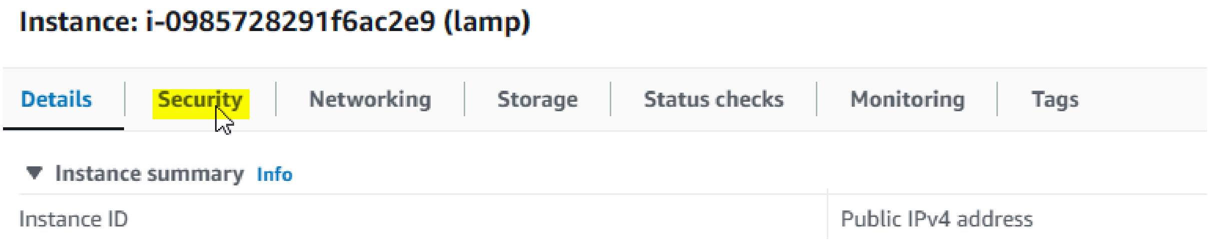
We have to verify that Apache is running in our Operating System.



```
ubuntu@ip-172-31-91-102:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2023-05-30 21:56:40 UTC; 58s ago
       Docs: https://httpd.apache.org/docs/2.4/
```

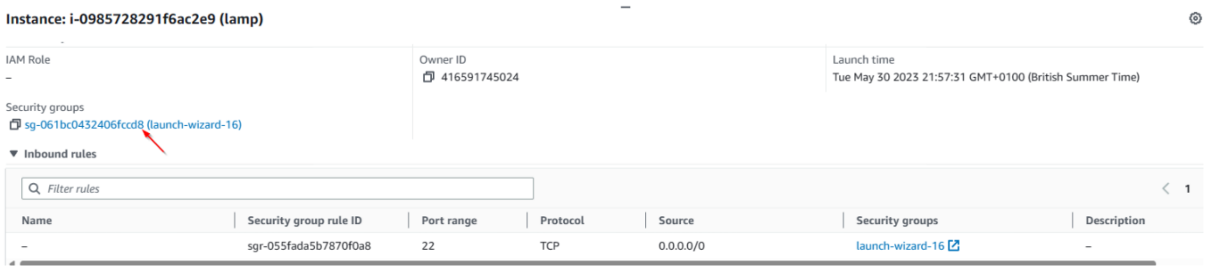
To proceed by launching the web server in the AWS Cloud, we need to navigate back to the security group on the platform to add a new rule for TCP port 80 which is the default for web browsers .
Once done we can access the web page on internet.

Click on security button.



Instance: i-0985728291f6ac2e9 (lamp)

And click the security group link



Instance: i-0985728291f6ac2e9 (lamp)

IAM Role: –

Owner ID: 416591745024

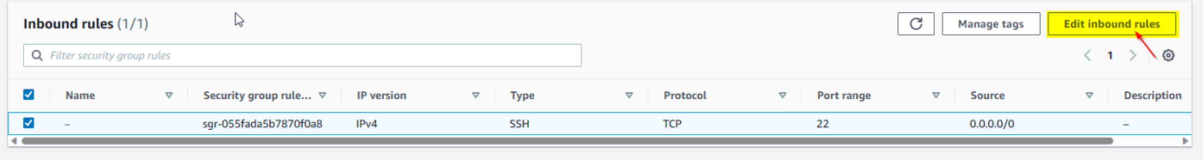
Launch time: Tue May 30 2023 21:57:31 GMT+0100 (British Summer Time)

Security groups: sg-061bc0432406fccd8 (launch-wizard-16)

Inbound rules

Name	Security group rule ID	Port range	Protocol	Source	Security groups	Description
–	sgr-055fada5b7870f0a8	22	TCP	0.0.0.0/0	launch-wizard-16	–

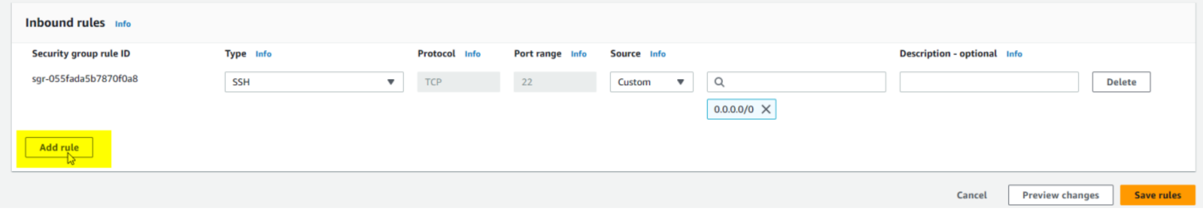
Click on “Edit inbound rules “ in order to add a new rule for port 80



