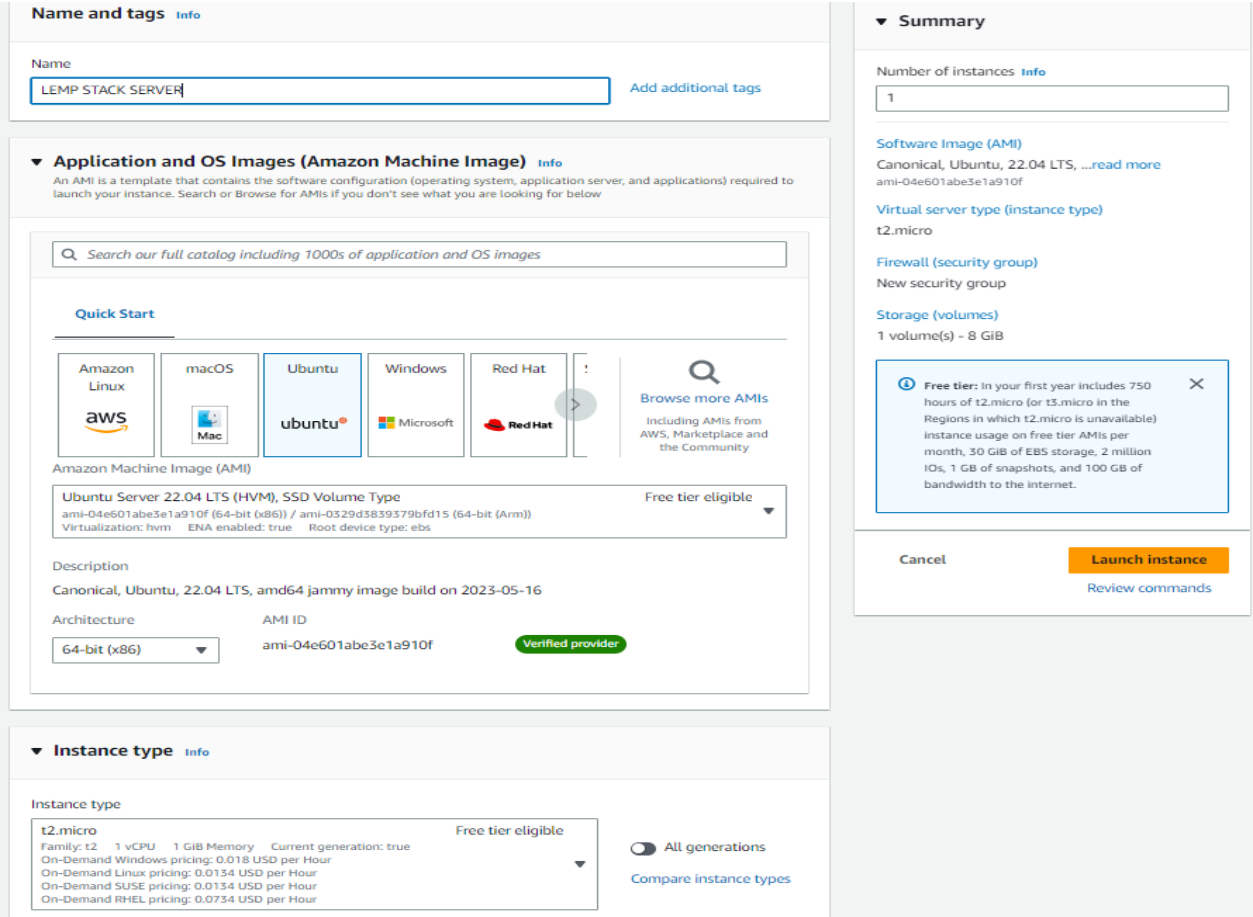
WEB STACK IMPLEMENTATION (LEMP STACK)

Definition: LEMP (Linux, Nginx, MySQL, PHP or Python, or Perl) A technology stack is a set of technologies that are stacked together to build any application. Popularly known as a technology infrastructure or solutions stack, technology stack has become essential for building easy-to-maintain, scalable web applications.

