

**PROJECT REPORT**  
On  
**LAMP STACK DEPLOYMENT**

By

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## **OBJECTIVE**

Locally deploy a LAMP Stack, hosting a simple webpage, running inside a docker container that is running inside a Virtual Machine created by using Vagrant.

After creating of the LAMP Stack and the webpage, access the webpage using another user or a host, which does not possess administrative permissions to change contents or working of the webpage.

# WORKING

## Software and programs used:

1. Linux Server Edition – Operating System.
2. Apache – Web Server.
3. MySQL – Data Storage and Management.
4. PHP – Server-side scripting.
5. Vagrant – Automate VM creation.
6. VirtualBox – Run virtual machines.
7. Docker (Docker Compose) – Run the application inside a container.

## Steps followed to deploy the LAMP Stack:

1. Downloading and installing Vagrant and VirtualBox in host machine.
2. Creating a new directory for the project and create a vagrant base file (vagrantfile) for Ubuntu by running

```
PS C:\Users\Ansh\Desktop\College\BITS\PS-1\project-1> vagrant init hashicorp/bionic64
A `Vagrantfile` has been placed in this directory. You are now
ready to `vagrant up` your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
`vagrantup.com` for more information on using Vagrant.
```

3. Modifying the following line in the vagrantfile to forward the HTTP Port (80) so that host machine can access the webpage

```
# Create a forwarded port mapping which allows access to a specific port
# within the machine from a port on the host machine. In the example below,
# accessing "localhost:8080" will access port 80 on the guest machine.
# NOTE: This will enable public access to the opened port
config.vm.network "forwarded_port", guest: 80, host: 80 # Opening HTTP port between VM and Host machine
```

#### 4. Starting vagrant VM with the following command

```
PS C:\Users\Ansh\Desktop\College\BITS\PS-1\project-1> vagrant up
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Importing base box 'hashicorp/bionic64'...
==> default: Matching MAC address for NAT networking...
==> default: Checking if box 'hashicorp/bionic64' version '1.0.282' is up to date...
==> default: Setting the name of the VM: project-1_default_1687536768104_98495
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
    default: Warning: Connection reset. Retrying...
    default: Warning: Connection aborted. Retrying...
    default:
    default: Vagrant insecure key detected. Vagrant will automatically replace
    default: this with a newly generated keypair for better security.
    default:
    default: Inserting generated public key within guest...
    default: Removing insecure key from the guest if it's present...
    default: Key inserted! Disconnecting and reconnecting using new SSH key...
==> default: Machine booted and ready!
==> default: Checking for guest additions in VM...
    default: The guest additions on this VM do not match the installed version of
    default: VirtualBox! In most cases this is fine, but in rare cases it can
    default: prevent things such as shared folders from working properly. If you see
    default: shared folder errors, please make sure the guest additions within the
    default: virtual machine match the version of VirtualBox you have installed on
    default: your host and reload your VM.
    default:
    default: Guest Additions Version: 6.0.10
    default: VirtualBox Version: 7.0
==> default: Mounting shared folders...
    default: /vagrant => C:/Users/Ansh/Desktop/College/BITS/PS-1/project-1
```

## 5. Accessing VM by using SSH into the virtual machine

```
PS C:\Users\Ansh\Desktop\College\BITS\PS-1\project-1> vagrant ssh
Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.15.0-58-generic x86_64)

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

System information as of Fri Jun 23 16:15:44 UTC 2023

System load:  0.13           Processes:            92
Usage of /:   2.5% of 61.80GB Users logged in:          0
Memory usage: 11%           IP address for eth0: 10.0.2.15
Swap usage:   0%

0 packages can be updated.
0 updates are security updates.

vagrant@vagrant:~$ _
```