Inbound rules (1/1)

☑	Name	Security group rule...	IP version	Type	Protocol	Port range	Source	Description
☑	–	sgr-055fada5b7870f0a8	IPv4	SSH	TCP	22	0.0.0.0/0	–

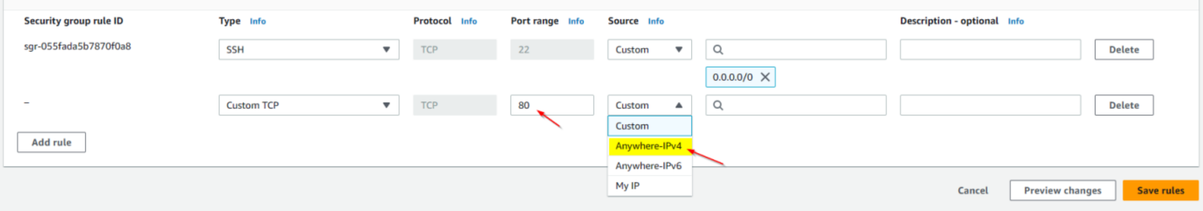
Add a new rule



Inbound rules Info

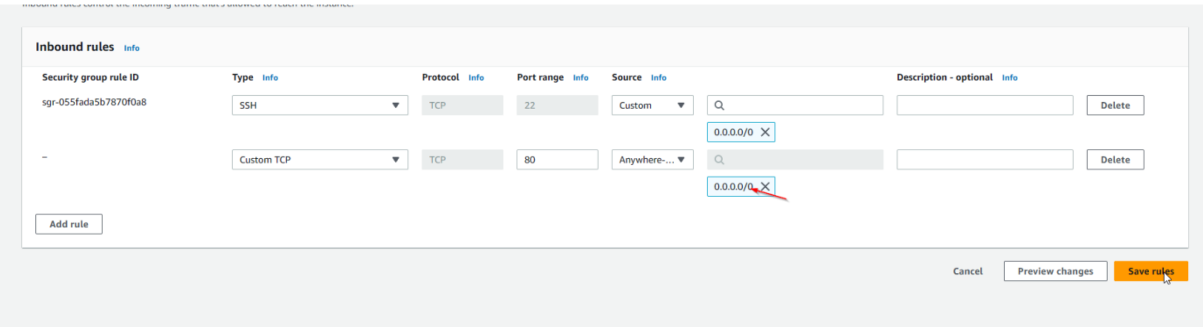
Security group rule ID	Type	Protocol	Port range	Source		Description - optional
sgr-055fada5b7870f0a8	SSH	TCP	22	Custom	0.0.0.0/0	

Type in the port range and click “Anywhere ipv4”



Security group rule ID	Type	Protocol	Port range	Source		Description - optional
sgr-055fada5b7870f0a8	SSH	TCP	22	Custom	0.0.0.0/0	
–	Custom TCP	TCP	80	Custom		

Click the “Save rules” Button

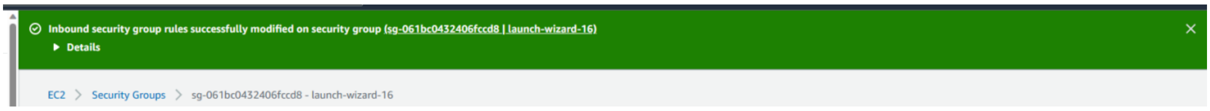


Inbound rules control the incoming traffic that's allowed to reach the instance.

Inbound rules Info

Security group rule ID	Type	Protocol	Port range	Source		Description - optional
sgr-055fada5b7870f0a8	SSH	TCP	22	Custom	0.0.0.0/0	
–	Custom TCP	TCP	80	Anywhere-...	0.0.0.0/0	

Inbound rule successfully modified.