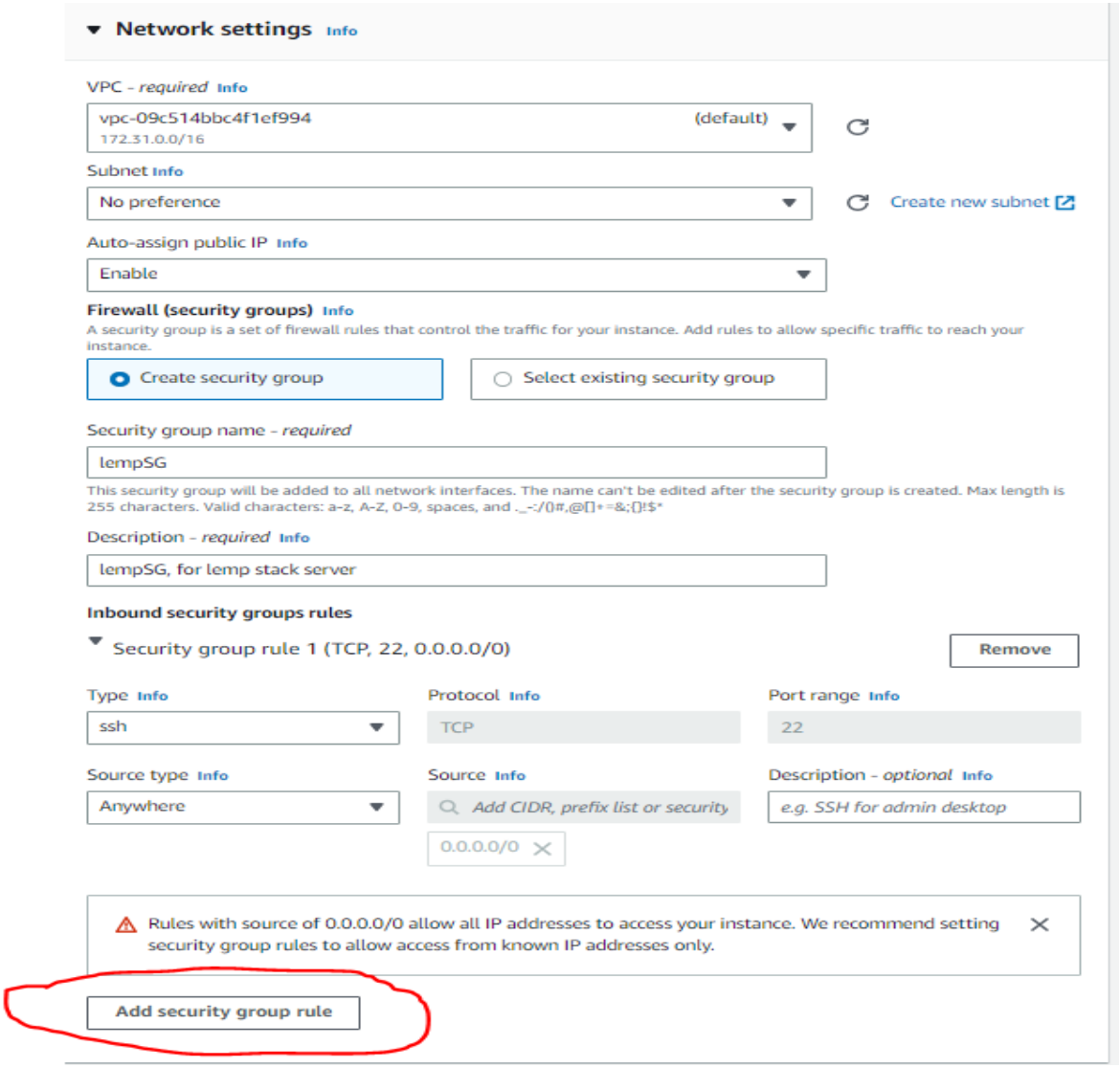
The technology stack determines the type of applications you can build, the level of customizations you can perform, and the resources you need to develop your application.