## 6. Updating the virtual machine

```
vagrant@vagrant:~$ sudo apt-get update
Hit:1 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:4 http://archive.ubuntu.com/ubuntu bionic-backports InRelease [83.3 kB]
Get:5 http://security.ubuntu.com/ubuntu bionic-security/main i386 Packages [1,375 kB]
Get:6 http://archive.ubuntu.com/ubuntu bionic-updates/main i386 Packages [1,661 kB]
Get:7 http://security.ubuntu.com/ubuntu bionic-security/main amd64 Packages [2,706 kB]
Get:8 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [3,033 kB]
Get:9 http://security.ubuntu.com/ubuntu bionic-security/main Translation-en [466 kB]
Get:10 http://security.ubuntu.com/ubuntu bionic-security/restricted i386 Packages [33.0 kB]
Get:11 http://security.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [1,302 kB]
Get:12 http://security.ubuntu.com/ubuntu bionic-security/restricted Translation-en [180 kB]
Get:13 http://security.ubuntu.com/ubuntu bionic-security/universe i386 Packages [1,077 kB]
Get:14 http://archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [552 kB]
Get:15 http://archive.ubuntu.com/ubuntu bionic-updates/restricted i386 Packages [39.7 kB]
Get:16 http://archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [1,332 kB]
Get:17 http://security.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1,301 kB]
Get:18 http://archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [185 kB]
Get:19 http://security.ubuntu.com/ubuntu bionic-security/universe Translation-en [307 kB]
Get:20 http://archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1,912 kB]
Get:21 http://security.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]
Get:22 http://archive.ubuntu.com/ubuntu bionic-updates/universe i386 Packages [1,662 kB]
Get:23 http://security.ubuntu.com/ubuntu bionic-security/multiverse i386 Packages [6,008 B]
Get:24 http://security.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3,928 B]
Get:25 http://archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [420 kB]
Get:26 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse i386 Packages [11.2 kB]
Get:27 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [25.6 kB]
Get:28 http://archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6,088 B]
Get:29 http://archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.3 kB]
Get:30 http://archive.ubuntu.com/ubuntu bionic-backports/main i386 Packages [53.2 kB]
Get:31 http://archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]
Get:32 http://archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.2 kB]
Get:33 http://archive.ubuntu.com/ubuntu bionic-backports/universe i386 Packages [18.1 kB]
Get:34 http://archive.ubuntu.com/ubuntu bionic-backports/universe Translation-en [8,668 B]
Fetched 20.0 MB in 11s (1,903 kB/s)
Reading package lists... Done
vagrant@vagrant:~$ _
```

## 7. Installing docker-compose

```
vagrant@vagrant:~$ sudo apt-get install docker-compose
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  bridge-utils containerd docker.io golang-docker-credential-helpers libseccomp2 libsecret-1-0 libsecret-common pigz python-asn1crypto python-backports.ssl-match-hostname python-cached-property python-certifi python-cffi-backend python-chardet python-cryptography python-docker python-dockerpty python-dockerpycreds python-docopt python-enum34 python-funcsigs python-functools32 python-idna python-ipaddress python-jsonschema python-mock python-openssl python-pbr python-pkg-resources python-requests python-six python-texttable python-urllib3 python-websocket python-yaml runc ubuntu-fan
Suggested packages:
  ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils python-cryptography-doc python-cryptography-vectors python-enum34-doc python-funcsigs-doc python-mock-doc python-openssl-doc python-openssl-dbg python-setuptools python-socks python-ntlm
The following NEW packages will be installed:
  bridge-utils containerd docker-compose docker.io golang-docker-credential-helpers libsecret-1-0 libsecret-common pigz python-asn1crypto python-backports.ssl-match-hostname python-cached-property python-certifi python-cffi-backend python-chardet python-cryptography python-docker python-dockerpty python-dockerpycreds python-docopt python-enum34 python-funcsigs python-functools32 python-idna python-ipaddress python-jsonschema python-mock python-openssl python-pbr python-pkg-resources python-requests python-six python-texttable python-urllib3 python-websocket python-yaml runc ubuntu-fan
1 upgraded, 37 newly installed, 0 to remove and 291 not upgraded.
Need to get 67.9 MB of archives.
After this operation, 301 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

## 8. Creating a docker-compose (docker-compose.yml) file