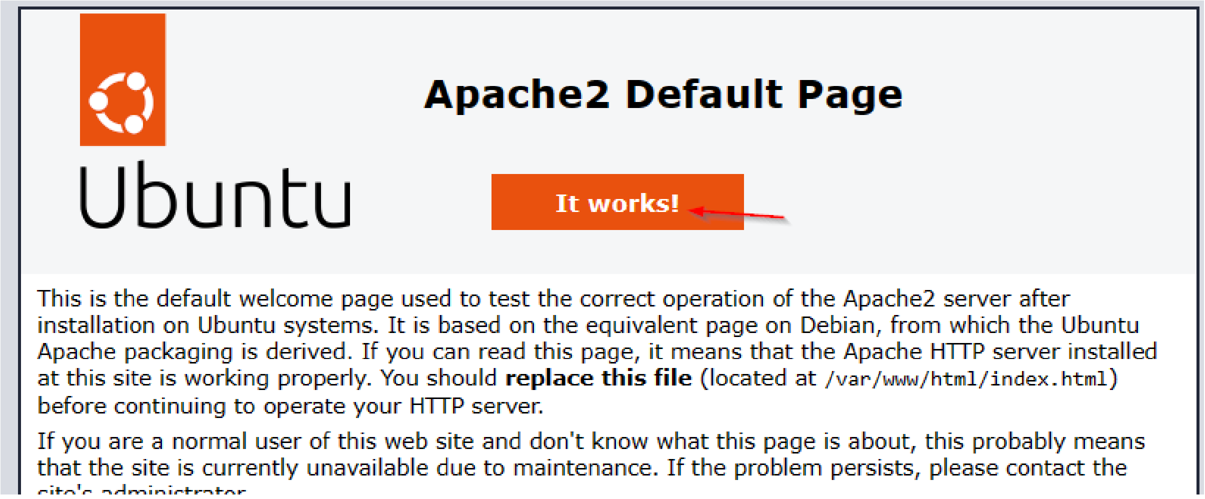


Inbound security group rules successfully modified on security group (sg-061bc0432406fccd8 | launch-wizard-16)

▶ Details

EC2 > Security Groups > sg-061bc0432406fccd8 - launch-wizard-16

Open any browser of your choice and access the URL http://34.201.134.152:80



Apache2 Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Apache2 default page successfully displayed.

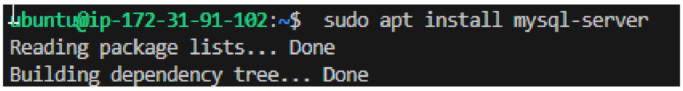
From the LAMP stack, we have implemented with Linux and got Apache ready .

Next step would be to get the MySQL installed.

MYSQL INSTALLATION

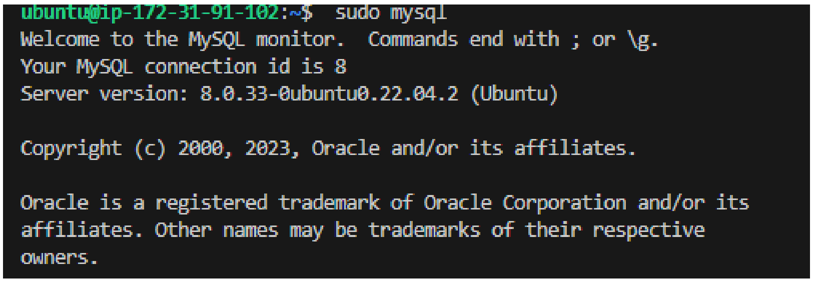
Now that our web server is running, we need a relational database uses within the PHP environment hence we install MySQL server

Type "Y" and enter.



```
ubuntu@ip-172-31-91-102:~$ sudo apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
```

