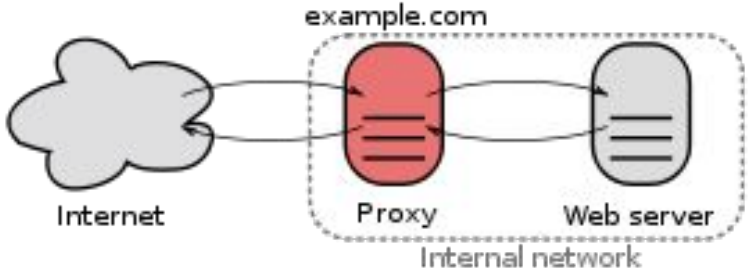
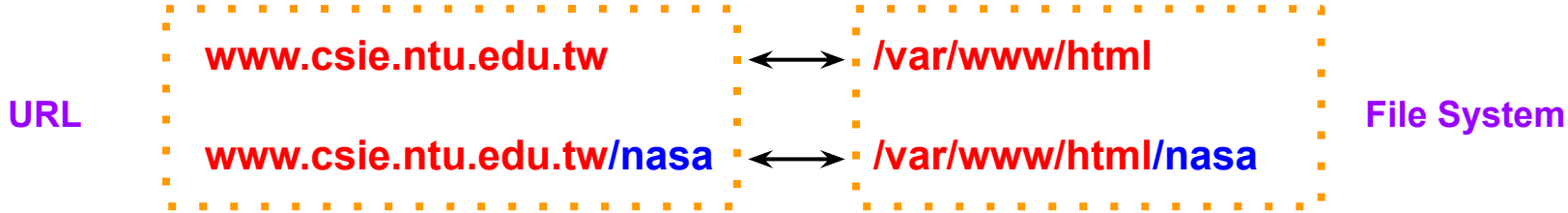
Lab 7 - Web Server

NASA 1! 2025
Web @ Salab
2025/03/31

Web Server

- handle http request & make response
- mapping
- multi-hosting
- Proxy/Reverse Proxy
- load balance





HTTP Request

- HTTP method (verb of a request)
- URL (specify the content)
  - Protocol
  - Host address / domain (with port)
  - Path to the resource
  - Additional parameters
- Example:

```
GET http://www.csie.ntu.edu.tw/members/teacher.php?mclass=110
```

HTTP Response

- Status code
- Body - requested data

HTTP status ranges in a nutshell:

1xx: hold on

2xx: here you go

3xx: go away

4xx: you fucked up

5xx: I fucked up

-via @abt_programming

Client-Server model

Browser

- request
- rendering
- HTML
- CSS
- Javascript

Web Server

- Apache
- Nginx

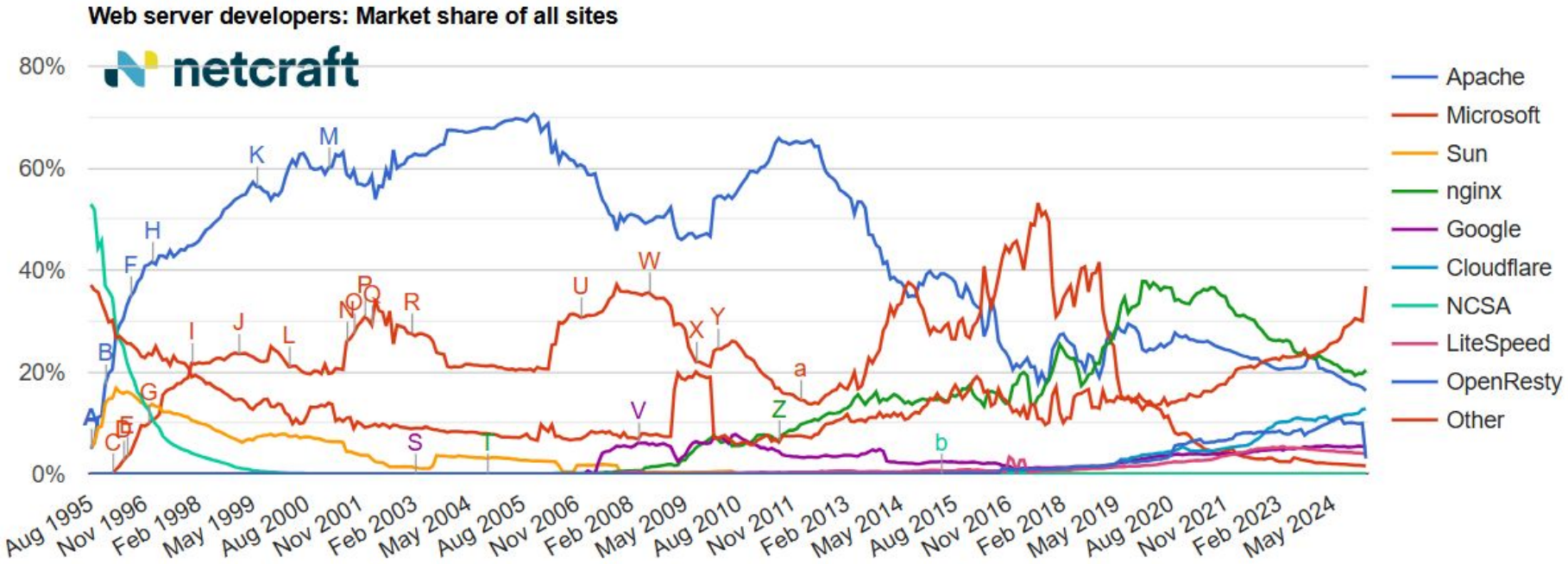
Backend Script / Framework

- PHP
- Django
- Ruby on Rails
- Express

Database

- MySQL
- PostgreSQL

Web Server Comparison



https://www.netcraft.com/blog/february-2025-web-server-survey/

Before we start

- Download & Install Ubuntu Server 24.04 LTS
  - Ubuntu 24.04 Download Page
  - 你可以在 /tmp2/rabhunter/lab7/ubuntu-24.04.2-live-server-amd64.iso 找到安裝檔
  - 或是使用我們安裝好的版本:/tmp2/rabhunter/lab7/server.qcow2（建議）
    - 帳號:nasa
    - 密碼:nasa2025
- You may use any OS you like.
- However, in the following lab we will explain on Ubuntu Server 24.04 LTS.

Set up a VM

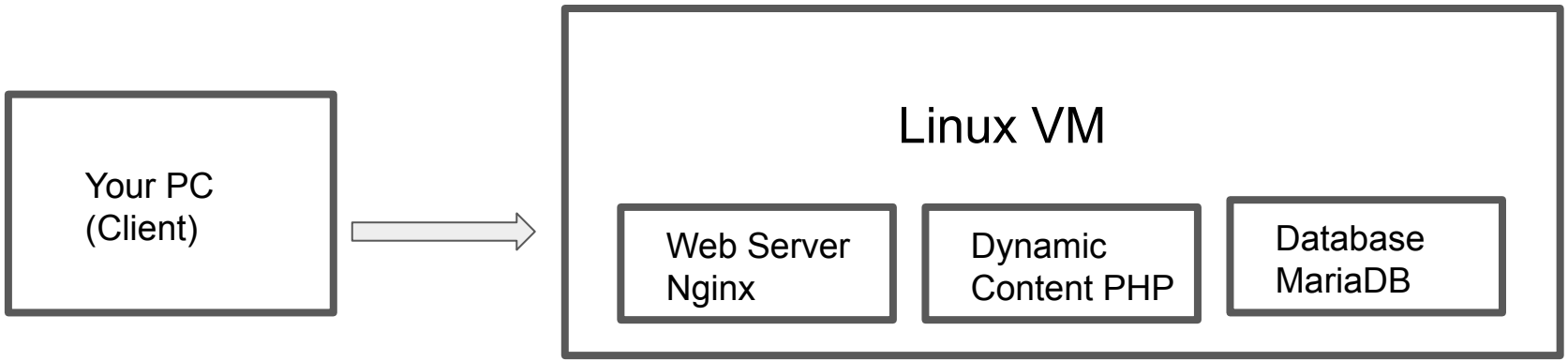
1. Create a Ubuntu Server VM
    - Username: Student ID, eg: b09902007. The user should be in **sudo** group
    - Hostname: nasalab
2. Networking
    - 確定可以對外有 internet 連線
    - 確定外部可以連入wordpress & ssh的 port。(bridge networking, port forwarding)

