



DevOps PBL Project 1 Report

Darey.io - DevOps Project Based Learning Project 1
Documentation

JULY 2022

LAMP STACK IMPLEMENTATION

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STEP 0 – Web Stack Implementation (LAMP Stack) in AWS

A technology stack is a set of frameworks and tools used to develop a software product. This set of frameworks and tools are very specifically chosen to work together in creating a well-functioning software. They are acronymns for individual technologies used together for a specific technology product. some examples are...

- **LAMP** (Linux, Apache, MySQL, PHP or Python, or Perl)
- **LEMP** (Linux, Nginx, MySQL, PHP or Python, or Perl)
- **MERN** (MongoDB, ExpressJS, ReactJS, NodeJS)
- **MEAN** (MongoDB, ExpressJS, AngularJS, NodeJS)

Our goal in this section is to:

1. Register and setup a FREE AWS account.
2. Create a new AWS EC2 Instance
3. Setup and Provision an Ubuntu Server
4. Connect to an EC2 instance



Explore Free Tier products with a new AWS account.

To learn more, visit aws.amazon.com/free.



Sign up for AWS

Root user email address
Used for account recovery and some administrative functions

AWS account name
Choose a name for your account. You can change this name in your account settings after you sign up.

Verify email address

OR

Sign in to an existing AWS account

Step 0 of 1 - Creating an aws account. Type in an email address and suitable AWS console name and click verify email address. Sign in to the email account and verify your account.



Sign in

☒ Root user

Account owner that performs tasks requiring unrestricted access. [Learn more](#)

☐ IAM user

User within an account that performs daily tasks. [Learn more](#)

Root user email address

Next

By continuing, you agree to the [AWS Customer Agreement](#) or other agreement for AWS services, and the [Privacy Notice](#). This site uses essential cookies. See our [Cookie Notice](#) for more information.

New to AWS?

Create a new AWS account

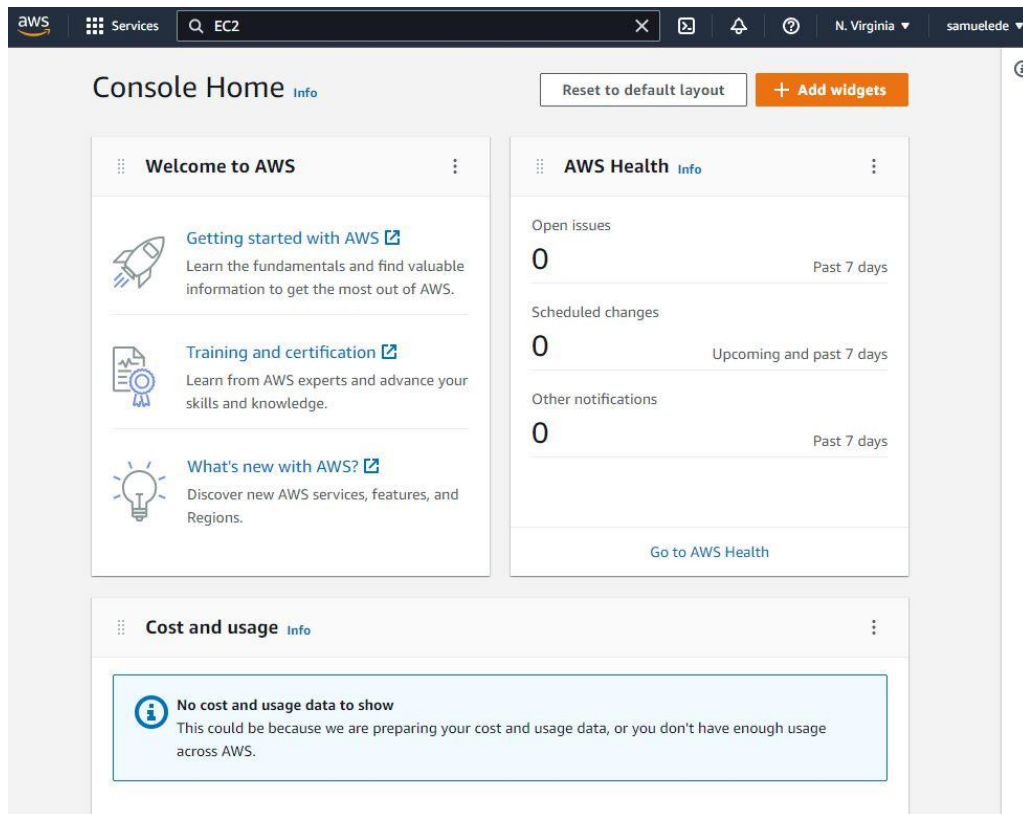
Amazon ElastiCache

Boost application performance, unlock microsecond latency and scale

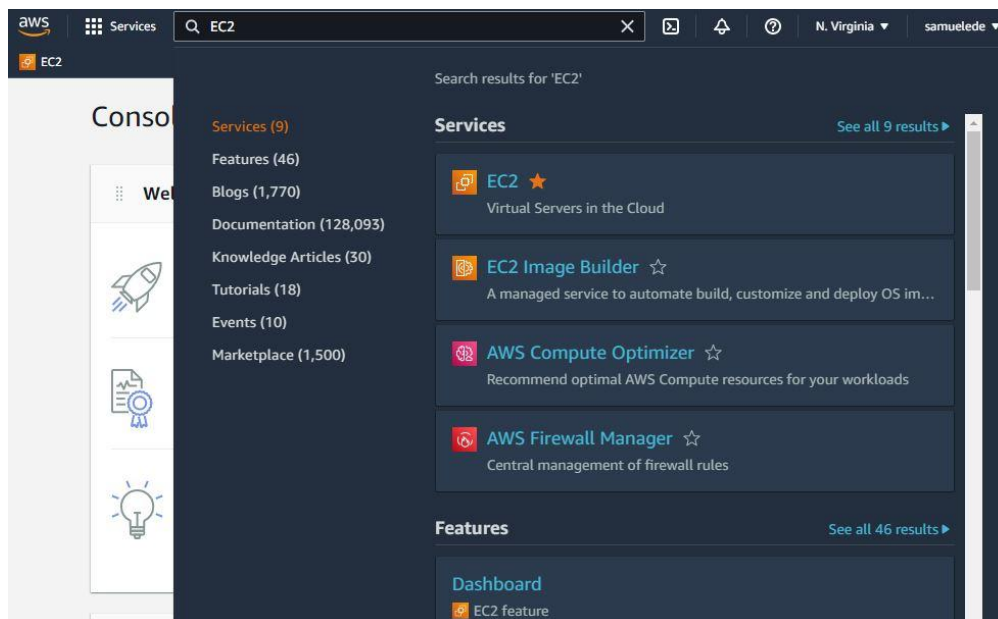
LEARN MORE



Step 0 of 2 - sign in to AWS account using new root user email after clicking the sign in link



Step 0 of 3 - Overview of the AWS console, Regions, Cost and usage, and other settings. In this case we type in **EC2** in the search bar to find and create a new AWS instance.



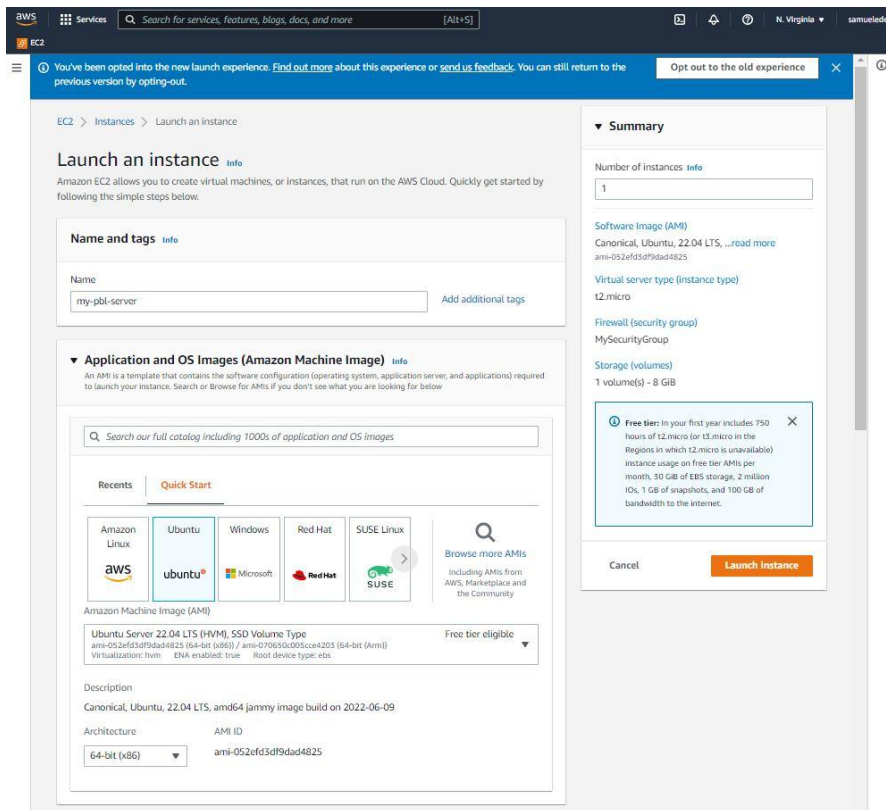
Step 0 of 4 - Select the EC2 instance and also check the star icon to add it to the favorite section of the console homepage.

The screenshot displays the AWS Management Console interface for the EC2 service. The top navigation bar shows the AWS logo, 'Services', a search bar, and the current region 'N. Virginia' (highlighted with a red box and the number '1'). The left sidebar contains a navigation menu with categories like 'New EC2 Experience', 'EC2 Dashboard', 'Instances', 'Images', 'Elastic Block Store', and 'Network & Security'. The 'Launch Instance' button is highlighted with a red box and the number '2'. The main content area is divided into several sections: 'Resources' showing a table of EC2 resources, 'Launch instance' with a 'Launch instance' button, 'Service health' showing the status of the EC2 service, and 'Zones' showing a table of availability zones.

Resource	Count
Instances (running)	0
Elastic IPs	0
Key pairs	1
Placement groups	0
Snapshots	0
Dedicated Hosts	0
Instances	0
Load balancers	0
Security groups	2
Volumes	0

Zone name	Zone ID
us-east-1a	use1-az1
us-east-1b	use1-az2

Step 0 of 5 - Select a preferred region as highlighted in the top right above to select a preferable region and/or change. Next click and select Launch instance as shown in 2.



Step 0 of 6 - Type in a preferred instance name and in the Applications and OS Images section select Ubuntu and the ubuntu server 22.04

Create key pair

✕

Key pairs allow you to connect to your instance securely.

Enter the name of the key pair below. 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](#)

Key pair name

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 (Not supported for Windows instances)

Private key file format

☒ .pem
 For use with OpenSSH

☐ .ppk
 For use with PuTTY

Cancel

Create key pair

Next, click create a key pair and type a key name, select RSA and .pem private key option.

aws Services Search for services, features, blogs, docs, and more [Alt+S] N. Virginia samuelede

EC2

Key pair name - required
pbl-kp Create new key pair

▼ Network settings Get guidance Edit

Network Info
vpc-08a5a75130da27f61

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

Common security groups Info
Select security groups

MySecurityGroup sg-0cc84238c53227d60 VPC: vpc-08a5a75130da27f61

Compare security group rules

Security groups that you add or remove here will be added to or removed from all your network interfaces.

