

Practical Experience Report

Lab 4.1: Web application environment setup

Name:

StudentID:

This lab focuses on setup an environment for web application deployment. In this lab, you will need the following:

- Ubuntu VM: the deployment server for your web app
- Google, GenAI (e.g.: ChatGPT) to assist in setup tasks
- *It would be more convenient if you work by ssh to the VM instead of using the VM GUI.

Task 1: Install nginx, a static web server for your application and answer the following questions:

1.1. What are commands to install *nginx*, to stop/start nginx service?

Answer:

- Command to install nginx:
`sudo apt update`
`sudo apt install nginx -y`
- Command to stop/start nginx:
`sudo systemctl start nginx`
`sudo systemctl stop nginx`

1.2. What are commands to check what port number and protocol that nginx is listening on?

Answer:

- Command to check port number and protocol:
`sudo netstat -tulpn | grep nginx`

We wil receive something like:

```
tcp        0      0 0.0.0.0:80          0.0.0.0:*
LISTEN    3043/nginx: master
```

```
tcp6      0      0 :::80      :::*
LISTEN    3043/nginx: master
```

Meaning:

tcp / tcp6 = protocol

:80 = listening port

1.3. How to know what system account under which nginx process is running :

Answer:

- We use this command: `ps aux | grep nginx`

Result in my computer:

```
root          3043  0.0  0.0  14832  2392 ?        Ss   03:10
0:00 nginx: master process /usr/sbin/nginx -g daemon on;
master_process on;

www-data      3044  0.0  0.1  16612  5336 ?        S    03:10
0:00 nginx: worker process

www-data      3045  0.0  0.1  16928  6448 ?        S    03:10
0:00 nginx: worker process

kali          42918 0.0  0.0   6544   2412 pts/3    S+   04:30
0:00 grep --color=auto nginx
```

At first column, we see user account:

- root runs the master process
- www-data runs the worker processes

Task 2: Nginx configuration. Perform the following sub tasks:

- Test the server with a text file ("hello.txt") file and a html file ("hello.html")
- Change listening port of nginx then check the effect
- Change document root and test it
- Configure a new location block
- Add one more virtual server that listens on another port

Answer the following questions:

2.1. Briefly explain the following commands listed in the table

Seq	command	Explanation
1	chown [username] [file/dir path]	Changes the owner of a file or directory to the specified user.
2	chmod a+r [file/dir path]	Gives read permission to all users.
3	ln -fs [target_path] [link_path]	Creates a symlink from link_path to target_path (-f forces overwrite, -s creates a symlink).
4	nginx -t	Tests the configuration syntax of Nginx.
5	nginx -s reload	Reloads Nginx Same as: <code>sudo systemctl reload nginx</code>

2.1. Show typical steps in changing configuration of nginx

Answer:

Step 1: Edit nginx configuration file

- We change directory to /etc/nginx/sites-available/
`cd /etc/nginx/sites-available`
- Then we use nano or vim to change the content of default, I use nano:
`sudo nano default`
(or /etc/nginx/nginx.conf, if you want to change global server settings)
Here I just want to config specific configurations for individual websites.

Step 2: After editing, we must check whether the syntax is good

`sudo nginx -t`

Step 3: If everything is good, we reload nginx to apply the changes

`sudo systemctl reload nginx`

Task 3: Install php-fpm application server for php and answer the following questions

3.1. What are commands to install *php-fpm*?

Answer:

We use:

```
sudo apt install php-fpm -y
```

3.2. What is the exact service name for php-fpm in your system? What are commands to stop/start/restart it ?

Answer:

Service name for php-fpm in my system is: php8.4-fpm

To stop/start/restart, we do the same with nginx, just change the service

```
sudo systemctl start php8.4-fpm
```

```
sudo systemctl stop php8.4-fpm
```

```
sudo systemctl restart php8.4-fpm
```

3.3. How to know what system account under which your php-fpm process is running :

Answer:

- I run command: `ps aux | grep php`
- Easily, I can see at first column:

```
root          22898  0.0  0.6 239412 23948 ?        Ss   12:05
0:00 php-fpm: mast
er process (/etc/php/8.4/fpm/php-fpm.conf)

www-data      22899  0.0  0.2 240016 10608 ?        S    12:05
0:00 php-fpm: pool
www

www-data      22900  0.0  0.2 240016 10608 ?        S    12:05
0:00 php-fpm: pool
www

kali          25950  0.0  0.0   6544  2364 pts/2    S+   12:10
0:00 grep --color=
auto php
```

- The php-fpm master process runs as root, while the worker processes run under the www-data user.