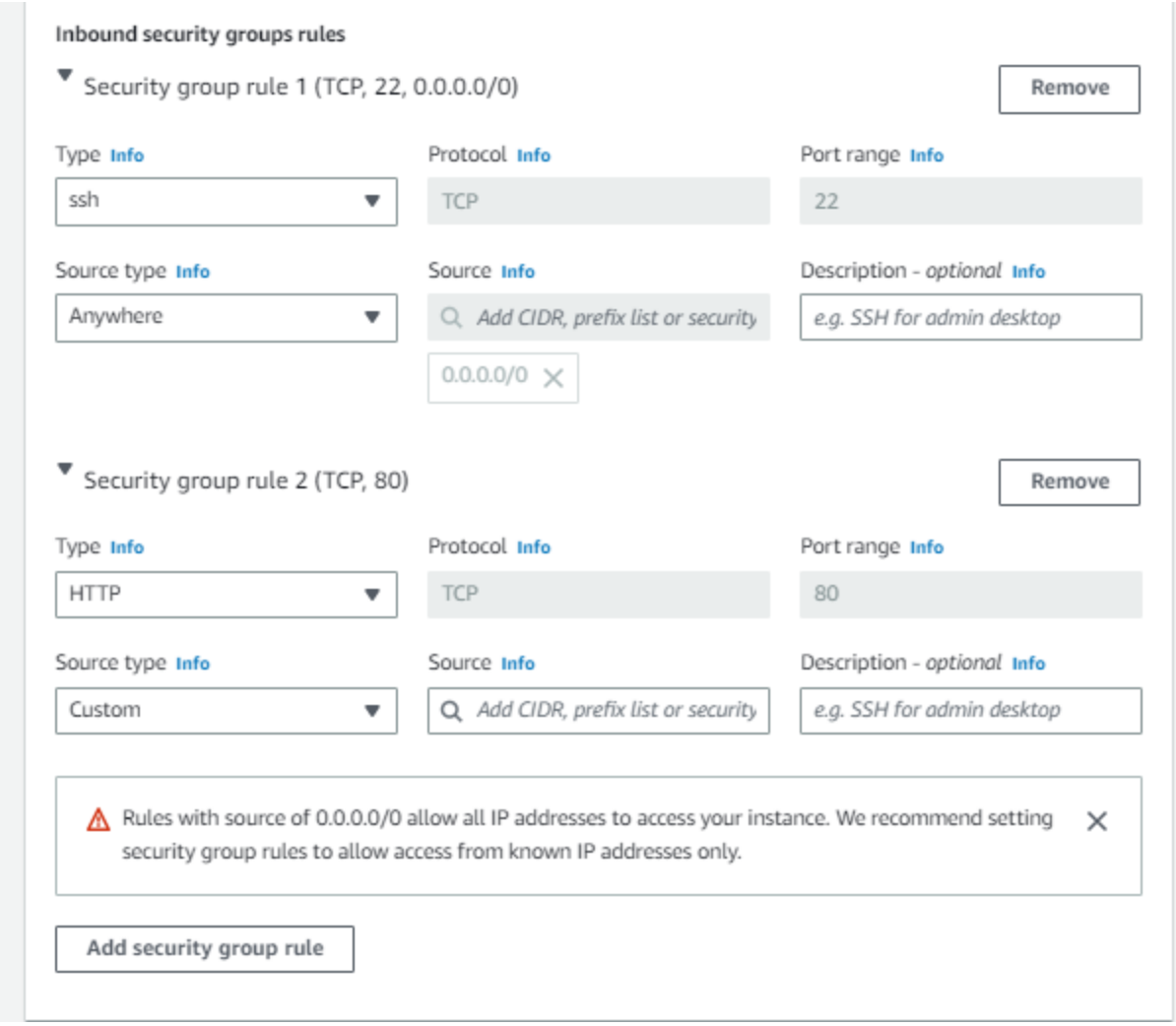
Implementation:

Step 1 **Launch Instance**: Go to your AWS console, Launch an EC2 Instance, the Ubuntu Free tier, create a key pair,



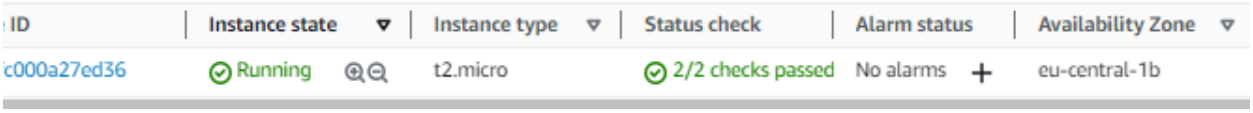
then go to network settings select edit, check create new security groups. Give it a name, in this case will call mine lempSG, by default you should have both ssh and http(but if there's no http, you can select the add security group rule to select *http*)





Then proceed to launch the instance.