▼ Configure storage Info Advanced

1x 8 GiB gp2 Root volume

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

► Advanced details Info

▼ Summary

Number of instances Info
1

Software Image (AMI)
Canonical, Ubuntu, 22.04 LTS, ...read more
ami-052efd3df9dad4825

Virtual server type (instance type)
t2.micro

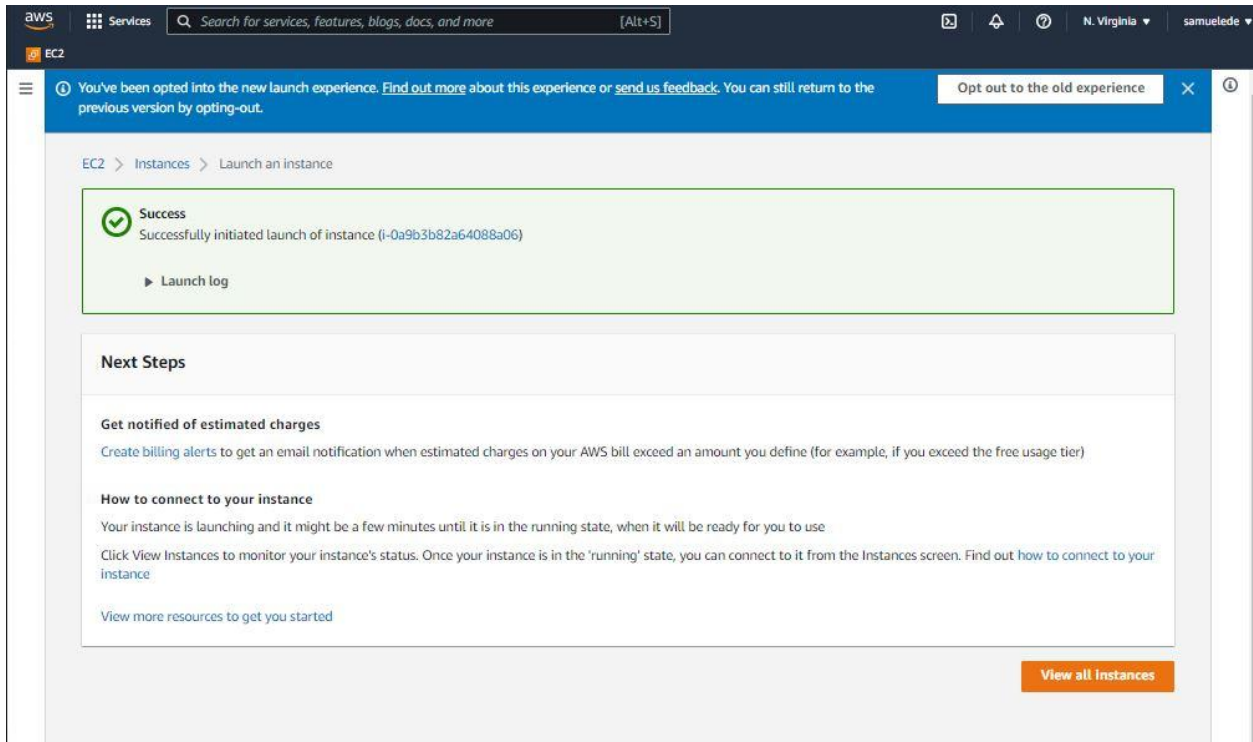
Firewall (security group)
MySecurityGroup

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 I/Os, 1 GB of snapshots, and 100 GB of bandwidth to the internet.

Cancel Launch instance

Step 0 of 7 - Click create new key pair and save the file in your downloads folder and In the Network Settings, click select existing security group previously created from the common security groups drop down, then finally click on Launch Instance.



Step 0 of 8 - After clicking Launch instance, the above page should show up. Next, click View all instances.

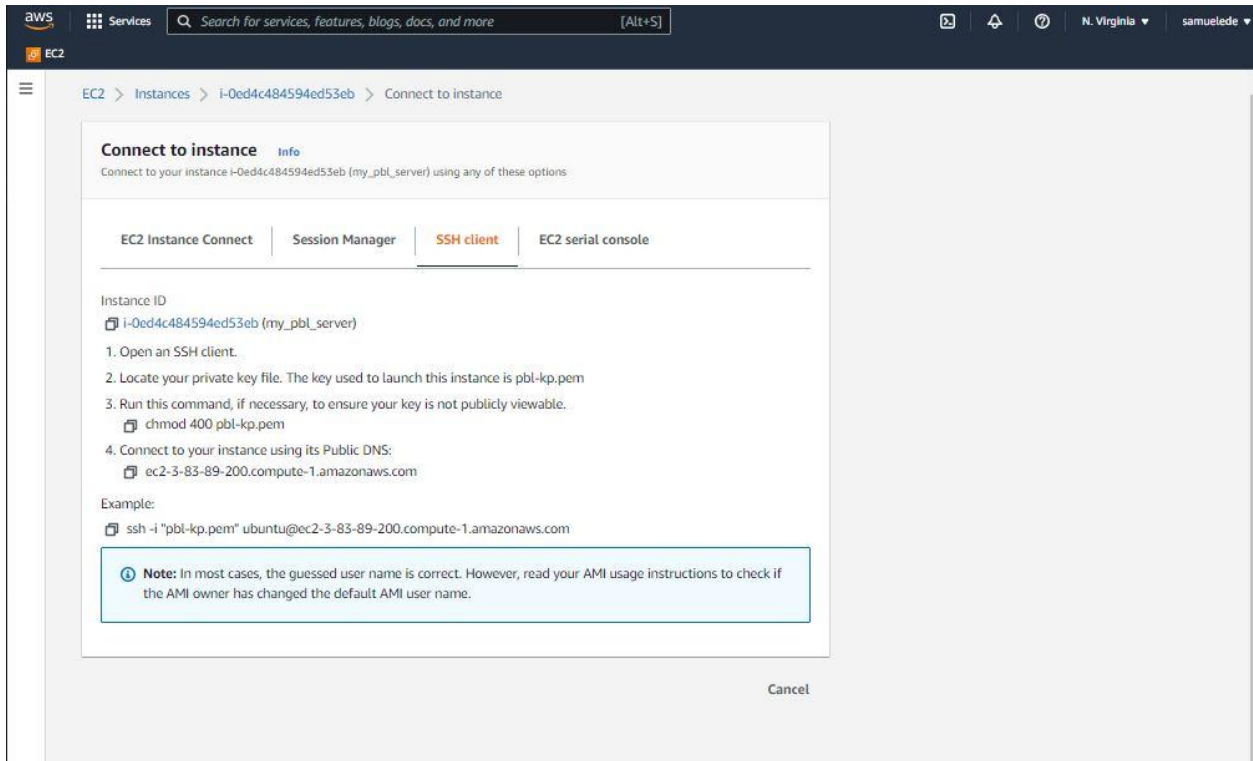
The screenshot shows the AWS Management Console interface for the EC2 service. The left sidebar contains navigation links for various AWS services. The main content area displays the 'Instances (1/1)' page. A table lists the instance 'my-pbl-server' with its ID 'i-0506e2a46f9cc6005' and status 'Running'. Red boxes and numbers highlight specific actions: 1 points to the refresh button, 2 points to the checkbox for selecting the instance, and 3 points to the 'Connect' button. Below the table, the 'Instance: i-0506e2a46f9cc6005 (my-pbl-server)' details are shown, including instance summary, networking, and security information.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability
<input checked="" type="checkbox"/> my-pbl-server	i-0506e2a46f9cc6005	Running	t2.micro	-	No alarms	us-east-1

Instance: i-0506e2a46f9cc6005 (my-pbl-server)

Instance summary Info		
Instance ID i-0506e2a46f9cc6005 (my-pbl-server)	Public IPv4 address 54.210.193.17 open address	Private IPv4 addresses 172.31.87.124
IPv6 address -	Instance state Running	Public IPv4 DNS ec2-54-210-193-17.compute-1.amazonaws.com open address
Hostname type IP name: ip-172-31-87-124.ec2.internal	Private IP DNS name (IPv4 only) ip-172-31-87-124.ec2.internal	Elastic IP addresses -
Answer private resource DNS name IPv4 (A)	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for recommendations. Learn more
Auto-assigned IP address 54.210.193.17 [Public IP]	VPC ID vpc-08a5a75130da27f61	Auto Scaling Group name -
IAM Role -	Subnet ID subnet-0a62d412a5c24eed1	Monitoring disabled
Instance details Info		
Platform Ubuntu (Inferred)	AMI ID ami-052efd3df9dad4825	Termination protection Disabled
Platform details Linux/UNIX	AMI name ubuntu/images/hvm-ssd/ubuntu-jammy-22.04-amd64-server-20220609	

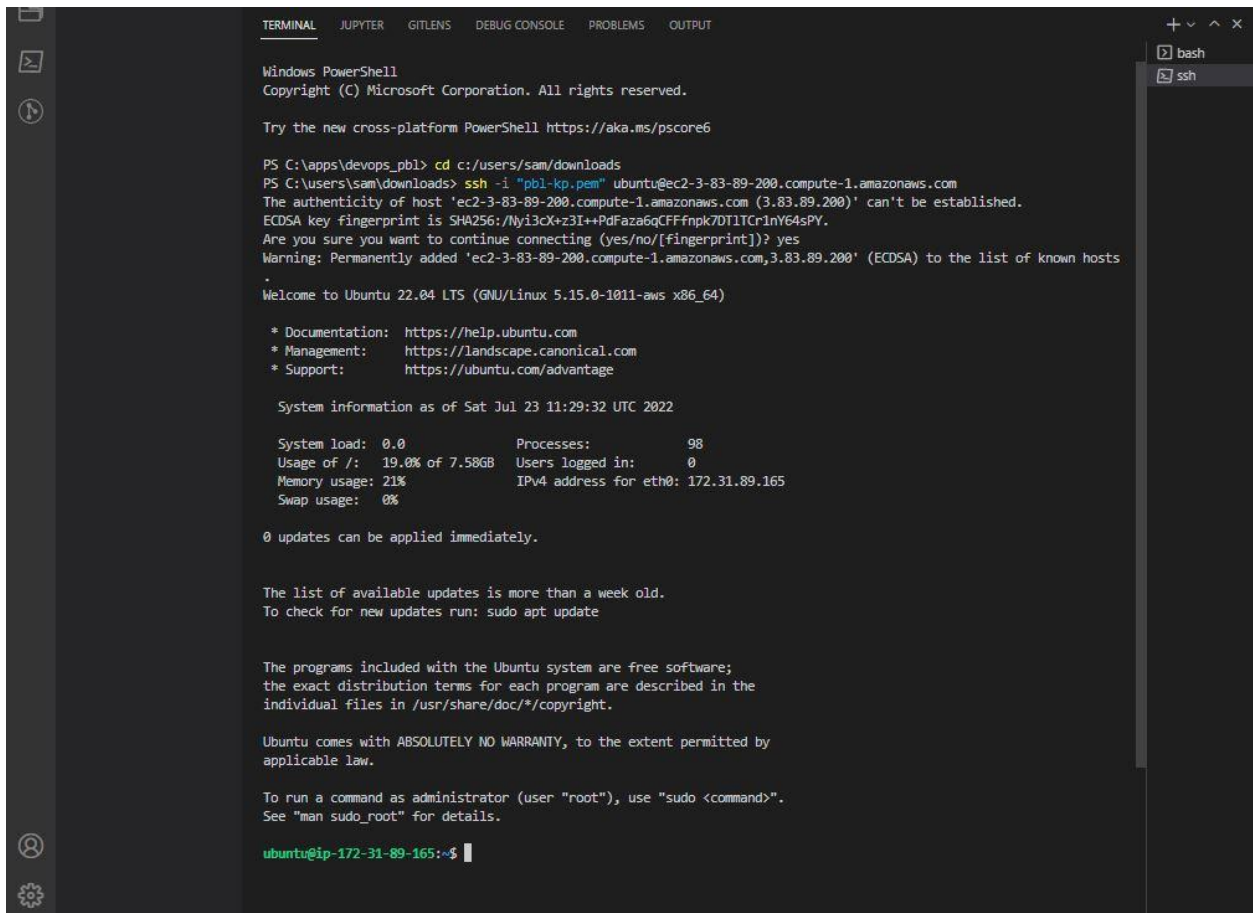
Step 0 of 9 - The above image shows the resulting features. To check the status of the server, click on the refresh button as in 1, then click the checkbox as in 2 above to view the server details below and finally click **connect** as in 3 above to connect to the Server.