Task 4: Configure nginx to integrate with php-fpm.

Research with Google/ChatGPT/Gemini to learn how to integrate nginx with php-fpm. Create a simple php file and test it. Finally, answer the following questions.

4.1. Paste the configuration block that you need to add to nginx configuration file. Also specify the configuration file name where the block should be added

Answer:

- Configuration block:

```
location ~ /\.php$ {  
    include snippets/fastcgi-php.conf;  
    fastcgi_pass unix:/run/php/php8.4-fpm.sock;  
}
```

- I added it into: /etc/nginx/sites-available/default
- If a different virtual server is used, the configuration file name will be different. Here, for simplicity, I just use default.

4.2. Paste the content of your testing php file. Also specify the location, ownership and mode of the file.

Answer:

- The content of my testing php file:

```
└─$ cat test.php
```

```
<?php
```

```
echo "Dr Tung is handsome <3";
```

```
?>
```

- The location of my file: /var/www/myweb/test.php
- Ownership: root:root, which means file belongs to user root and group root.
- Mode: 644, owner has read and write; group and others have read-only permission.

4.3. Paste a screenshot to prove that it works

It worked!!!

[SCREENSHOT]

Task 5: Database setup.

Install mysql-server and answer the following questions

5.1. Show commands to install mysql-server

Answer:

It depends on the distro that we are using, for Ubuntu/Debian:

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

But in some new distros, or my Kali Linux, mysql-server is not directly provided, we must use another version, which literally the same as mysql-server. It's mariadb-server:

```
sudo apt install mariadb-server -y
```

5.2. Show commands to control mysql server service. Specify the service name for mysql server in your system

Answer:

- Command to check mysql service:

```
sudo systemctl status mariadb
```
- Command to start mysql service:

```
sudo systemctl start mariadb
```
- Command to stop mysql service:

```
sudo systemctl stop mariadb
```
- Command to restart mysql service:

```
sudo systemctl restart mariadb
```

In my system, mysql-server is provided by MariaDB, so the service name is "mariadb".

5.3. Use netstat or ss command to check for address and port at which your mysql server is listening on. Show your command and output

Answer:

- My command:

```
sudo netstat -tulpn | grep mariadb
```
- Output:

tcp	0	0	127.0.0.1:3306	0.0.0.0:*
LISTEN			15287/mariabdb	

The MariaDB server (process mariadb) is listening on TCP port 3306 at 127.0.0.1, meaning it accepts connections only from the local machine.

5.4. Research with Google/ChatGPT/Gemini to reconfigure your mysql server so that it will listen on all interfaces of the vm. Show the configuration file and the configuration directive. Also identify actions that you need to take after changing the configuration.

Answer:

- The configuration file is:
`/etc/mysql/mariadb.conf.d/50-server.cnf`
- I changed `bind-address = 127.0.0.1` to `bind-address = 0.0.0.0`
This setting means the database server will listen on all network interfaces of the VM instead of only 127.0.0.1

- Actions required after changing the configuration:

- o Step 1: Save the configuration file.
- o Step 2: Restart the database service.
`sudo systemctl restart mariadb`
- o Step 3: Verify that the server is listening on all interfaces.

└─\$ `sudo netstat -tulpn | grep mariadb`

```
tcp        0      0 0.0.0.0:3306          0.0.0.0:*
LISTEN      42577/mariabdb
```

Now we see the server is listening on all interfaces. We are done.

Task 6: Test the database server with mysql command line tool

Switch to root user with ``sudo -i``

Access mysql server via command ``mysql`` to start a mysql connection session

Use Google/ChatGPT to learn how to interact with mysql server from mysql session. You need to know the followings:

- Show databases in mysql server
- Use a database
- Show all tables in a database
- Create a new user in mysql server (and set it password)
- Grant all privileges to an account.
- How to exit mysql session

Install Adminer on your Ubuntu VM. Use Google/ChatGPT if needed

Use Adminer to work with your mysql server.