```
version: '3'
services:
  db:
    image: mysql:latest
    environment:
      MYSQL_DATABASE: lamp_stack
      MYSQL_USER: user1
      MYSQL_PASSWORD: password
      MYSQL_ALLOW_EMPTY_PASSWORD: 1
    volumes:
      - ./db/docker-entrypoint-initdb.d
    networks:
      - lamp-network
  www:
    build:
      context: .
      dockerfile: Dockerfile
    depends_on:
      - db
    image: php:apache
    volumes:
      - ./var/www/html
    ports:
      - 80:80
      - 443:443
    networks:
      - lamp-network
  phpmyadmin:
    depends_on:
      - db
    image: phpmyadmin/phpmyadmin
    ports:
      - 8001:80
    environment:
      - PMA_HOST=db
      - PMA_PORT=3306
    networks:
      - lamp-network
networks:
  lamp-network:
    driver: bridge
```

## 9. Create a dockerfile for docker setup

```
FROM php:apache

RUN docker-php-ext-install mysqli

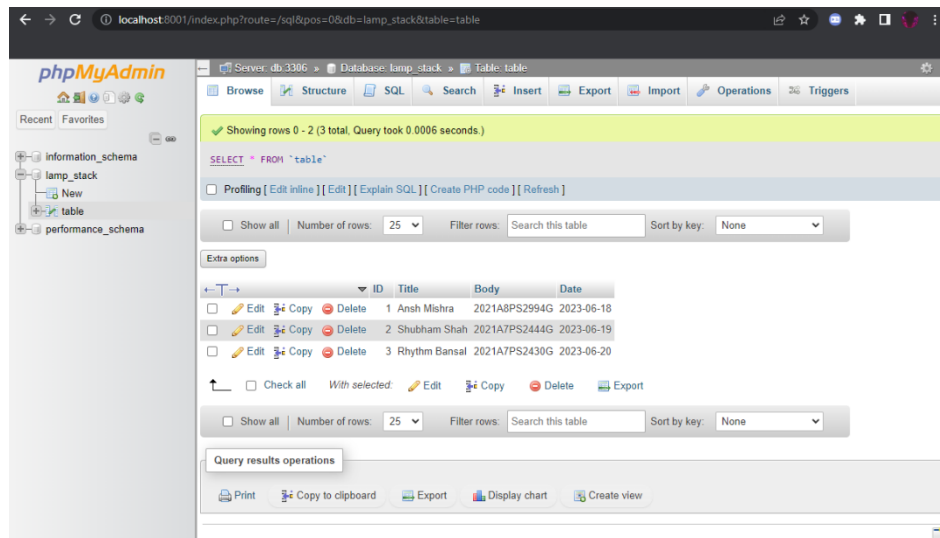
CMD ["apache2-foreground"]