Step 0 of 10 - After clicking connect, select the SSH client tab. The above details would be visible. Click on the copy icon beside

```
ssh -i "<yourpemkeyname.pem" ubuntu@ec2-<ip address>.compute-1.amazon.com
```

This is used in our ssh client to connect remotely to our server.



```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\apps\devops_pbl> cd c:/users/sam/downloads
PS C:\users\sam\downloads> ssh -i "pbl-kp.pem" ubuntu@ec2-3-83-89-200.compute-1.amazonaws.com
The authenticity of host 'ec2-3-83-89-200.compute-1.amazonaws.com (3.83.89.200)' can't be established.
ECDSA key fingerprint is SHA256:/Myi3cX+z3I++PdFaza6qCFFfnPk7DIITCr1nY64sPY.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-3-83-89-200.compute-1.amazonaws.com,3.83.89.200' (ECDSA) to the list of known hosts
.
Welcome to Ubuntu 22.04 LTS (GNU/Linux 5.15.0-1011-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Sat Jul 23 11:29:32 UTC 2022

System load:  0.0               Processes:    98
Usage of /:   19.0% of 7.58GB   Users logged in:  0
Memory usage: 21%              IPv4 address for eth0: 172.31.89.165
Swap usage:   0%

0 updates can be applied immediately.

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-89-165:~$
```

Step 0 of 11 - Open your preferred terminal and change directory to your stored .pem key location as shown above, if stored in the downloads folder type command `Cd c:/users/<pcname>/downloads` and hit enter. Then type the command `ssh -i "<yourpemkeyname.pem" ubuntu@ec2-<ip address>.compute-1.amazon.com` On the command line and hit enter. A green prompt with our server ip should pop up as shown in the above image.

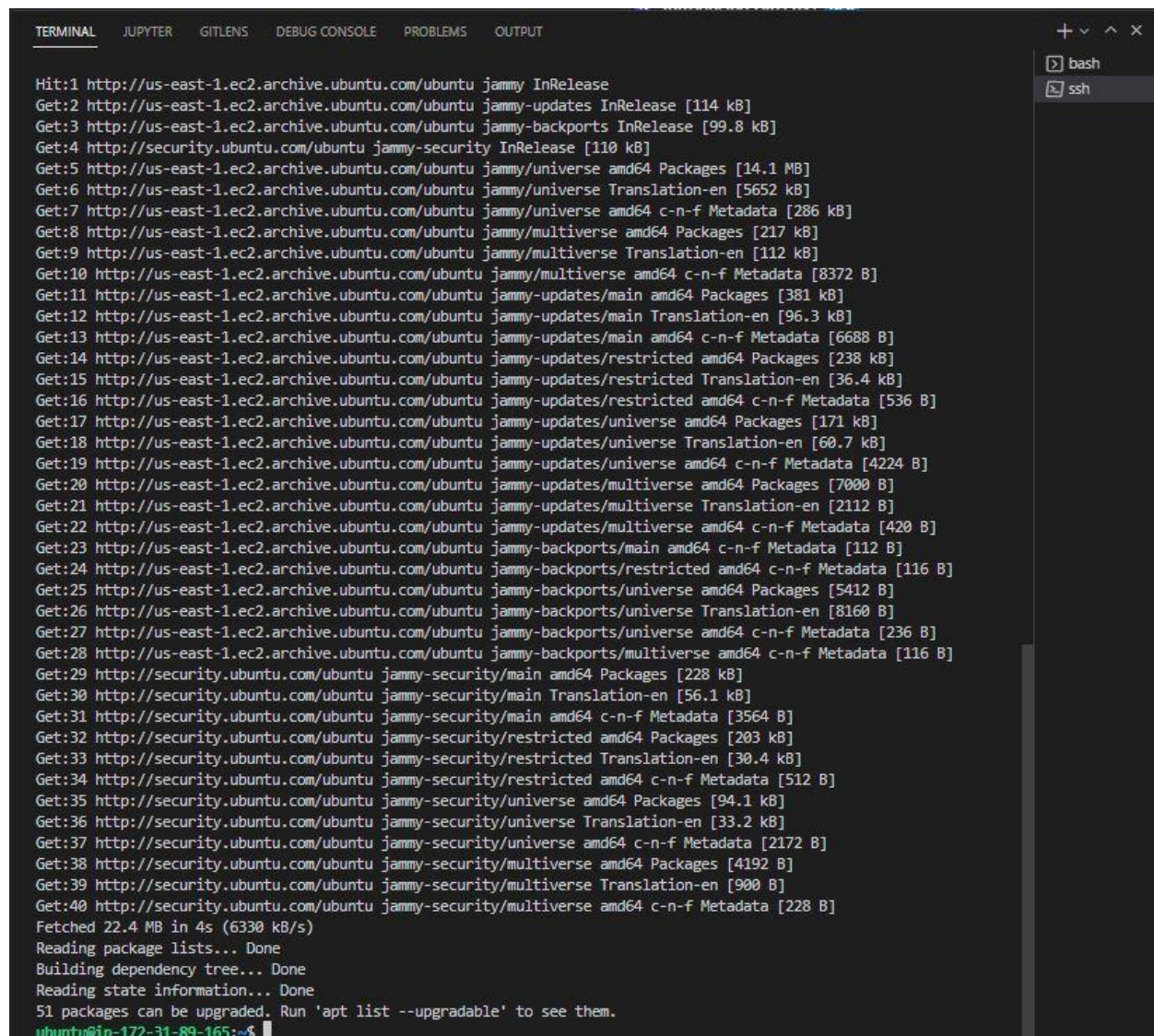
The objective of these steps are to setup our server environment to enable us install the necessary prerequisites, application software, databases and other software deployment tools to be used for deployment and hosting of our websites or software applications.

Step 1 – Installing apache and updating firewall

[Apache HTTP Server](#) is the most widely used web server software. Developed and maintained by Apache Software Foundation, Apache is an open source software available for free. It runs on 67% of all web servers in the world.

Our goal with this installation is to:

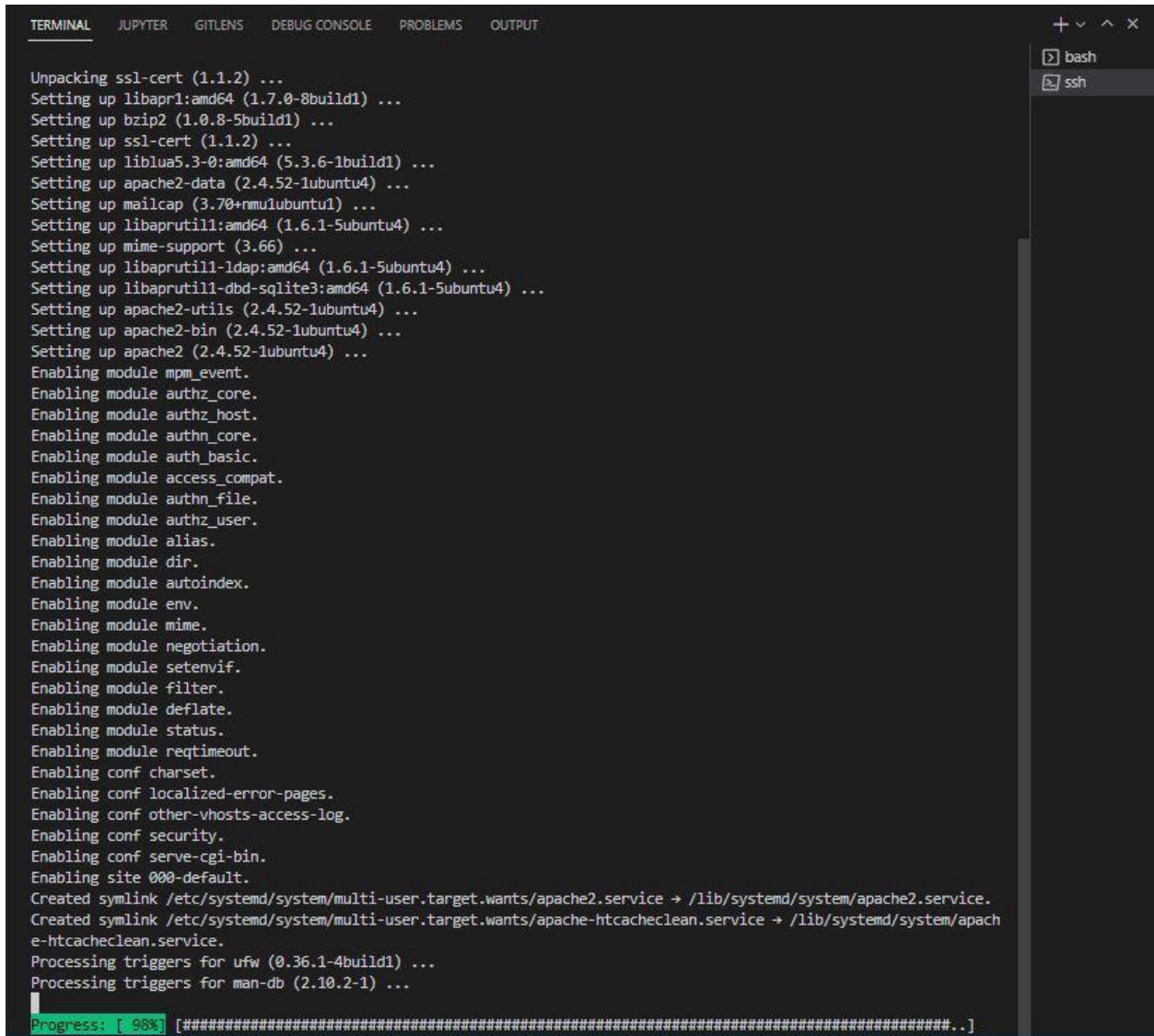
1. Install an apache server on our ubuntu virtual machine
2. Configure the server and set firewall rules



```
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [114 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [99.8 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [381 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [96.3 kB]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metadata [6688 B]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [238 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [36.4 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 c-n-f Metadata [536 B]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [171 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [60.7 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [4224 B]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [7000 B]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [2112 B]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [420 B]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [112 B]
Get:24 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]
Get:25 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [5412 B]
Get:26 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [8160 B]
Get:27 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [236 B]
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 c-n-f Metadata [116 B]
Get:29 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [228 kB]
Get:30 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [56.1 kB]
Get:31 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [3564 B]
Get:32 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [203 kB]
Get:33 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [30.4 kB]
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f Metadata [512 B]
Get:35 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [94.1 kB]
Get:36 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [33.2 kB]
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [2172 B]
Get:38 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [4192 B]
Get:39 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [900 B]
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [228 B]
Fetched 22.4 MB in 4s (6330 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
51 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-89-165:~$
```