When installation is finished, Log in to connect to the MySQL server as the administrator user root so that you can have access to the sudo command.



```
ubuntu@ip-172-31-91-102:~$ sudo mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.33-0ubuntu0.22.04.2 (Ubuntu)

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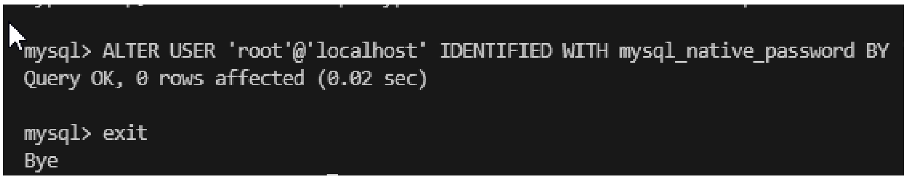
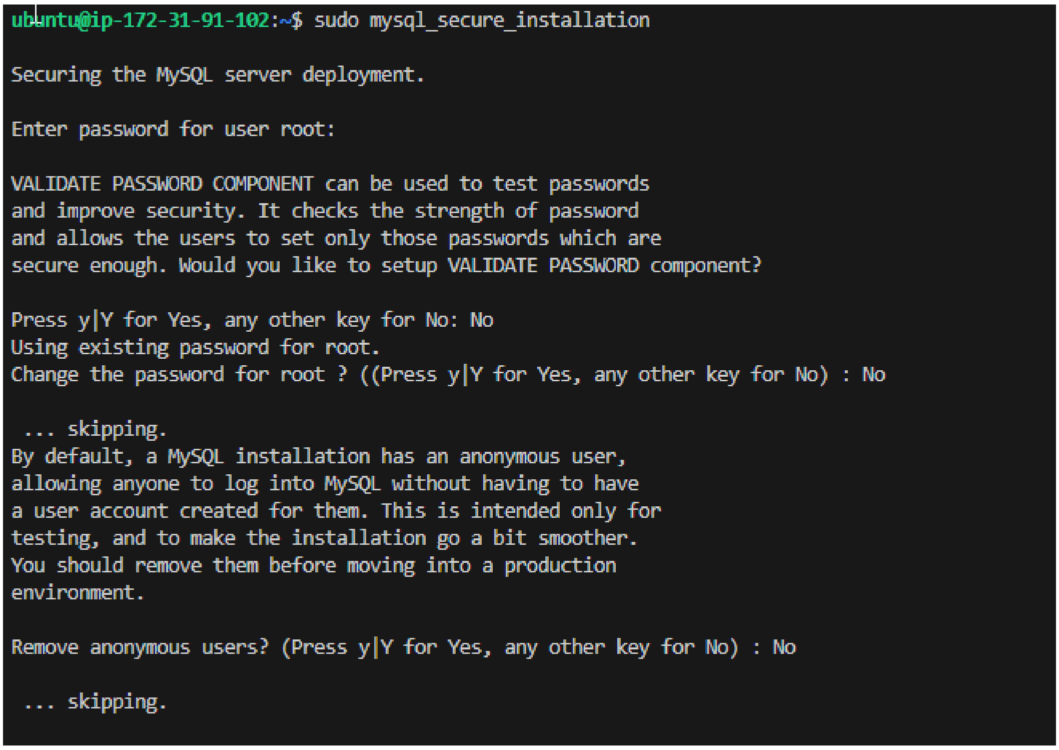

It is important to set up a password for the user root using mysql_native_password as a default authentication method.
Please note, Password not revealed for security purpose
Exit MySQL



```
mysql> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY
Query OK, 0 rows affected (0.02 sec)