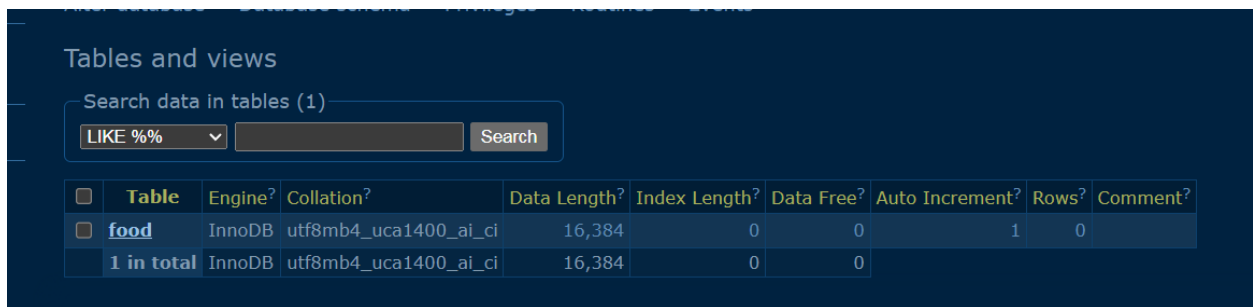
Create a database, a table in that database and capture screenshot via Adminer to prove that your make it.

Your screenshots showing your DB and your table go here (right below this line):

- I created ...:

[SCREENSHOT OF DB]

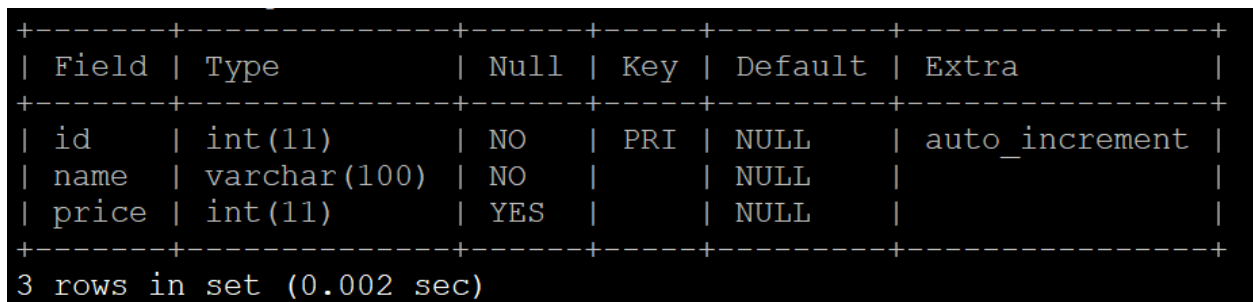
- I created table “food”:



The screenshot shows the Adminer interface for a MySQL database. The 'Tables and views' section is active, displaying a table with columns: Table, Engine, Collation, Data Length, Index Length, Data Free, Auto Increment, Rows, and Comment. The table 'food' is listed with InnoDB engine, utf8mb4_uca1400_ai_ci collation, 16,384 data length, 0 index length, 0 data free, 1 auto increment, and 0 rows. A '1 in total' summary row is also present.

Table	Engine	Collation	Data Length	Index Length	Data Free	Auto Increment	Rows	Comment
food	InnoDB	utf8mb4_uca1400_ai_ci	16,384	0	0	1	0	
1 in total	InnoDB	utf8mb4_uca1400_ai_ci	16,384	0	0			

- Inside table “food”:



The screenshot shows the output of a MySQL command, likely 'DESCRIBE food'. It displays the structure of the 'food' table with columns: id (int(11), PRIMARY, NULL, auto_increment), name (varchar(100), NULL), and price (int(11), YES, NULL). The output ends with '3 rows in set (0.002 sec)'.

Field	Type	Null	Key	Default	Extra
id	int(11)	NO	PRI	NULL	auto_increment
name	varchar(100)	NO		NULL	
price	int(11)	YES		NULL	

3 rows in set (0.002 sec)