Step 1 of 1 - Type the following in your recently launched command line

`sudo apt update` this would update the list of packages available in our ubuntu box as shown above.



```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT

Unpacking ssl-cert (1.1.2) ...
Setting up libapr1:amd64 (1.7.0-8build1) ...
Setting up bzip2 (1.0.8-5build1) ...
Setting up ssl-cert (1.1.2) ...
Setting up liblua5.3-0:amd64 (5.3.6-1build1) ...
Setting up apache2-data (2.4.52-1ubuntu4) ...
Setting up mailcap (3.70+nmu1ubuntu1) ...
Setting up libaprutil1:amd64 (1.6.1-5ubuntu4) ...
Setting up mime-support (3.66) ...
Setting up libaprutil1-ldap:amd64 (1.6.1-5ubuntu4) ...
Setting up libaprutil1-dbd-sqlite3:amd64 (1.6.1-5ubuntu4) ...
Setting up apache2-utils (2.4.52-1ubuntu4) ...
Setting up apache2-bin (2.4.52-1ubuntu4) ...
Setting up apache2 (2.4.52-1ubuntu4) ...
Enabling module mpm_event.
Enabling module authz_core.
Enabling module authz_host.
Enabling module authn_core.
Enabling module auth_basic.
Enabling module access_compat.
Enabling module authn_file.
Enabling module authz_user.
Enabling module alias.
Enabling module dir.
Enabling module autoindex.
Enabling module env.
Enabling module mime.
Enabling module negotiation.
Enabling module setenvif.
Enabling module filter.
Enabling module deflate.
Enabling module status.
Enabling module reqtimeout.
Enabling conf charset.
Enabling conf localized-error-pages.
Enabling conf other-vhosts-access-log.
Enabling conf security.
Enabling conf serve-cgi-bin.
Enabling site 000-default.
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apach
e-htcacheclean.service.
Processing triggers for ufw (0.36.1-4build1) ...
Processing triggers for man-db (2.10.2-1) ...

Progress: [ 98%] [#####..]
```

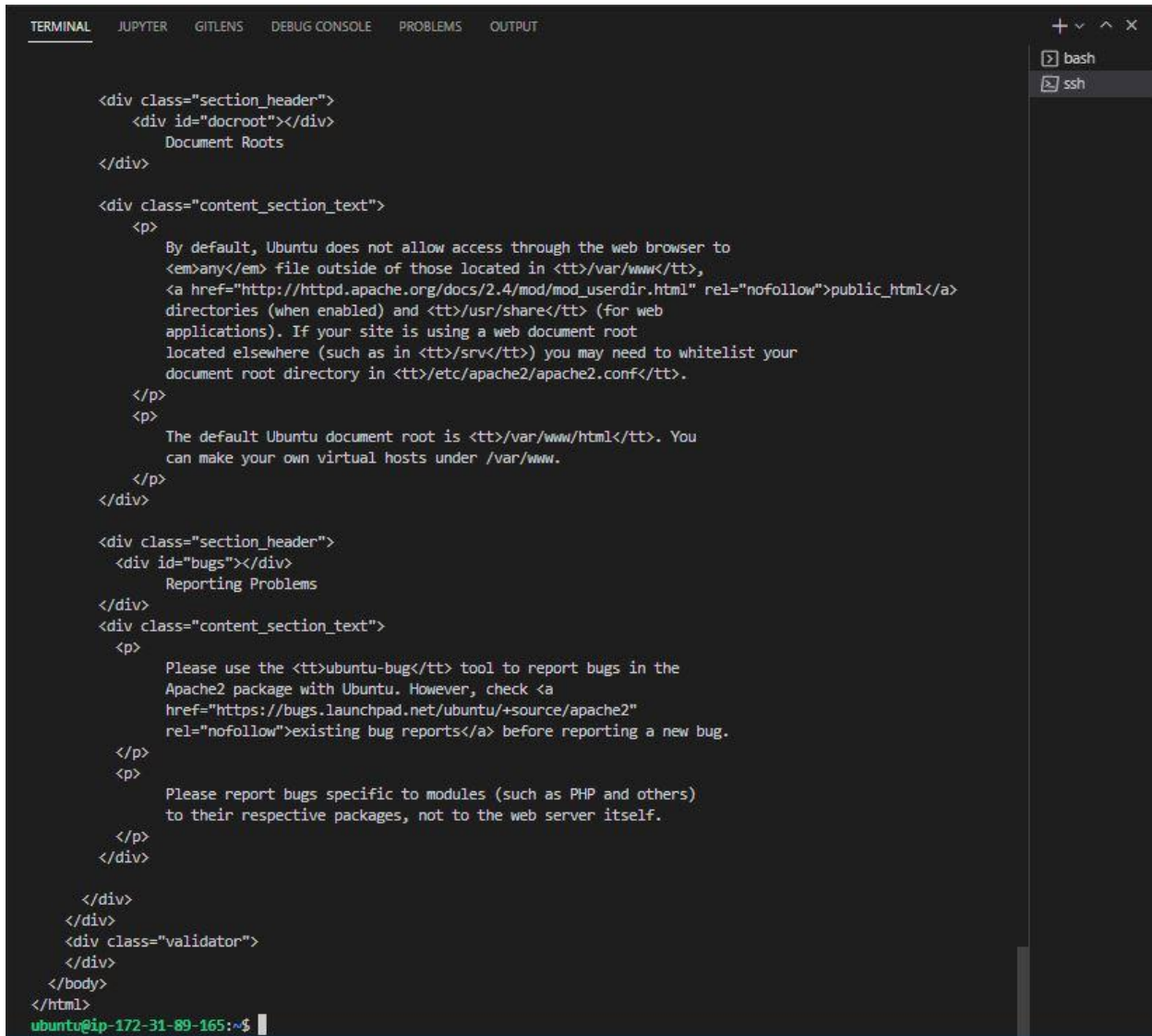
Step 1 of 2 - Next type in `sudo apt install apache2` and hit enter. The resulting page should look like the above image.

```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT

Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [171 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [60.7 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [4224 B]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [7000 B]
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Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [228 B]
Fetched 22.4 MB in 4s (6330 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
51 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-89-165:~$ 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 Sat 2022-07-23 11:54:50 UTC; 5min ago
     Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 1940 (apache2)
     Tasks: 55 (limit: 1146)
    Memory: 5.0M
       CPU: 45ms
    CGroup: /system.slice/apache2.service
            └─1940 /usr/sbin/apache2 -k start
              └─1942 /usr/sbin/apache2 -k start
                └─1943 /usr/sbin/apache2 -k start

Jul 23 11:54:50 ip-172-31-89-165 systemd[1]: Starting The Apache HTTP Server...
Jul 23 11:54:50 ip-172-31-89-165 systemd[1]: Started The Apache HTTP Server.
ubuntu@ip-172-31-89-165:~$
```

Step 1 of 3 - Next type `systemctl status apache2` to verify the status of the running apache service. A green active status would confirm the status of our installed apache server in the cloud.



```
TERMINAL JUPYTER GITLENS DEBUG CONSOLE PROBLEMS OUTPUT

<div class="section_header">
  <div id="docroot"></div>
  Document Roots
</div>

<div class="content_section_text">
  <p>
    By default, Ubuntu does not allow access through the web browser to
    <em>any</em> file outside of those located in <tt>/var/www</tt>,
    <a href="http://httpd.apache.org/docs/2.4/mod/mod_userdir.html" rel="nofollow">public_html</a>
    directories (when enabled) and <tt>/usr/share</tt> (for web
    applications). If your site is using a web document root
    located elsewhere (such as in <tt>/srv</tt>) you may need to whitelist your
    document root directory in <tt>/etc/apache2/apache2.conf</tt>.
  </p>
  <p>
    The default Ubuntu document root is <tt>/var/www/html</tt>. You
    can make your own virtual hosts under /var/www.
  </p>
</div>

<div class="section_header">
  <div id="bugs"></div>
  Reporting Problems
</div>
<div class="content_section_text">
  <p>
    Please use the <tt>ubuntu-bug</tt> tool to report bugs in the
    Apache2 package with Ubuntu. However, check <a
    href="https://bugs.launchpad.net/ubuntu/+source/apache2"
    rel="nofollow">existing bug reports</a> before reporting a new bug.
  </p>
  <p>
    Please report bugs specific to modules (such as PHP and others)
    to their respective packages, not to the web server itself.
  </p>
</div>

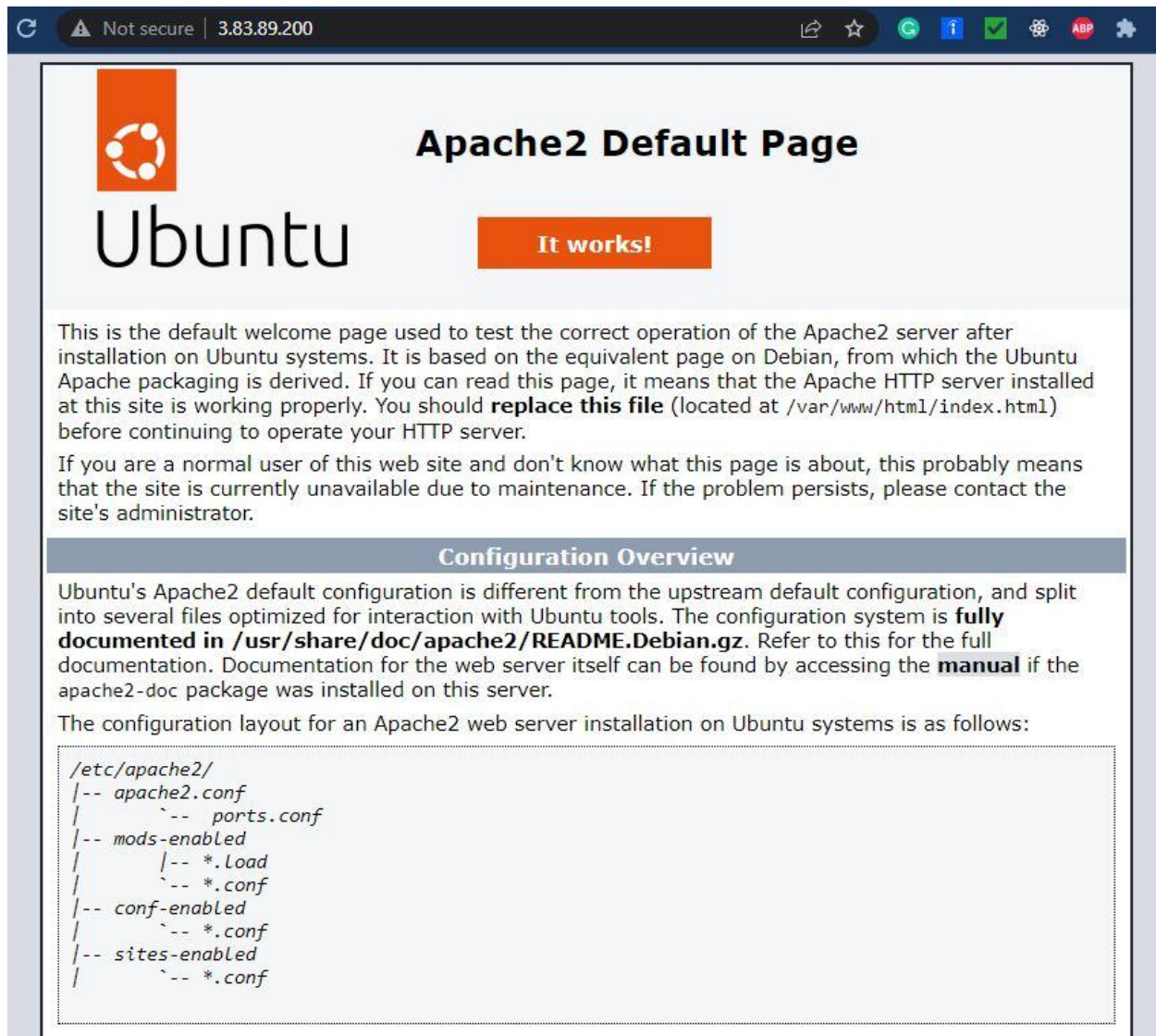
</div>
</div>
<div class="validator">
</div>
</body>
</html>
ubuntu@ip-172-31-89-165:~$
```