~
~
```

## 10. Launch and host the docker container

```
vagrant@vagrant:~/LAMP-Stack$ sudo docker-compose up
Starting lampstack_db_1 ...
Starting lampstack_db_1 ... done
Starting lampstack_phpmyadmin_1 ...
Starting lampstack_www_1 ...
Starting lampstack_phpmyadmin_1
Starting lampstack_www_1 ... done
Attaching to lampstack_db_1, lampstack_phpmyadmin_1, lampstack_www_1
db_1 | 2023-06-24 20:48:35+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.33-1.el8 started.
db_1 | 2023-06-24 20:48:35+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
db_1 | 2023-06-24 20:48:35+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.33-1.el8 started.
db_1 | '/var/lib/mysql/mysql.sock' -> '/var/run/mysqld/mysqld.sock'
db_1 | 2023-06-24T20:48:37.636706Z 0 [Warning] [MY-011068] [Server] The syntax '--skip-host-cache' is deprecated and will be removed in a future release. Please use SET GLOBAL host_cache_size=0 instead.
db_1 | 2023-06-24T20:48:37.659811Z 0 [System] [MY-010116] [Server] /usr/sbin/mysqld (mysqld 8.0.33) starting as process 1
db_1 | 2023-06-24T20:48:37.693203Z 1 [System] [MY-013576] [InnoDB] InnoDB initialization has started.
phpmyadmin_1 | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.3. Set the 'ServerName' directive globally to suppress this message
phpmyadmin_1 | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.3. Set the 'ServerName' directive globally to suppress this message
phpmyadmin_1 | [Sat Jun 24 20:48:38.098715 2023] [mpm_prefork:notice] [pid 1] AH00163: Apache/2.4.56 (Debian) PHP/8.1.17 configured -- resuming normal operations
phpmyadmin_1 | [Sat Jun 24 20:48:38.113474 2023] [core:notice] [pid 1] AH00094: Command line: 'apache2 -D FOREGROUND'
www_1 | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.4. Set the 'ServerName' directive globally to suppress this message
www_1 | [Sat Jun 24 20:48:38.635774 2023] [mpm_prefork:notice] [pid 1] AH00163: Apache/2.4.57 (Debian) PHP/8.2.7 configured -- resuming normal operations
www_1 | [Sat Jun 24 20:48:38.640385 2023] [core:notice] [pid 1] AH00094: Command line: 'apache2 -D FOREGROUND'
db_1 | 2023-06-24T20:48:39.302717Z 1 [System] [MY-013577] [InnoDB] InnoDB initialization has ended.
db_1 | 2023-06-24T20:48:39.873897Z 0 [Warning] [MY-010068] [Server] CA certificate ca.pem is self signed.
db_1 | 2023-06-24T20:48:39.874270Z 0 [System] [MY-013602] [Server] Channel mysql_main configured to support TLS. Encrypted connections are now supported for this channel.
db_1 | 2023-06-24T20:48:39.878367Z 0 [Warning] [MY-011810] [Server] Insecure configuration for --pid-file: Location '/var/run/mysqld' in the path is accessible to all OS users. Consider choosing a different directory.
db_1 | 2023-06-24T20:48:39.941780Z 0 [System] [MY-011323] [Server] X Plugin ready for connections. Bind-address: '::' port: 33060, socket: /var/run/mysqld/mysqldx.sock
db_1 | 2023-06-24T20:48:39.943123Z 0 [System] [MY-010931] [Server] /usr/sbin/mysqld: ready for connections. Version: '8.0.33' socket: '/var/run/mysqld/mysqld.sock' port: 3306 MySQL Community Server - GPL.
```

11. Open the PHP Admin page on <http://localhost:8001> and create a .sql table



12. Export and save the .sql table in a folder named “db”

```
vagrant@vagrant:~/LAMP-Stack/db$ ls
table.sql
vagrant@vagrant:~/LAMP-Stack/db$ _
```

13. Creating a PHP file (index.php) to be hosted inside the docker container

```
?php
$conn = mysqli_connect(
    'db',
    'user1',
    'password',
    'lamp_stack'
);

$query = 'SELECT * FROM table';
$result = mysqli_query($conn, $query);

echo '<h1>MySQL Content,</h1>';

while($record = mysqli_fetch_assoc($result))
{
    echo '<h2>'.$record['Title'].'</h2>';
    echo '<p>'.$record['Body'].'</p>';
    echo 'Posted: '.$record['Date'];
    echo '<hr>';
}
?
```



## 14. Restart docker container

```
^CGracefully stopping... (press Ctrl+C again to force)
Stopping lampstack_www_1 ... done
Stopping lampstack_phpmyadmin_1 ... done
Stopping lampstack_db_1 ... done
vagrant@vagrant:~/LAMP-Stack$ _
```