After confirmation of instance up and running as shown below, then ssh into the instance.

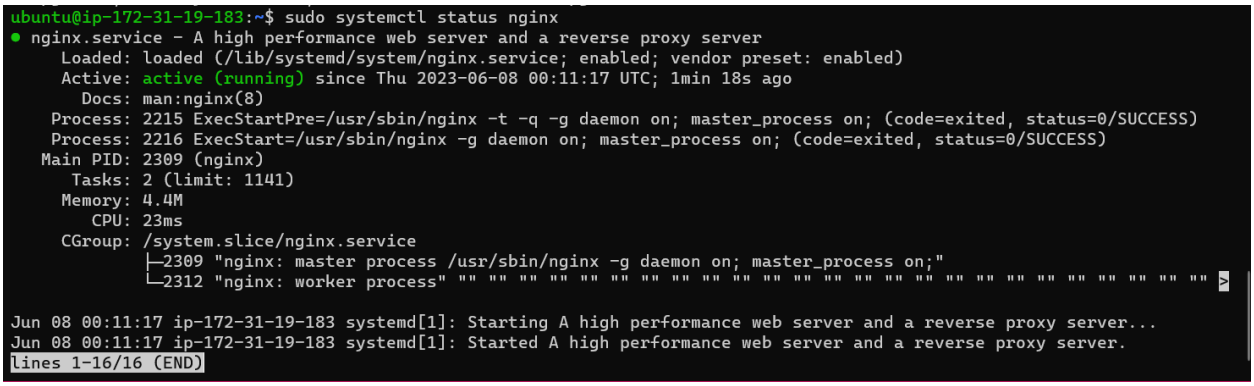


***Step* 2 Installing the Nginx Web Server:**

We then setup the nginx server by running the following commands accordingly:

$sudo apt update
$sudo apt install nginx

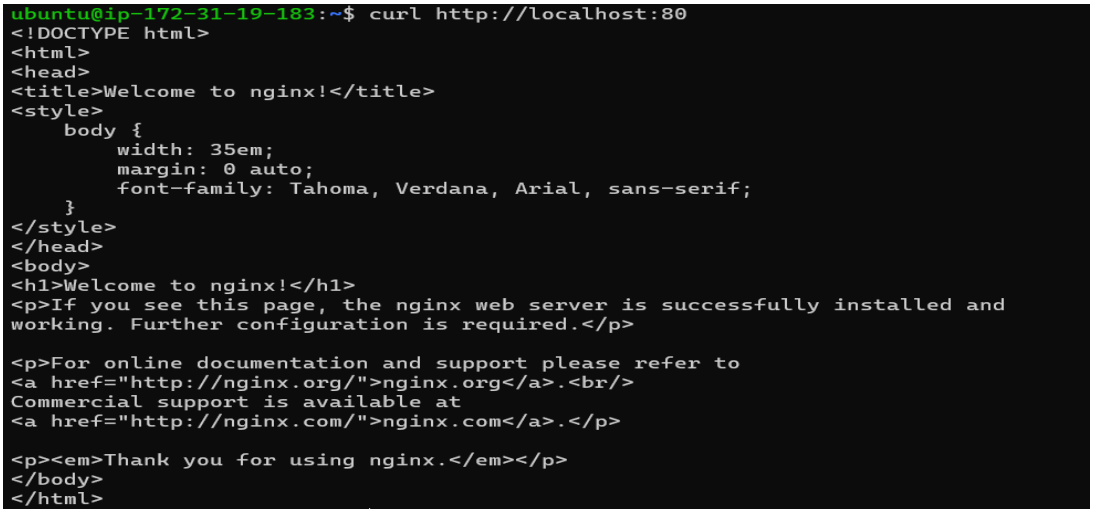
To verify that nginx was successfully installed and is running as a service in Ubuntu as shown below, run:
$sudo systemctl status nginx