Step 1 of 4 - To verify and access our server locally on our ubuntu command line, type the following:

```
curl http://localhost:80 or curl http://127.0.0.1:80
```

The above image shows the content of the resulting html file that can be viewed publicly.

The 'curl' command indicates to our apache http server on port 80 to request for the server default page.



Step 1 of 5 - to test our server default page on a browser, open a browser and type in `http://<public-ip-address>: 80` using the ip address provided after our instance was created. The 80 means the default port used by browsers to connect to our apache web server. The resulting page should look like the image above.

```
ubuntu@ip-172-31-89-165:~$ curl -s http://3.83.89.200/latest/meta-data/public-ipv4
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>404 Not Found</title>
</head><body>
<h1>Not Found</h1>
<p>The requested URL was not found on this server.</p>
<hr>
<address>Apache/2.4.52 (Ubuntu) Server at 3.83.89.200 Port 80</address>
</body></html>
ubuntu@ip-172-31-89-165:~$
```

Step 1 of 6 - Another way to check our ip address rather than through the aws console is to type in `curl -s http://<ip-address>/latest/meta-data/public-ipv4` As shown above.

Step 2 – Installing MySQL

In step 2 we will install a [Database Management System \(DBMS\)](#) to be able to store and manage data for your site in a [relational database](#). [MySQL](#) is a popular relational database management system used within PHP environments, so we will use it in our project.

```
ubuntu@ip-172-31-89-165:~$ sudo apt-get install mysql-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  mysql-client-8.0 mysql-client-core-8.0 mysql-common mysql-server-8.0 mysql-server-core-8.0
Suggested packages:
  mailx tinyca
The following NEW packages will be installed:
  mysql-client-8.0 mysql-client-core-8.0 mysql-common mysql-server mysql-server-8.0 mysql-server-core-8.0
0 upgraded, 6 newly installed, 0 to remove and 0 not upgraded.
Need to get 20.8 MB of archives.
After this operation, 182 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

Step 2 of 1 - type in the following command to begin installation of mysql server

```
sudo apt install mysql-server
```

A prompt will ask to confirm the installation process, type y to proceed.

```
ubuntu@ip-172-31-89-165:~$ sudo service mysql status
• mysql.service - MySQL Community Server
   Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
   Active: active (running) since Sat 2022-07-23 12:28:13 UTC; 32s ago
     Process: 15854 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, status=0/SUCCESS)
    Main PID: 15862 (mysqld)
      Status: "Server is operational"
        Tasks: 38 (limit: 1146)
      Memory: 356.0M
         CPU: 831ms
    CGroup: /system.slice/mysql.service
            └─15862 /usr/sbin/mysqld

Jul 23 12:28:12 ip-172-31-89-165 systemd[1]: Starting MySQL Community Server...
Jul 23 12:28:13 ip-172-31-89-165 systemd[1]: Started MySQL Community Server.
ubuntu@ip-172-31-89-165:~$
```

Step 2 of 2 - type the following command after the installation is complete to confirm mysql server running status. `sudo service mysql status`

A green active status confirms our mysql server installation in the above diagram.

```
ubuntu@ip-172-31-89-165:~$ sudo mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.29-0ubuntu0.22.04.2 (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> ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY 'PassWord.1';
Query OK, 0 rows affected (0.01 sec)

mysql> exit
```

Step 2 of 3 - to login to our installed mysql database server, type `sudo mysql` in the terminal prompt. The above image shows the resulting output and new `mysql>` prompt. Type `exit` to exit the mysql shell.

```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT
Query OK, 0 rows affected (0.01 sec)

mysql> exit
Bye
ubuntu@ip-172-31-89-165:~$ 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: y

There are three levels of password validation policy:

LOW      Length >= 8
MEDIUM  Length >= 8, numeric, mixed case, and special characters
STRONG Length >= 8, numeric, mixed case, special characters and dictionary      file

Please enter 0 = LOW, 1 = MEDIUM and 2 = STRONG: 1
Using existing password for root.

Estimated strength of the password: 100
Change the password for root ? ((Press y|Y for Yes, any other key for No) : y

New password:

Re-enter new password:
Sorry, passwords do not match.

New password:

Re-enter new password:

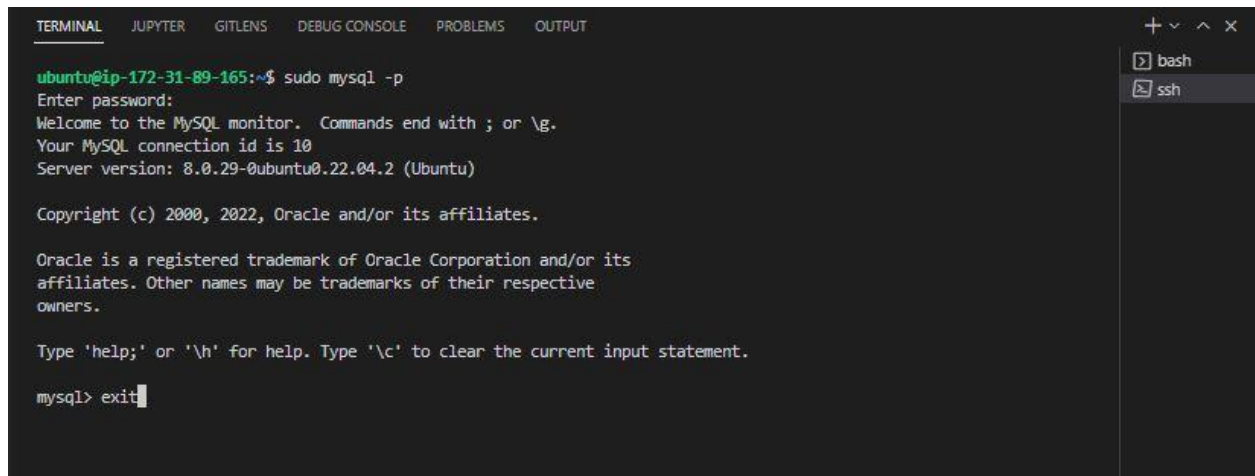
Estimated strength of the password: 100
Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : y
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only 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) : Y
Success.

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) : y
Success.
```

Step 2 of 4 - To make our sql server more secure with a password, we use the following command to achieve this. `sudo mysql_secure_installation`
Answer `y` for yes and/or anything else. Follow the prompts and type in a secure password to complete the process as shown above.



```
ubuntu@ip-172-31-89-165:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 10
Server version: 8.0.29-0ubuntu0.22.04.2 (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.

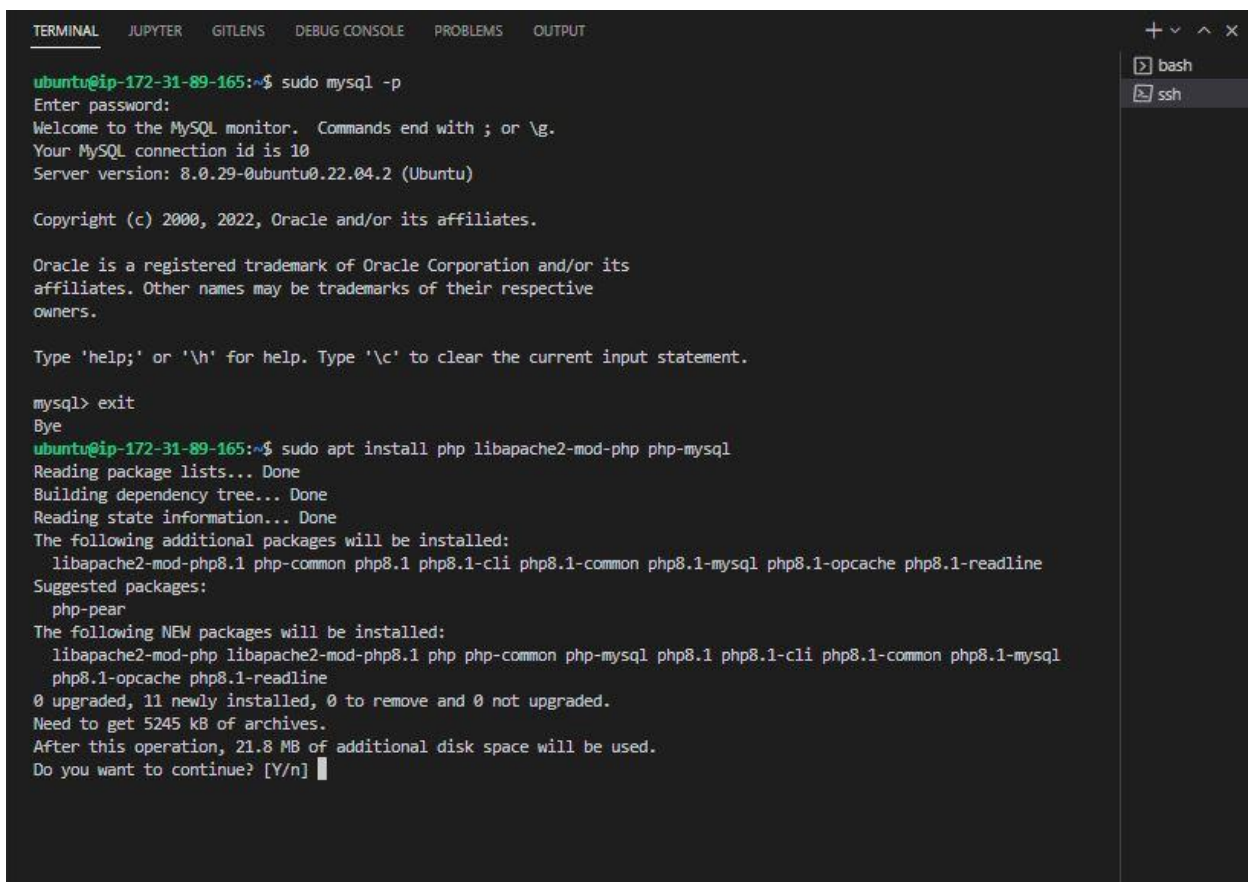
mysql> exit
```

Step 2 of 5 - To login securely to our mysql console, type `sudo mysql -p` in the command line and type in the newly specified password. The above shows the result of the command. Type `exit` to close the mysql console.

This would always prompt for a password everytime we want to access the mysql console.

Step 3 – Installing PHP

Now that we have Apache installed to serve your content and MySQL installed to store and manage your data. **PHP** is the component of our setup that will process code to display dynamic content to the end user. In addition to the `php` package, you'll need `php-mysql`, a PHP module that allows PHP to communicate with MySQL-based databases. You'll also need `libapache2-mod-php` to enable Apache to handle PHP files. Core PHP packages will automatically be installed as dependencies.