```
vagrant@vagrant:~/LAMP-Stack$ sudo docker-compose up
Starting lampstack_db_1 ...
Starting lampstack_db_1 ... done
Starting lampstack_phpmyadmin_1 ...
Starting lampstack_phpmyadmin_1
Starting lampstack_www_1 ...
Starting lampstack_www_1 ... done
Attaching to lampstack_db_1, lampstack_phpmyadmin_1, lampstack_www_1
db_1      | 2023-06-24 20:52:07+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.33-1.el8 started.
db_1      | 2023-06-24 20:52:08+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
db_1      | 2023-06-24 20:52:08+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.33-1.el8 started.
db_1      | '/var/lib/mysql/mysql.sock' -> '/var/run/mysqld/mysqld.sock'
db_1      | 2023-06-24T20:52:08.975506Z 0 [Warning] [MY-011068] [Server] The syntax '--skip-host-cache' is deprecated and will be removed in a future release. Please use SET GLOBAL host_cache_size=0 instead.
db_1      | 2023-06-24T20:52:08.976764Z 0 [System] [MY-010116] [Server] /usr/sbin/mysqld (mysqld 8.0.33) starting as process 1
db_1      | 2023-06-24T20:52:08.994217Z 1 [System] [MY-013576] [InnoDB] InnoDB initialization has started.
phpmyadmin_1 | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.3. Set the 'ServerName' directive globally to suppress this message
phpmyadmin_1 | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.3. Set the 'ServerName' directive globally to suppress this message
phpmyadmin_1 | [Sat Jun 24 20:52:09.566847 2023] [mpm_prefork:notice] [pid 1] AH00163: Apache/2.4.56 (Debian) PHP/8.1.17 configured -- resuming normal operations
phpmyadmin_1 | [Sat Jun 24 20:52:09.586778 2023] [core:notice] [pid 1] AH00094: Command line: 'apache2 -D FOREGROUND'
www_1      | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.4. Set the 'ServerName' directive globally to suppress this message
www_1      | AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.19.0.4. Set the 'ServerName' directive globally to suppress this message
www_1      | [Sat Jun 24 20:52:09.739236 2023] [mpm_prefork:notice] [pid 1] AH00163: Apache/2.4.57 (Debian) PHP/8.2.7 configured -- resuming normal operations
www_1      | [Sat Jun 24 20:52:09.739545 2023] [core:notice] [pid 1] AH00094: Command line: 'apache2 -D FOREGROUND'
db_1      | 2023-06-24T20:52:09.984908Z 1 [System] [MY-013577] [InnoDB] InnoDB initialization has ended.
db_1      | 2023-06-24T20:52:10.412614Z 0 [Warning] [MY-010068] [Server] CA certificate ca.pem is self signed.
db_1      | 2023-06-24T20:52:10.412940Z 0 [System] [MY-013602] [Server] Channel mysql_main configured to support TLS. Encrypted connections are now supported for this channel.
db_1      | 2023-06-24T20:52:10.419219Z 0 [Warning] [MY-011810] [Server] Insecure configuration for --pid-file: Location '/var/run/mysqld' in the path is accessible to all OS users. Consider choosing a different directory.
db_1      | 2023-06-24T20:52:10.460894Z 0 [System] [MY-011323] [Server] X Plugin ready for connections. Bind-address: '::' port: 33060, socket: /var/run/mysqld/mysqlx.sock
db_1      | 2023-06-24T20:52:10.462372Z 0 [System] [MY-010931] [Server] /usr/sbin/mysqld: ready for connections. Version: '8.0.33' socket: '/var/run/mysqld/mysqld.sock' port: 3306 MySQL Community Server - GPL.
```

## 15. Go to <http://localhost> to see the final result of the LAMP Stack hosting the index.php file

## **References and Links:**

<https://ubuntu.com/download/server>

<https://developer.hashicorp.com/vagrant/downloads>

<https://www.docker.com/products/docker-desktop/>

<https://hub.docker.com/layers/library/php/apache-bullseye/images/sha256-db0c72b6bf00c521f4092b6236f50520b6f60bdf763f2b1114f104170d2f6fee?context=explore>

<https://www.virtualbox.org/wiki/Downloads>

<https://linuxjourney.com>

<https://stackoverflow.com/>

<https://github.com/>

<https://chat.openai.com/>