mysql> exit
Bye
```

Interactive script is started, and all modifications are answered with a Y/N response

Root user password was set Validate password: No
Change password: No
Remove anonymous user: No

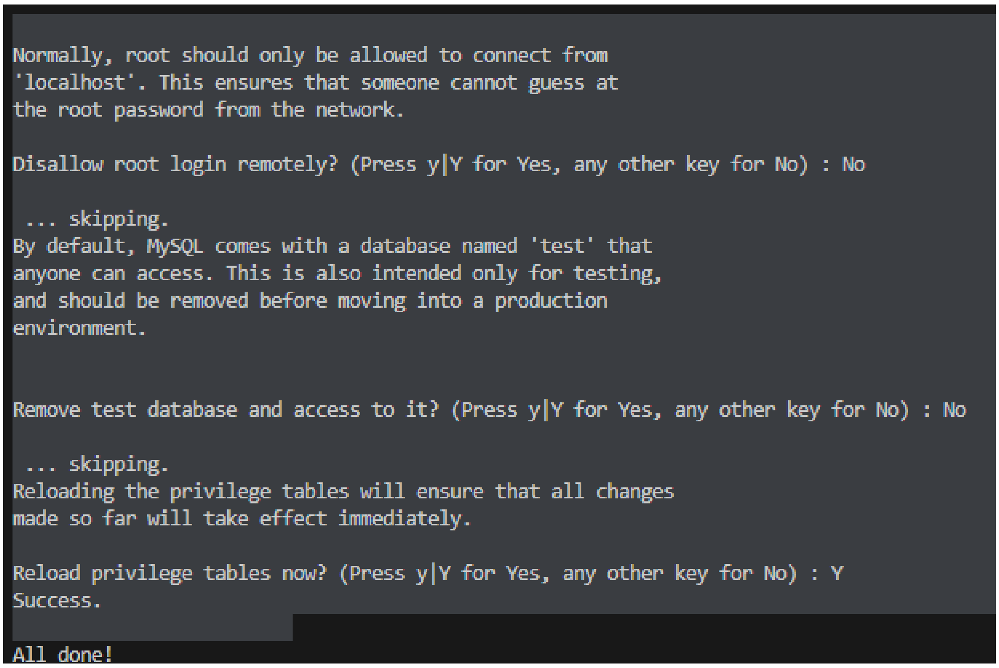


```
ubuntu@ip-172-31-91-102:~$ sudo mysql_secure_installation

Securing the MySQL server deployment.

Enter password for user root:

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: No
Using existing password for root.
Change the password for root ? ((Press y|Y for Yes, any other key for No) : No

 ... skipping.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : No

 ... skipping.
```

Disallow remote login: No

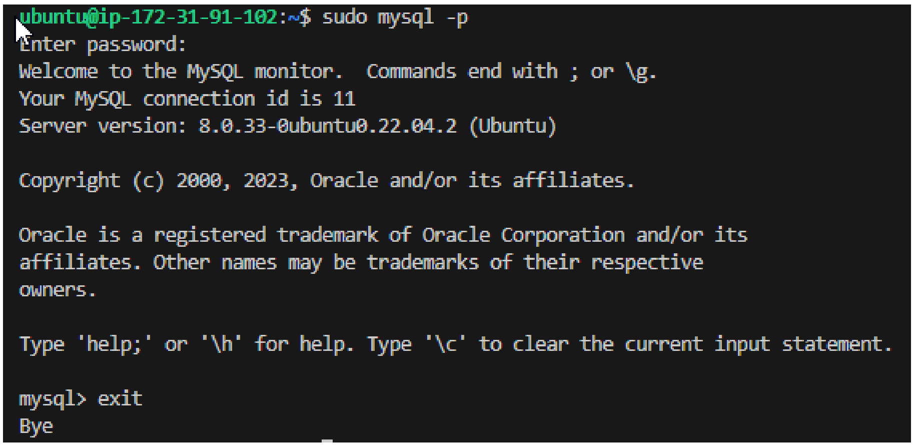
Remove test data base and access to it: No

Reload Privilege tables: Yes.



```
Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : No

 ... skipping.
By default, MySQL comes with a database named 'test' that
anyone can access. This is also intended only for testing,
and should be removed before moving into a production
environment.


Remove test database and access to it? (Press y|Y for Yes, any other key for No) : No

 ... skipping.
Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y
Success.

All done!
```

Verify login details to ensure all details were inputted correctly and exiting MySQL



```
ubuntu@ip-172-31-91-102:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 11
Server version: 8.0.33-0ubuntu0.22.04.2 (Ubuntu)