```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT
ubuntu@ip-172-31-89-165:~$ sudo mysql -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 10
Server version: 8.0.29-0ubuntu0.22.04.2 (Ubuntu)

Copyright (c) 2000, 2022, Oracle and/or its affiliates.

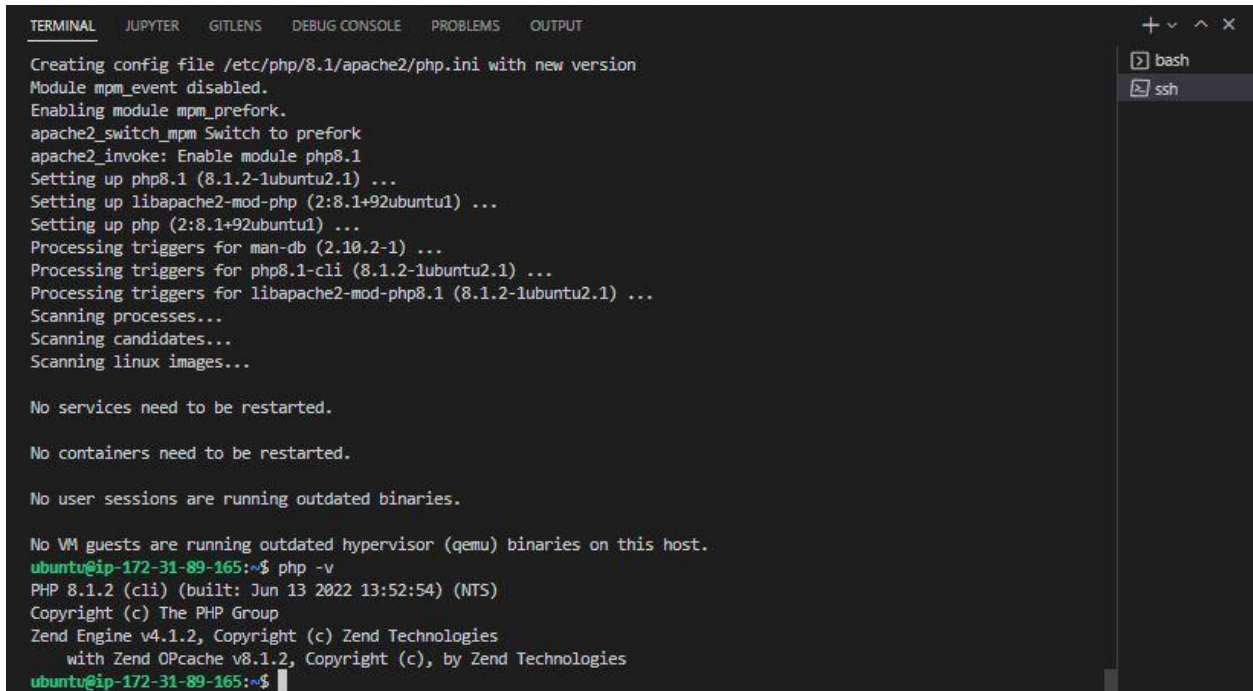
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

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

mysql> exit
Bye
ubuntu@ip-172-31-89-165:~$ 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:
  libapache2-mod-php8.1 php-common php8.1 php8.1-cli php8.1-common php8.1-mysql php8.1-opcache php8.1-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php8.1 php php-common php-mysql php8.1 php8.1-cli php8.1-common php8.1-mysql
  php8.1-opcache php8.1-readline
0 upgraded, 11 newly installed, 0 to remove and 0 not upgraded.
Need to get 5245 kB of archives.
After this operation, 21.8 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

Step 3 of 1 - To install php type the following command

`sudo apt install php libapache2-mod-php php-mysql` in the ssh prompt to begin the installation process. The above shows the next steps, type `y` at the prompt to confirm yes and proceed.



```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT
Creating config file /etc/php/8.1/apache2/php.ini with new version
Module mpm_event disabled.
Enabling module mpm_prefork.
apache2_switch_mpm Switch to prefork
apache2_invoke: Enable module php8.1
Setting up php8.1 (8.1.2-1ubuntu2.1) ...
Setting up libapache2-mod-php (2:8.1+92ubuntu1) ...
Setting up php (2:8.1+92ubuntu1) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for php8.1-cli (8.1.2-1ubuntu2.1) ...
Processing triggers for libapache2-mod-php8.1 (8.1.2-1ubuntu2.1) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-89-165:~$ php -v
PHP 8.1.2 (cli) (built: Jun 13 2022 13:52:54) (NTS)
Copyright (c) The PHP Group
Zend Engine v4.1.2, Copyright (c) Zend Technologies
with Zend OPcache v8.1.2, Copyright (c), by Zend Technologies
ubuntu@ip-172-31-89-165:~$
```

Step 3 of 2 - Once the installation is complete type `php -v` to confirm the php version as shown above.

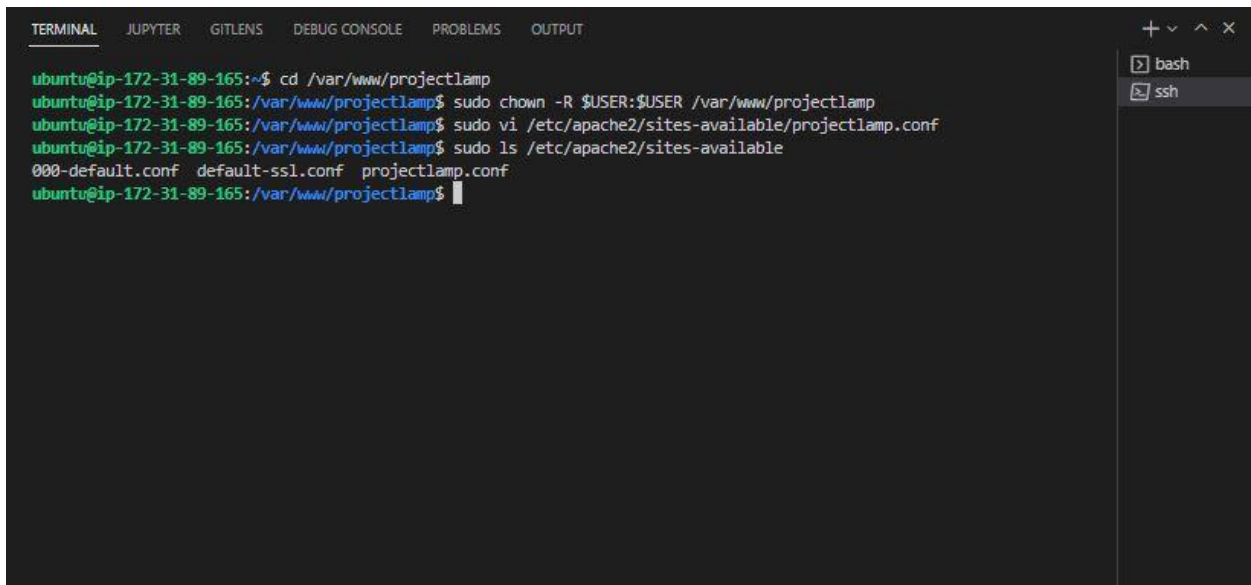
After this, we would have successfully installed all components of the LAMP (Linux, Apache, MySQL, PHP) stack.

Step 4 – Creating a Website Virtual Host using APACHE

In step 4, we will set up a domain called `projectlamp`, but you can replace this with any domain of your choice.

Apache on Ubuntu 20.04 has one server block enabled by default that is configured to serve documents from the `/var/www/html` directory.

We will leave this configuration as is and will add our own directory next next to the default one.

A terminal window with a dark background and light green text. The terminal shows a series of commands being executed in a shell. The commands are: `cd /var/www/projectlamp`, `sudo chown -R $USER:$USER /var/www/projectlamp`, `sudo vi /etc/apache2/sites-available/projectlamp.conf`, and `sudo ls /etc/apache2/sites-available`. The output of the last command shows three files: `000-default.conf`, `default-ssl.conf`, and `projectlamp.conf`. The terminal window has tabs at the top labeled 'TERMINAL', 'JUPYTER', 'GITLENS', 'DEBUG CONSOLE', 'PROBLEMS', and 'OUTPUT'. On the right side, there are icons for 'bash' and 'ssh'.