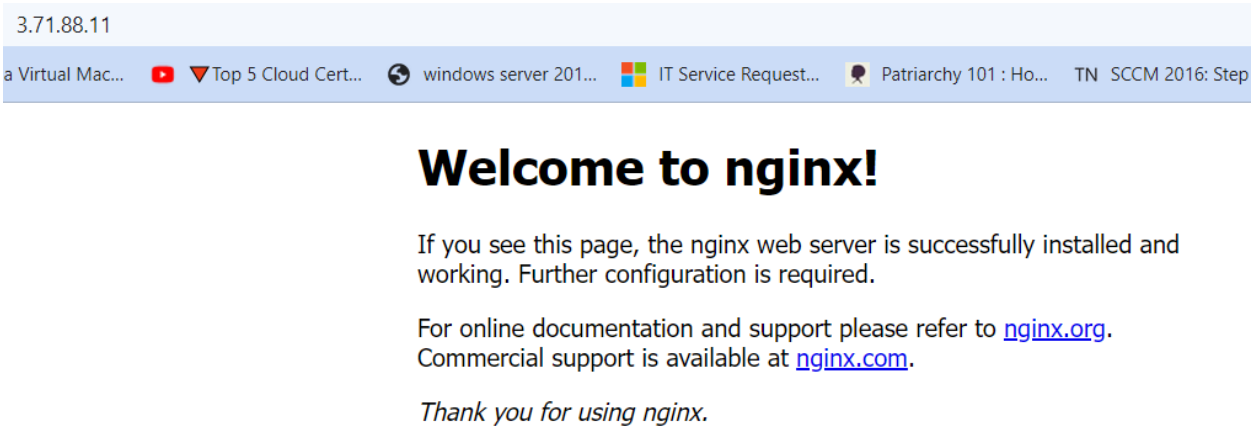
First, let us try to check how we can access it locally in our Ubuntu shell, run the command:

$ curl http://localhost:80

Then the image below is what you should get



Another way to find out is to go to your AWS console, from the instance copy the public ipv4 ip address and paste in your browser, please remember its http not https before the ip address as its http port the we allowed access from.



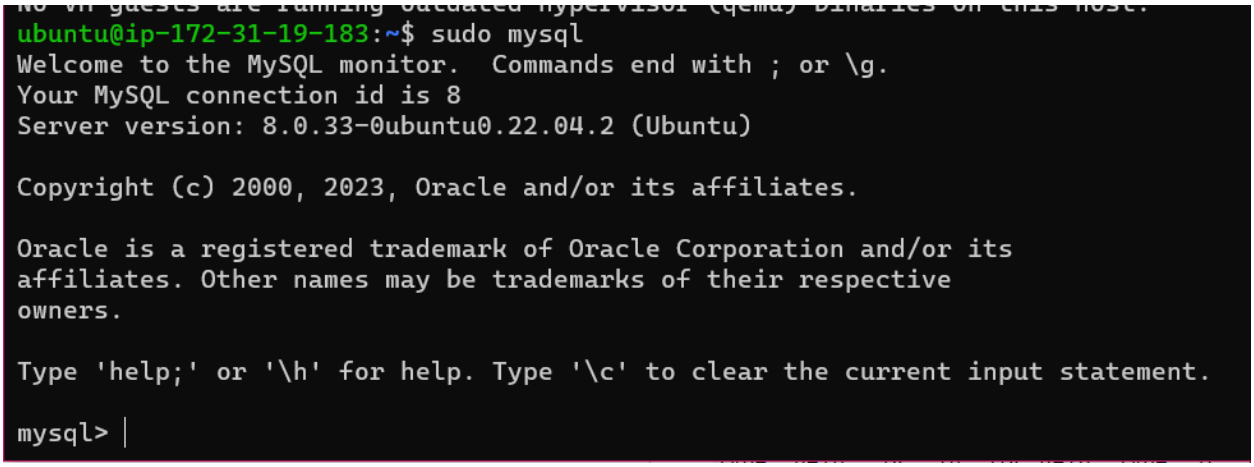
STEP 3 Installing SQL then we have to install SQL using the commands

```
➢  sudo apt install mysql-server
➢  sudo MySQL
```