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Oracle is a registered trademark of Oracle Corporation and/or its
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> exit
Bye
```
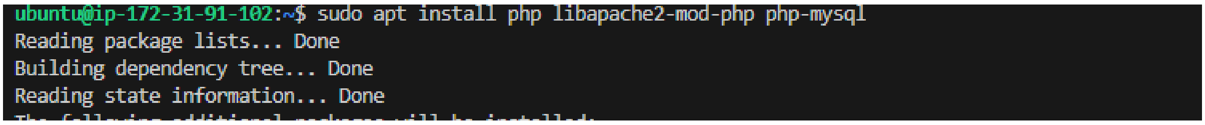

MySQL server was correctly installed and secured.

Next, we proceed to the PHP installation which is the final component of the LAMP STACK

PHP INSTALLATION

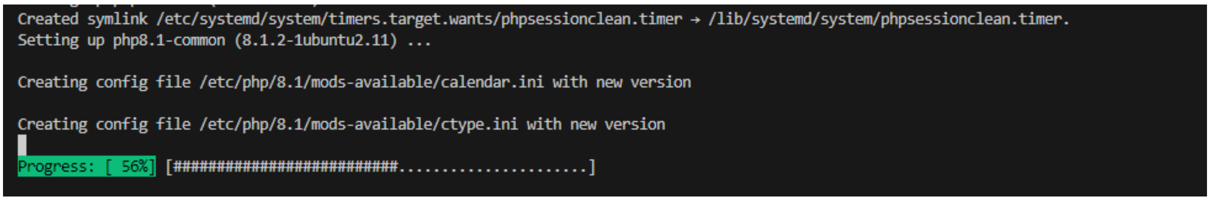
PHP is the component that would process the codes to display dynamic content to the end user. Hence, we would need to install 3 packages namely :

1)PHP package 2) libapache2-mod-php 3) php-mysql .



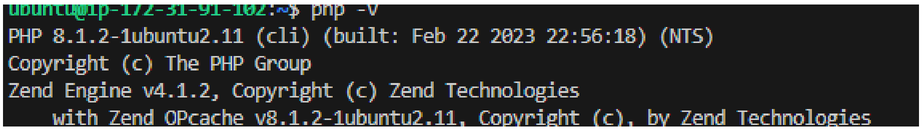
```
ubuntu@ip-172-31-91-102:~$ sudo apt install php libapache2-mod-php php-mysql
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
```

Installation continues.



```
Created symlink /etc/systemd/system/timers.target.wants/phpsessionclean.timer → /lib/systemd/system/phpsessionclean.timer.
Setting up php8.1-common (8.1.2-1ubuntu2.11) ...