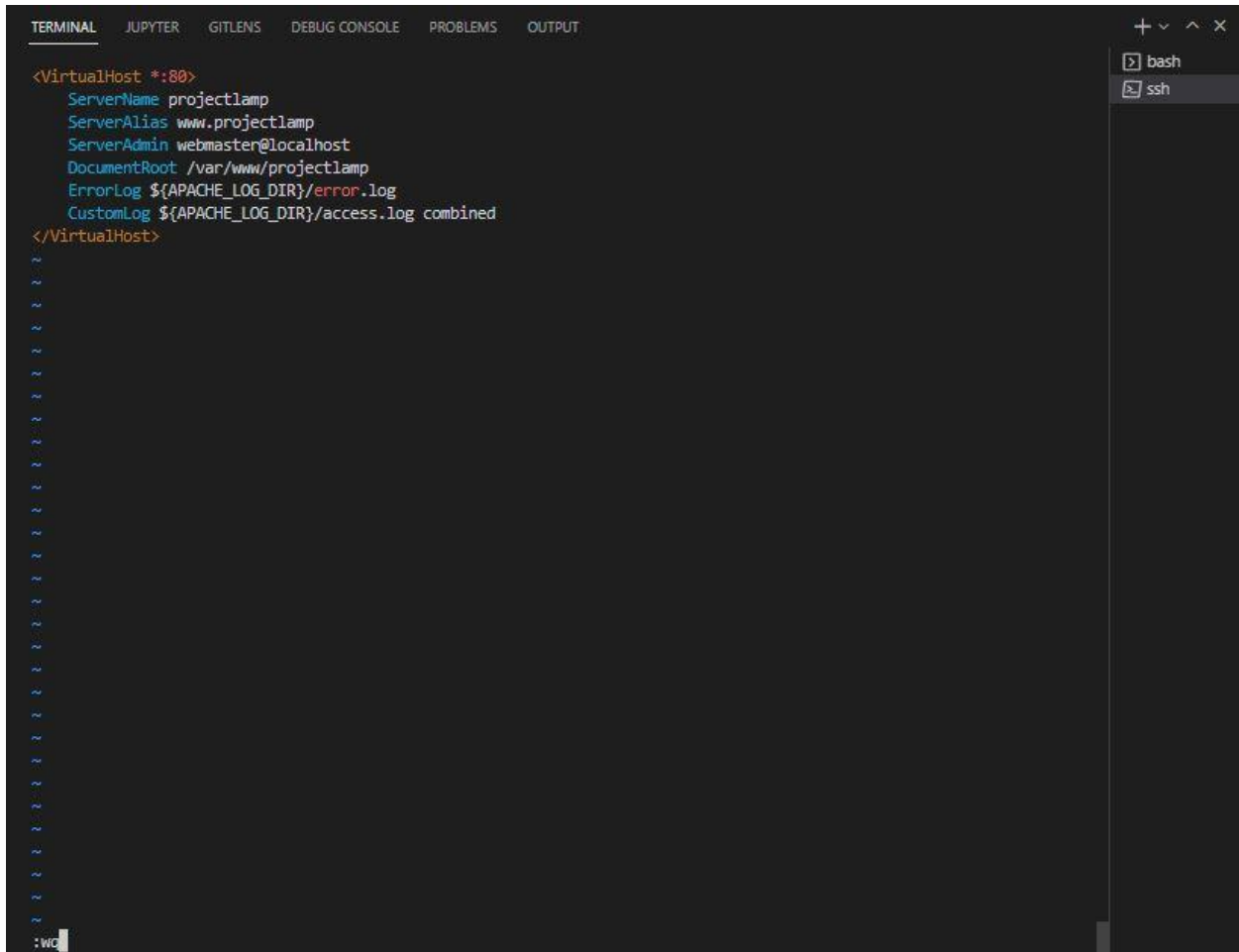
Step 4 of 1 - Type in the command `sudo mkdir /var/www/projectlamp` to create a new directory/folder in our php installation. The command `mkdir` in linux creates a folder followed by the path of the new folder location.

Next, type `cd /var/www/projectlamp` to change directory to the new folder location as shown above. To assign ownership of the directory, also type

```
sudo chown -R $USER:$USER /var/www/projectlamp
```

Then we create a new configuration file in apache's sites-available directory with the following command, `sudo vi /etc/apache2/sites-available/projectlamp.conf`

After running the above command, a blank file is created and opened as shown below.



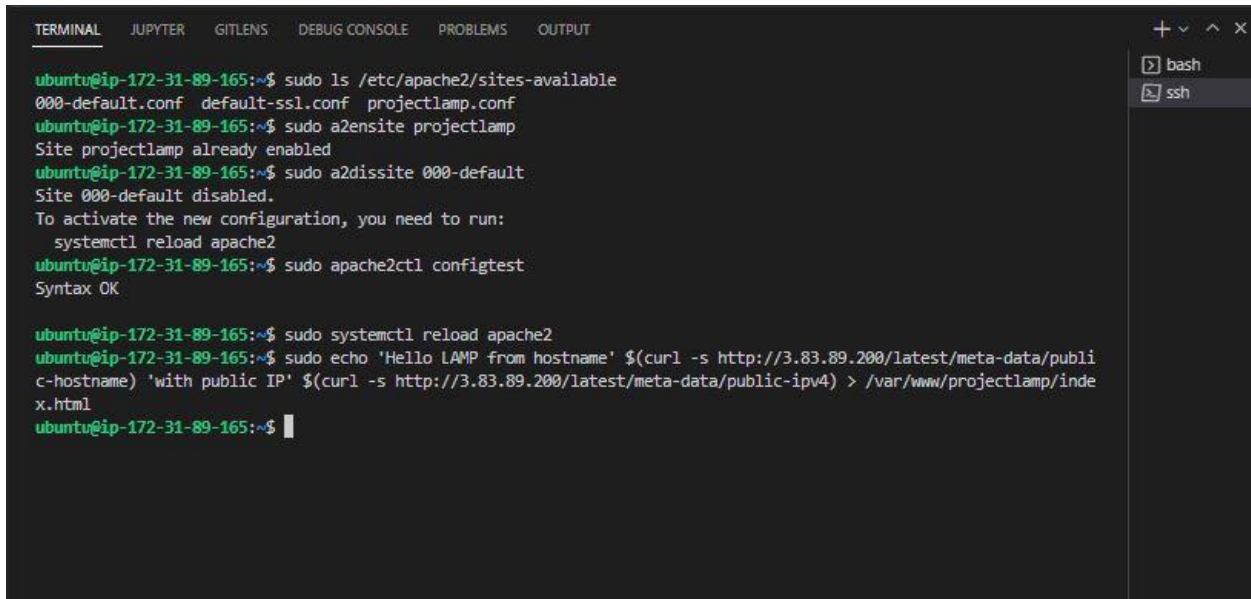
The screenshot shows a terminal window with a dark background. The terminal output displays the configuration for a VirtualHost named *:80. The configuration includes the following lines: <VirtualHost *:80>, ServerName projectlamp, ServerAlias www.projectlamp, ServerAdmin webmaster@localhost, DocumentRoot /var/www/projectlamp, ErrorLog \${APACHE_LOG_DIR}/error.log, CustomLog \${APACHE_LOG_DIR}/access.log combined, and </VirtualHost>. The terminal window has tabs for TERMINAL, JUPYTER, GITLENS, DEBUG CONSOLE, PROBLEMS, and OUTPUT. On the right side, there are icons for bash and ssh.

```
<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>
```

Step 4 of 2 - Type `i` and paste the following code into the configuration file as show in the image above:

```
<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, hit `esc` , type `:` , and type `wq` **w** for *write* and **q** to *quit* and then finally hit `enter` to save the file.



```
TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT
ubuntu@ip-172-31-89-165:~$ sudo ls /etc/apache2/sites-available
000-default.conf  default-ssl.conf  projectlamp.conf
ubuntu@ip-172-31-89-165:~$ sudo a2ensite projectlamp
Site projectlamp already enabled
ubuntu@ip-172-31-89-165:~$ sudo a2dissite 000-default
Site 000-default disabled.
To activate the new configuration, you need to run:
    systemctl reload apache2
ubuntu@ip-172-31-89-165:~$ sudo apache2ctl configtest
Syntax OK
ubuntu@ip-172-31-89-165:~$ sudo systemctl reload apache2
ubuntu@ip-172-31-89-165:~$ sudo echo 'Hello LAMP from hostname' $(curl -s http://3.83.89.200/latest/meta-data/public-hostname) 'with public IP' $(curl -s http://3.83.89.200/latest/meta-data/public-ipv4) > /var/www/projectlamp/index.html
ubuntu@ip-172-31-89-165:~$
```

Step 4 of 3 - Next type `sudo ls /etc/apache2/sites-available` to show the available files in the directory as shown above.

The following `000-default.conf default-ssl.conf projectlamp.conf` displays confirming the newly created file and other files as shown in the image above.

Next, we type `sudo a2ensite projectlamp` to enable our projectlamp as our virtual host and the root directory of our web application as shown above.

Next, type `sudo a2dissite 000-default` to disable abache's default website

Next, type `sudo apache2ctl configtest` to confirm our configuratoin file is syntax error free

Finally, type `sudo systemctl reload apache2` to reload apache for changes to take effect.

Next we need to create a new file for our empty web root location. We create an index.html file for this purpose. Copy and pase the following command to perform this task as shown in the image above.

```
sudo echo 'Hello LAMP 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/projectlamp/index.html
```

Next, in our browser, we type the following to see the changes.

`http://<Public-IP-Address>:80`

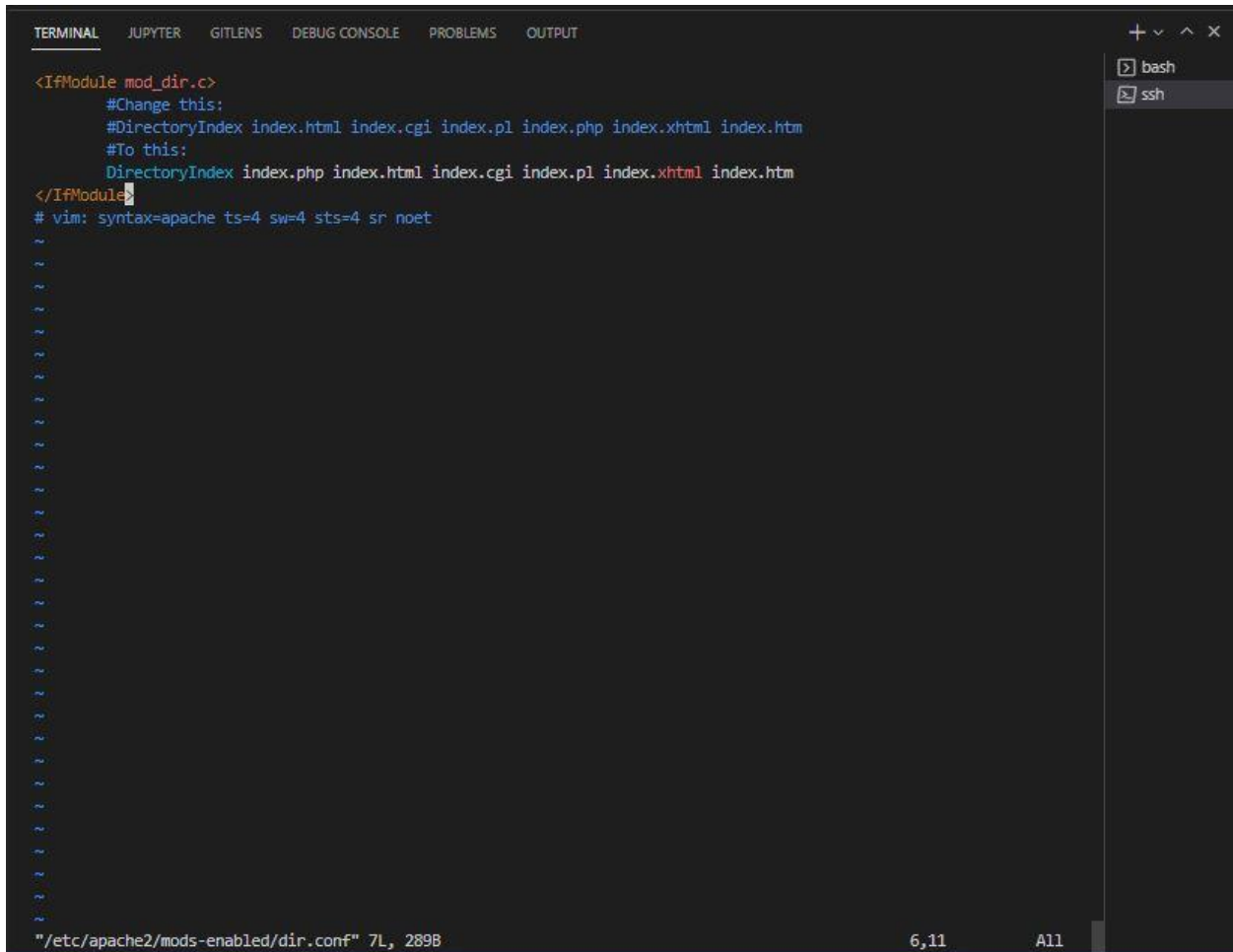


Our html page shows successfully as shown in the above image. This will be the temporary default page until we install an application with an index.php page to replace it.

Page 10 of 10

In case you want to change this behavior, you'll need to edit the `/etc/apache2/mods-enabled/dir.conf` file and change the order in which the `index.php` file is listed within the `DirectoryIndex` directive:

[illegible]

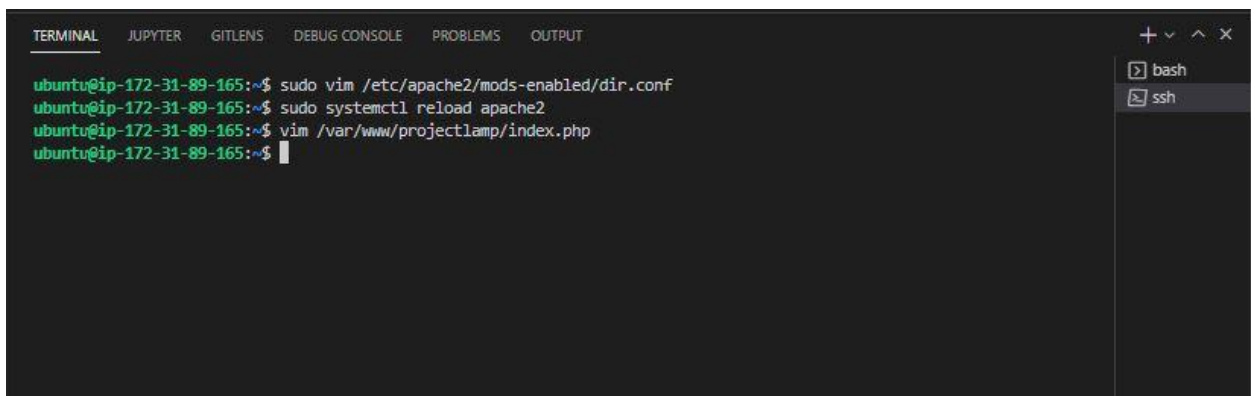