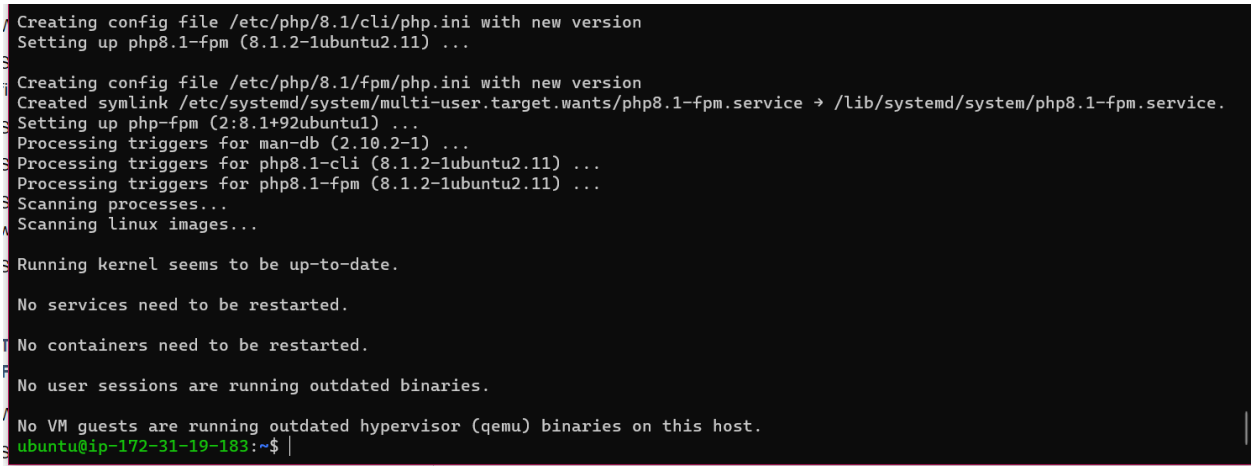
Then the screenshot below confirms sql has been installed

Then run this command **mysql> exit**

To return to the cli



STEP 4 Installing php is what next we have to do and that is accomplished by using the command: **sudo apt install php-fpm php-mysql**



STEP 5 Configuring Ngnix To Use Php Processor by running the command in bold.

Create the root web directory.

sudo mkdir /var/www/projectLEMP

This assigns ownership of the directory with the $USER environment variable, which will reference your current system user

sudo chown -R $USER:$USER /var/www/projectLEMP

This opens a new configuration file in Nginx's sites-available directory, This will create a new blank file.

sudo nano /etc/nginx/sites-available/projectLEMP

Paste in the following bare-bones configuration:

#/etc/nginx/sites-available/projectLEMP

server {

listen 80;

server_name projectLEMP www.projectLEMP;

root /var/www/projectLEMP;

index index.html index.htm index.php;

location / {

try_files $uri $uri/ =404;

```
    }
    location ~ \.php$ {
        include snippets/fastcgi-php.conf;
        fastcgi_pass unix:/var/run/php/php8.1-fpm.sock;
     }
    location ~ /\.ht {
        deny all;
    }
}
```

Activate your configuration by linking to the config file from Nginx's sites-enabled directory:

sudo ln -s /etc/nginx/sites-available/projectLEMP /etc/nginx/sites-enabled/

- Test your configuration for syntax errors by typing:

sudo nginx -t

```
ubuntu@ip-172-31-19-183:~$ sudo mkdir /var/www/projectLEMP
ubuntu@ip-172-31-19-183:~$ sudo chown -R $USER:$USER /var/www/projectLEMP
ubuntu@ip-172-31-19-183:~$ sudo nano /etc/nginx/sites-available/projectLEMP
ubuntu@ip-172-31-19-183:~$ sudo vim /etc/nginx/sites-available/projectLEMP
ubuntu@ip-172-31-19-183:~$ sudo ln -s /etc/nginx/sites-available/projectLEMP /etc/nginx/sites-enabled/
ubuntu@ip-172-31-19-183:~$ sudo nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
```

We need to disable the default Nginx host that is currently configured to listen on port 80, for this run:

sudo unlink /etc/nginx/sites-enabled/default

When you are ready, reload Nginx to apply the changes:

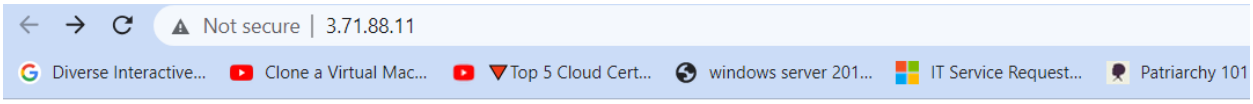
sudo systemctl reload nginx

Create an index.html file in that location so that we can test that your new server block works as expected:

sudo echo 'Hello LEMP from hostname' $(curl -s http://169.254.169.254/latest/meta-data/public-hostname) 'with public IP' $(curl -s http://169.254.169.254/latest/meta-data/public-ipv4) > /var/www/projectLEMP/index.html

```
ubuntu@ip-172-31-19-183:~$ sudo unlink /etc/nginx/sites-enabled/default
ubuntu@ip-172-31-19-183:~$ sudo systemctl reload nginx
ubuntu@ip-172-31-19-183:~$ sudo echo 'Hello LEMP from hostname' $(curl -s http://169.254.169.254/latest/meta-data/public
-hostname) 'with public IP' $(curl -s http://169.254.169.254/latest/meta-data/public-ipv4) > /var/www/projectLEMP/index.
html
ubuntu@ip-172-31-19-183:~$
```

Test your website URL using IP address from the ec2 instance, as shown below (in some cases you might have to put**:80** after the ip address to test):



Hello LEMP from hostname ec2-3-71-88-11.eu-central-1.compute.amazonaws.com with public IP 3.71.88.11

STEP 6 Testing Php With Nginx

At this point, your LAMP stack is completely installed, but we need to test it to validate that Nginx can correctly hand .php files off to your PHP processor by using the command below

sudo nano /var/www/projectLEMP/info.php

Type or paste the following lines into the new file. This is valid PHP code that will return information about your server:

<?php

phpinfo();

You can now access this page in your web browser by going to our browser

http://`ec2-ipaddress`/info.php

System	Linux ip-172-31-19-183 5.19.0-1025-aws #26~22.04.1-Ubuntu SMP Mon Apr 24 01:58:15 UTC 2023 x86_64
Build Date	Feb 22 2023 22:56:18
Build System	Linux
Server API	FPM/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/8.1/fpm
Loaded Configuration File	/etc/php/8.1/fpm/php.ini
Scan this dir for additional .ini files	/etc/php/8.1/fpm/conf.d
Additional .ini files parsed	/etc/php/8.1/fpm/conf.d/10-mysqlnd.ini, /etc/php/8.1/fpm/conf.d/10-opcache.ini, /etc/php/8.1/fpm/conf.d/10-pdo.ini, /etc/php/8.1/fpm/conf.d/20-calendar.ini, /etc/php/8.1/fpm/conf.d/20-ctype.ini, /etc/php/8.1/fpm/conf.d/20-exif.ini, /etc/php/8.1/fpm/conf.d/20-ffi.ini, /etc/php/8.1/fpm/conf.d/20-fileinfo.ini, /etc/php/8.1/fpm/conf.d/20-ftp.ini, /etc/php/8.1/fpm/conf.d/20-gettext.ini, /etc/php/8.1/fpm/conf.d/20-iconv.ini, /etc/php/8.1/fpm/conf.d/20-mysqli.ini, /etc/php/8.1/fpm/conf.d/20-pdo_mysql.ini, /etc/php/8.1/fpm/conf.d/20-phar.ini, /etc/php/8.1/fpm/conf.d/20-posix.ini, /etc/php/8.1/fpm/conf.d/20-readline.ini, /etc/php/8.1/fpm/conf.d/20-shmop.ini, /etc/php/8.1/fpm/conf.d/20-sockets.ini, /etc/php/8.1/fpm/conf.d/20-sysvmsg.ini, /etc/php/8.1/fpm/conf.d/20-sysvsem.ini, /etc/php/8.1/fpm/conf.d/20-sysvshm.ini, /etc/php/8.1/fpm/conf.d/20-tokenizer.ini
PHP API	20210902
PHP Extension	20210902
Zend Extension	420210902
Zend Extension Build	API420210902,NTS
PHP Extension Build	API20210902,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, phar
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, tls, tlsv1.0, tlsv1.1, tlsv1.2, tlsv1.3

Step 7: Retrieving data from mysql database using php
We will be creating a database using mysql which was installed some steps ago. To do this just type the command below