Creating config file /etc/php/8.1/mods-available/calendar.ini with new version

Creating config file /etc/php/8.1/mods-available/ctype.ini with new version

Progress: [ 56%] [##########################.....................]
```

After installing, we check the PHP version.



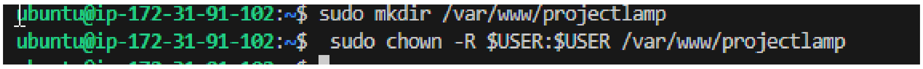
```
ubuntu@ip-172-31-91-102:~$ php -v
PHP 8.1.2-1ubuntu2.11 (cli) (built: Feb 22 2023 22:56:18) (NTS)
Copyright (c) The PHP Group
Zend Engine v4.1.2, Copyright (c) Zend Technologies
    with Zend OPcache v8.1.2-1ubuntu2.11, Copyright (c), by Zend Technologies
```

At this point the LAMP STACK implementation is completed and fully operational

We need to test our set up with a PHP script and this needs a proper APACHE virtual host to keep your website files and folder .Multiple website can be hosted on a single machine and the users would not notice

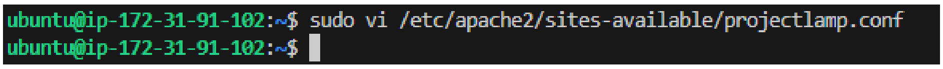
CREATING AN APACHE VIRTUAL HOST FOR OUR WEBSITE TO USE .

Next step, making a directory for the site directory, running below



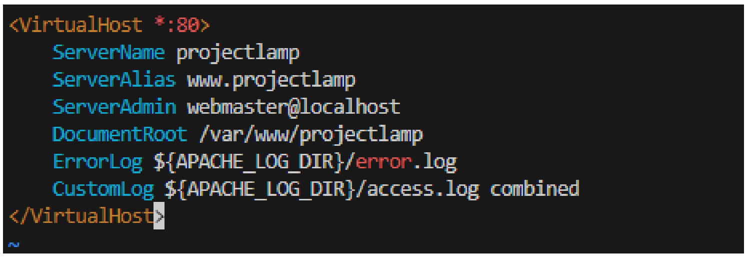
```
ubuntu@ip-172-31-91-102:~$ sudo mkdir /var/www/projectlamp
ubuntu@ip-172-31-91-102:~$  sudo chown -R $USER:$USER /var/www/projectlamp
```

Then proceed to edit a new site directory to input the virtual host information.



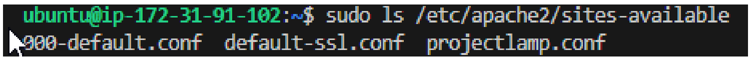
```
ubuntu@ip-172-31-91-102:~$ sudo vi /etc/apache2/sites-available/projectlamp.conf
ubuntu@ip-172-31-91-102:~$
```

Put the edited file in an insert mode by typing “i” without quotes and add the config files, press ESC ,save and exit with “ :wq” command



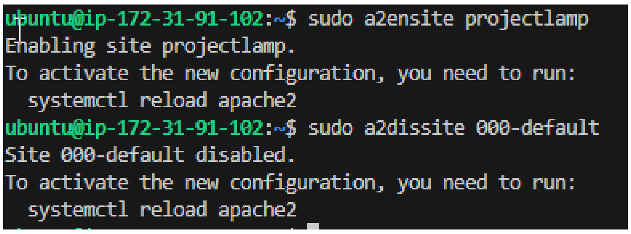
```
<VirtualHost *:80>
    ServerName projectlamp
    ServerAlias www.projectlamp
    ServerAdmin webmaster@localhost
    DocumentRoot /var/www/projectlamp
    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>
~
```

Next check the content of the sites-available directory and you would see 3 configurations files on here .



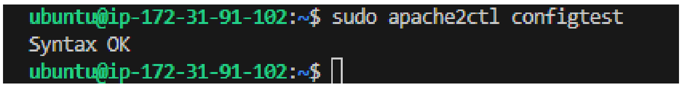
```
ubuntu@ip-172-31-91-102:~$ sudo ls /etc/apache2/sites-available
000-default.conf  default-ssl.conf  projectlamp.conf
```

With this configuration files, we would need to DISABLE the 000-default config file and ENABLE the new directory we created using the following command



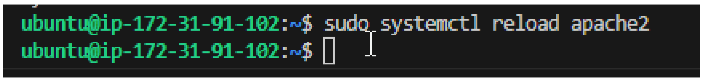
```
ubuntu@ip-172-31-91-102:~$ sudo a2ensite projectlamp
Enabling site projectlamp.
To activate the new configuration, you need to run:
  systemctl reload apache2
ubuntu@ip-172-31-91-102:~$ sudo a2dissite 000-default
Site 000-default disabled.
To activate the new configuration, you need to run:
  systemctl reload apache2
```

After enabling and disabling done successfully, we would verify that there are no syntax errors with the command below



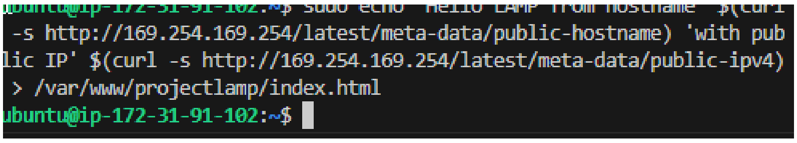
```
ubuntu@ip-172-31-91-102:~$ sudo apache2ctl configtest
Syntax OK
ubuntu@ip-172-31-91-102:~$
```

Then we proceed by reloading the Apache server to make these changes take effects.



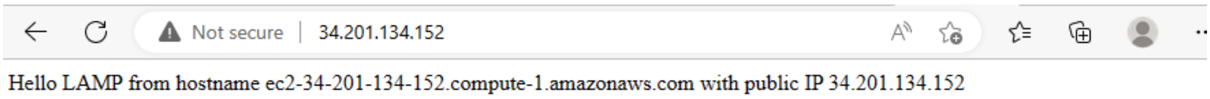
```
ubuntu@ip-172-31-91-102:~$ sudo systemctl reload apache2
ubuntu@ip-172-31-91-102:~$
```

The new website is now active but the projectlamp has empty file .We create an index.html file in that location so that we can test our virtual host is performing as expected .