VM on Workstation

```
# setting VM
qemu-system-x86_64 -enable-kvm \
  -cpu host \
  -m 8G \
  -drive file=server.qcow2,format=qcow2 \
  -monitor stdio \
  -nic user,hostfwd=tcp::<http port>-:80,hostfwd=tcp::<ssh port>-:22 \
  -vnc :<vnc port>,password=on

# change vnc password
(qemu) change vnc password

# connect to web page
http://nasaws[n].csie.ntu.edu.tw<http port>

# connect with ssh
ssh nasa@nasaws[n].csie.ntu.edu.tw -p <ssh port>

# add user(in ubuntu)
$ sudo adduser <student id>

# change hostname in /etc/hostname
nasalab

# restart
$ reboot
```

LAB

- Run WordPress by LEMP
  - Linux + Nginx + MariaDB + PHP



Firewall Configuration

- What do you see when visiting VM’s webpage from the host?
- Enable 80 port for `Apache:`
  - `$ sudo firewall-cmd --list-all`
  - `$ sudo firewall-cmd --add-service=http --permanent`
  - `$ sudo firewall-cmd --reload`

Install Nginx + MariaDB + php

```
$ sudo apt update
$ sudo apt install nginx mariadb-server php8.3-fpm php-mysql
```

php-mysql 是 php 的 MySQL 模組，需要這個才能連線、執行 SQL 查詢

Testing Nginx

```
$ curl localhost
```

What do you see?

Nginx Directory Structure

- Ubuntu/nginx: /etc/nginx
- nginx.conf # nginx general config
- conf.d # general config folder
- modules-available/ # module file
- modules-enabled/ # ln to enable module
- sites-available/ # config for sites
- sites-enabled/ # ln to enable site configs
- snippiets/ # 安裝時附送可能會用到的設定

Nginx Config - nginx.conf

- `user www-data` `# the user for nginx`
- `include` `# import other configuration files`
- `access_log` `# location of error log`
- `error_log` `# location of error log`
- `gzip` `# compress the served content`

Configure Nginx

```
$ cd /etc/nginx
$ sudo cp sites-available/default sites-available/wordpress.conf
$ sudo unlink sites-enabled/default

$ sudo nano sites-available/wordpress.conf
```

Configure Nginx

```
server {
    listen 80 default_server;
    root /var/www/wordpress;

    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/php8.3-fpm.sock;
    }

}
```

Configure Nginx

```
$ sudo ln -s /etc/nginx/sites-available/wordpress.conf
/etc/nginx/sites-enabled/wordpress.conf

$ sudo mkdir -p /var/www/wordpress

# 測試 nginx configuration 有沒有錯
$ sudo nginx -t

# 重新載入 nginx
$ sudo systemctl reload nginx
```

Configure Nginx - Testing Nginx with PHP

建立一個檔案測試 /var/www/wordpress/index.php, 記得要刪掉(理由)

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

System	Linux nasalab 6.8.0-56-generic #58-Ubuntu SMP PREEMPT_DYNAMIC Fri Feb 14 15:33:28 UTC 2025 x86_64
Build Date	Dec 2 2024 12:36:18
Build System	Linux
Server API	FPM/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/8.3/fpm
Loaded Configuration File	/etc/php/8.3/fpm/php.ini
Scan this dir for additional .ini files	/etc/php/8.3/fpm/conf.d
Additional .ini files parsed	/etc/php/8.3/fpm/conf.d/10-mysqlnd.ini, /etc/php/8.3/fpm/conf.d/10-opcache.ini, /etc/php/8.3/fpm/conf.d/10-pdo.ini, /etc/php/8.3/fpm/conf.d/20-calendar.ini, /etc/php/8.3/fpm/conf.d/20-ctype.ini, /etc/php/8.3/fpm/conf.d/20-exif.ini, /etc/php/8.3/fpm/conf.d/20-ffi.ini, /etc/php/8.3/fpm/conf.d/20-fileinfo.ini, /etc/php/8.3/fpm/conf.d/20-ftp.ini, /etc/php/8.3/fpm/conf.d/20-gettext.ini, /etc/php/8.3/fpm/conf.d/20-iconv.ini, /etc/php/8.3/fpm/conf.d/20-mysqli.ini, /etc/php/8.3/fpm/conf.d/20-pdo_mysql.ini, /etc/php/8.3/fpm/conf.d/20-phar.ini, /etc/php/8.3/fpm/conf.d/20-posix.ini, /etc/php/8.3/fpm/conf.d/20-readline.ini, /etc/php/8.3/fpm/conf.d/20-shmop.ini, /etc/php/8.3/fpm/conf.d/20-sockets.ini, /etc/php/8.3/fpm/conf.d/20-sysvmsg.ini, /etc/php/8.3/fpm/conf.d/20-sysvsem.ini, /etc/php/8.3/fpm/conf.d/20-sysvshm.ini, /etc/php/8.3/fpm/conf.d/20-tokenizer.ini
PHP API	20230831
PHP Extension	20230831
Zend Extension	420230831
Zend Extension Build	API420230831,NTS
PHP Extension Build	API20230831,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
Zend Max Execution Timers	disabled
IPv6 Support	enabled
DTrace Support	disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, phar