```
TERMINAL JUPYTER GITLENS DEBUG CONSOLE PROBLEMS OUTPUT
<IfModule mod_dir.c>
#Change this:
#DirectoryIndex index.html index.cgi index.pl index.php index.xhtml index.htm
#To this:
DirectoryIndex index.php index.html index.cgi index.pl index.xhtml index.htm
</IfModule>
# vim: syntax=apache ts=4 sw=4 sts=4 sr noet

"/etc/apache2/mods-enabled/dir.conf" 7L, 289B 6,11 All
```

Step 5 of 2 - Copy the following and replace the above content with this:

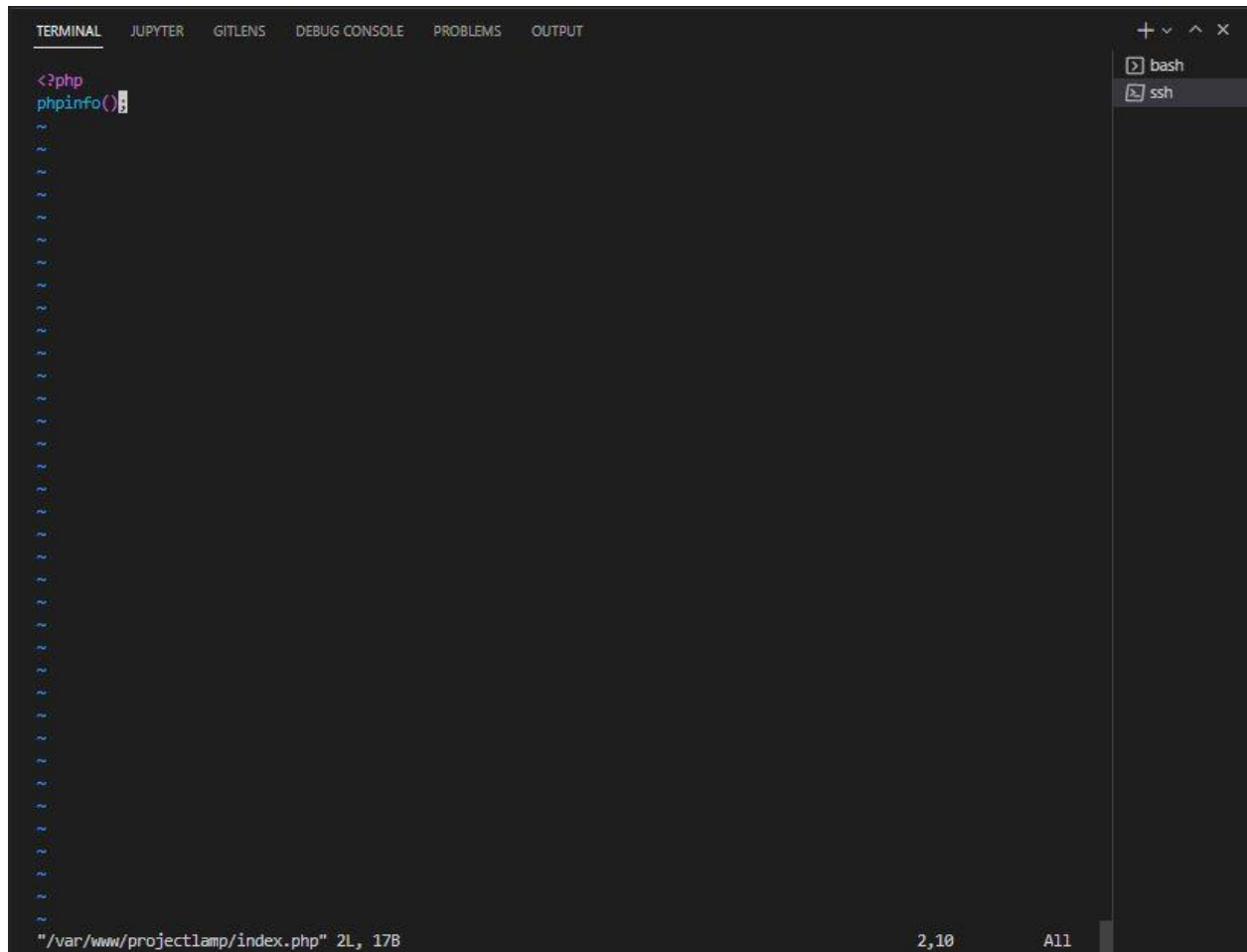
```
<IfModule mod_dir.c>
    #Change this:
    #DirectoryIndex index.html index.cgi index.pl index.php index.xhtml index.htm
    #To this:
    DirectoryIndex index.php index.html index.cgi index.pl index.xhtml index.htm
</IfModule>
```



```
TERMINAL JUPYTER GITLENS DEBUG CONSOLE PROBLEMS OUTPUT
ubuntu@ip-172-31-89-165:~$ sudo vim /etc/apache2/mods-enabled/dir.conf
ubuntu@ip-172-31-89-165:~$ sudo systemctl reload apache2
ubuntu@ip-172-31-89-165:~$ vim /var/www/projectlamp/index.php
ubuntu@ip-172-31-89-165:~$
```

Step 5 of 3 - After saving the file, close and refresh the server using the following command to effect the changes. `sudo systemctl reload apache2`

Next, we will create a PHP script to test our PHP configurations are run correctly.

A screenshot of a code editor interface. The top bar shows tabs for 'TERMINAL', 'JUPYTER', 'GITLENS', 'DEBUG CONSOLE', 'PROBLEMS', and 'OUTPUT'. The 'TERMINAL' tab is active, showing a terminal window with a 'bash' prompt and the command 'phpinfo()' entered. The code is highlighted in blue. The status bar at the bottom indicates the file path as '/var/www/projectlamp/index.php' with line 2, column 10, and a total of 17B. The editor also shows a sidebar on the right with 'bash' and 'ssh' options.

```
<?php
phpinfo();
```


Step 5 of 4 - To create a new PHP file, type `vim /var/www/projectlamp/index.php` this will open a blank file. Add the following code to the file.

```
<?php
phpinfo();
```

Save and close the file.


← → ↻ ⚠ Not secure | 3.83.89.200

PHP Version 8.1.2



System	Linux ip-172-31-89-165 5.15.0-1011-aws #14-Ubuntu SMP Wed Jun 1 20:54:22 UTC 2022 x86_64
Build Date	Jun 13 2022 13:52:54
Build System	Linux
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/8.1/apache2
Loaded Configuration File	/etc/php/8.1/apache2/php.ini
Scan this dir for additional .ini files	/etc/php/8.1/apache2/conf.d
Additional .ini files parsed	/etc/php/8.1/apache2/conf.d/10-mysqld.ini, /etc/php/8.1/apache2/conf.d/10-opcache.ini, /etc/php/8.1/apache2/conf.d/10-pdo.ini, /etc/php/8.1/apache2/conf.d/20-calendar.ini, /etc/php/8.1/apache2/conf.d/20-ctype.ini, /etc/php/8.1/apache2/conf.d/20-exif.ini, /etc/php/8.1/apache2/conf.d/20-ffi.ini, /etc/php/8.1/apache2/conf.d/20-fileinfo.ini, /etc/php/8.1/apache2/conf.d/20-ftp.ini, /etc/php/8.1/apache2/conf.d/20-gettext.ini, /etc/php/8.1/apache2/conf.d/20-iconv.ini, /etc/php/8.1/apache2/conf.d/20-mysqli.ini, /etc/php/8.1/apache2/conf.d/20-pdo_mysql.ini, /etc/php/8.1/apache2/conf.d/20-phar.ini, /etc/php/8.1/apache2/conf.d/20-posix.ini, /etc/php/8.1/apache2/conf.d/20-readline.ini, /etc/php/8.1/apache2/conf.d/20-shmop.ini, /etc/php/8.1/apache2/conf.d/20-sockets.ini, /etc/php/8.1/apache2/conf.d/20-sysvmsg.ini, /etc/php/8.1/apache2/conf.d/20-sysvsem.ini, /etc/php/8.1/apache2/conf.d/20-sysvshm.ini, /etc/php/8.1/apache2/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
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, convert.*, consumed, dechunk, convert.iconv.*

This program makes use of the Zend Scripting Language Engine:
 Zend Engine v4.1.2, Copyright (c) Zend Technologies
 with Zend OPcache v8.1.2, Copyright (c), by Zend Technologies



Step 5 of 5 - Then refresh the page in the browser to see the changes. The above page appears in our browser and provides the PHP information on our server, used for debugging and ensuring the settings are up to speed.

```

TERMINAL  JUPYTER  GITLENS  DEBUG CONSOLE  PROBLEMS  OUTPUT
ubuntu@ip-172-31-89-165:~$ sudo rm /var/www/projectlamp/index.php
ubuntu@ip-172-31-89-165:~$

```

Step 5 of 6 - After checking the PHP settings, we need to remove the file because it contains critical server information about our PHP environment.

Use the `rm` command to remove the file by typing the following:

```
sudo rm /var/www/projectlamp/index.php
```

This completes all the requirements for our project 1.