```
ubuntu@ip-172-31-91-102:~$ sudo echo 'Hello LAMP from hostname' $(curl
 -s http://169.254.169.254/latest/meta-data/public-hostname) 'with pub
lic IP' $(curl -s http://169.254.169.254/latest/meta-data/public-ipv4)
 > /var/www/projectlamp/index.html
ubuntu@ip-172-31-91-102:~$
```

Proceed to the browser and open the previous website using the ip address



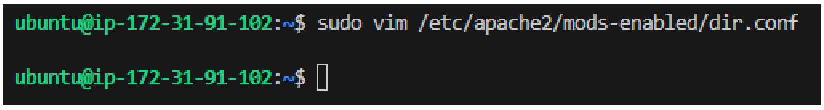
Hello LAMP from hostname ec2-34-201-134-152.compute-1.amazonaws.com with public IP 34.201.134.152

Echo successfully displayed but this is just to test the website.

Type "clear" command to clear screen.

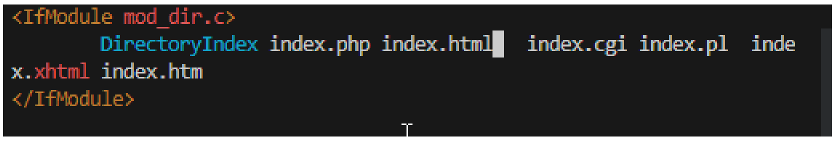
ENABLE PHP ON THE WEBSITE

We would need to set up an index.php file to replace the index.html file from the document root as it needs to override the default settings. This is a very useful maintenance page in PHP application



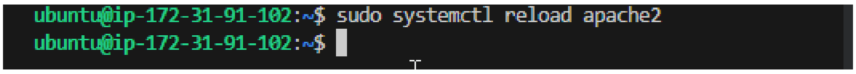
```
ubuntu@ip-172-31-91-102:~$ sudo vim /etc/apache2/mods-enabled/dir.conf

ubuntu@ip-172-31-91-102:~$
```

Files are edited correctly while index.php and index.html are in that order respectively.



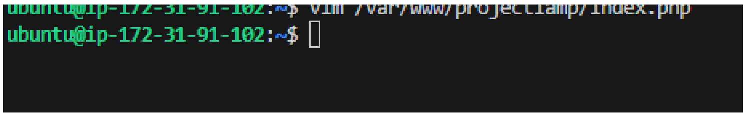
```
<IfModule mod_dir.c>
        DirectoryIndex index.php index.html  index.cgi index.pl  inde
x.xhtml index.htm
</IfModule>
```

Edited successfully and the Apache needs to be reloaded again by the command below.



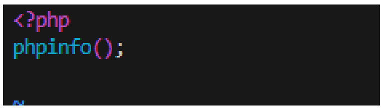
```
ubuntu@ip-172-31-91-102:~$ sudo systemctl reload apache2
ubuntu@ip-172-31-91-102:~$
```

Finally we would create the PHP script to test that PHP is correctly installed and configured on the server .The importance is to be able to handle and process request for PHP files with the command below



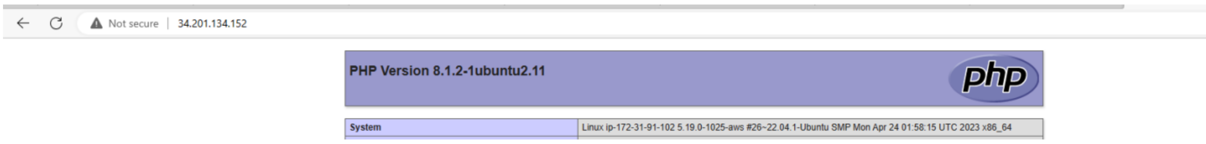
```
ubuntu@ip-172-31-91-102:~$ vim /var/www/projectlamp/index.php
ubuntu@ip-172-31-91-102:~$
```

Put the edited file in an insert mode by typing “i” without quotes and add the valid PHP code files, press ESC ,save and exit with “ :wq” command



```
<?php
phpinfo();

~
```

Refresh the web page and you would see the web page server in a PHP perspective.



PHP Version 8.1.2-1ubuntu2.11

System	Linux ip-172-31-91-102 5.19.0-1025-aws #26~22.04.1-Ubuntu SMP Mon Apr 24 01:58:15 UTC 2023 x86_64

This is the minimum requirement to set up an AWS instance with LINUX ,APACHE,MYSQL AND PHP for a web project.

Please note: Remember to terminate your EC2 instance.