Sudo mysql -p

We are using -p because we have put a password on the mysql module. With out this you would get theerror message you can see in the image below

```
ubuntu@ip-172-31-19-183:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 8.0.33-0ubuntu0.22.04.2 (Ubuntu)

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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> mysql> CREATE DATABASE 'example_database';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version
 for the right syntax to use near 'mysql> CREATE DATABASE 'example_database'' at line 1
mysql> CREATE DATABASE `example_database1`;
Query OK, 1 row affected (0.02 sec)

mysql>
```

```
ubuntu@ip-172-31-19-183:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 8.0.33-0ubuntu0.22.04.2 (Ubuntu)

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

mysql> mysql> CREATE DATABASE 'example_database';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL s
 for the right syntax to use near 'mysql> CREATE DATABASE 'example_database'' at line 1
mysql> CREATE DATABASE `example_database1`;
Query OK, 1 row affected (0.02 sec)

mysql> CREATE USER 'example_user'@'%' IDENTIFIED WITH mysql_native_password BY 'password';
ERROR 1819 (HY000): Your password does not satisfy the current policy requirements
mysql> CREATE USER 'example_user'@'%' IDENTIFIED WITH mysql_native_password BY 'passworD1';
ERROR 1819 (HY000): Your password does not satisfy the current policy requirements
mysql> CREATE USER 'example_user'@'%' IDENTIFIED WITH mysql_native_password BY 'passworD1.';
Query OK, 0 rows affected (0.00 sec)

mysql>
```

You can test if the new user has the proper permissions by logging in to the MySQL console again, this time using the custom user credentials:

```
ubuntu@ip-172-31-19-183:~$ mysql -u example_user -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 20
Server version: 8.0.33-0ubuntu0.22.04.2 (Ubuntu)

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owners.

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

mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| example_database1  |
| information_schema |
| performance_schema |
+--------------------+
3 rows in set (0.02 sec)

mysql>
```

To confirm that the data was successfully saved to your table, run:

Mysql > SELECT * FROM example_database.todo_list;

You'll see the following output:

```
mysql> INSERT INTO example_database1.todo_list (content) VALUES ("My first important item");
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO example_database1.todo_list (content) VALUES ("My second important item");
Query OK, 1 row affected (0.00 sec)

mysql> INSERT INTO example_database1.todo_list (content) VALUES ("My third important item");
Query OK, 1 row affected (0.01 sec)

mysql> INSERT INTO example_database1.todo_list (content) VALUES ("My fourth important item");
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM example_database1.todo_list;
+---------+--------------------------+
| item_id | content                  |
+---------+--------------------------+
|       1 | My first important item  |
|       2 | My second important item |
|       3 | My third important item  |
|       4 | My fourth important item |
+---------+--------------------------+
4 rows in set (0.00 sec)

mysql>
```

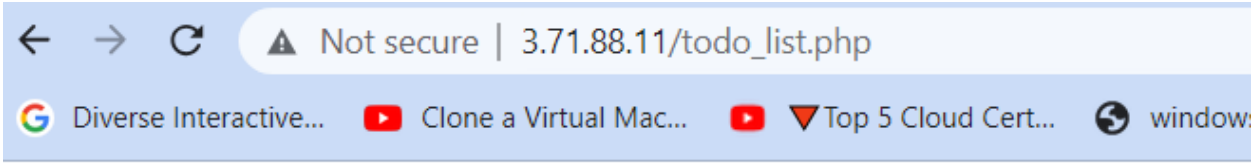
The following PHP script connects to the MySQL database and queries for the content of the todo_list table, displays the results in a list. If there is a problem with the database connection, it will throw an exception.

Copy this content into your todo_list.php script:

```
 GNU nano 6.2                                /var/www/projectLEMP/todo_list.php *
<?php
$user = "example_user";
$password = "passworD"1;
$database = "example_database1";
$table = "todo_list";

try {
  $db = new PDO("mysql:host=localhost;dbname=$database", $user, $password);
  echo "<h2>TODO</h2><ol>";
  foreach($db->query("SELECT content FROM $table") as $row) {
    echo "<li>" . $row['content'] . "</li>";
  }
  echo "</ol>";
} catch (PDOException $e) {
    print "Error!: " . $e->getMessage() . "<br/>";
    die();
}
```

You can now access this page in your web browser by visiting the domain name or public IP address configured for your website, followed by /todo_list.php:



TODO

1. My first important item
2. My second important item
3. My third important item
4. My fourth important item