Configure MariaDB

```
$ sudo mysql_secure_installation
Enter current password for root (enter for none): [Enter]
Switch to unix_socket authentication: [Enter]
Change the root password? [Y/n] n
Remove anonymous users? [Y/n] Y
Disallow root login remotely? [Y/n] Y
Remove test database and access to it? [Y/n] Y
Reload privilege tables now? [Y/n] Y
```

基本上是認真讀
然後接受它的建議就好了
測試可以登入 MySQL

```
$ sudo mysql
```

```
b09902007@nasalab:/tmp$ sudo mysql
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 41
Server version: 10.11.8-MariaDB-0ubuntu0.24.04.1 Ubuntu 24.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

MariaDB [(none)]> quit
Bye
```

Download and Configure WordPress

```
$ cd /tmp
$ wget https://wordpress.org/latest.tar.gz
$ tar xzvf latest.tar.gz
$ cp /tmp/wordpress/wp-config-sample.php /tmp/wordpress/wp-config.php
$ sudo cp -a /tmp/wordpress/. /var/www/wordpress
$ sudo chown -R www-data:www-data /var/www/wordpress
```

透過 Wordpress API 取得安全的 secret key, 複製到 wp-config.php 中

```
$ wget -O - https://api.wordpress.org/secret-key/1.1/salt/
$ sudo nano /var/www/wordpress/wp-config.php
```

Configure WordPress - 設定 mariaDB 帳號

```
$ sudo mysql
```

```
CREATE DATABASE wordpress DEFAULT CHARACTER SET utf8 COLLATE utf8_unicode_ci;
CREATE USER 'wordpressuser'@'localhost' IDENTIFIED BY 'password';
GRANT ALL ON wordpress.* TO 'wordpressuser'@'localhost';
```

Configure WordPress - 設定 mariaDB 帳號

設定 DB_NAME, DB_USER, DB_PASSWORD。供 Wordpress 連線到 mariaDB 使用。之後新增一行定義 FS_METHOD 為 direct。因為我們已經授予 Web 服務器寫入 /var/www/wordpress 的權限

```
$ sudo nano /var/www/wordpress/wp-config.php

define( 'DB_NAME', 'wordpress' );

/** MySQL database username */
define( 'DB_USER', 'wordpressuser' );

/** MySQL database password */
define( 'DB_PASSWORD', 'password' );

/** Database hostname **/
define( 'DB_HOST', 'localhost' );

define( 'FS_METHOD', 'direct' );
```

Configure WordPress - Nginx 改設定

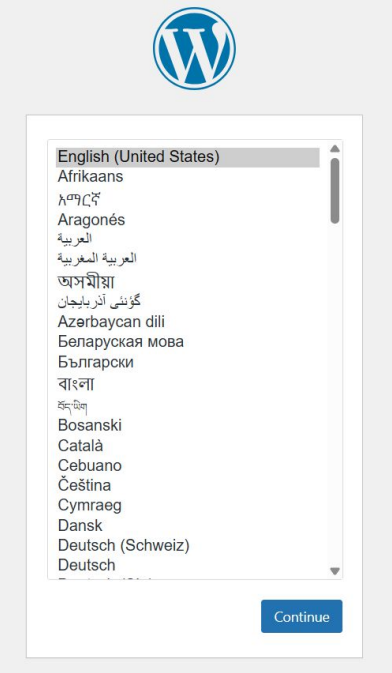
讓 Wordpress 可以顯示 404 頁面

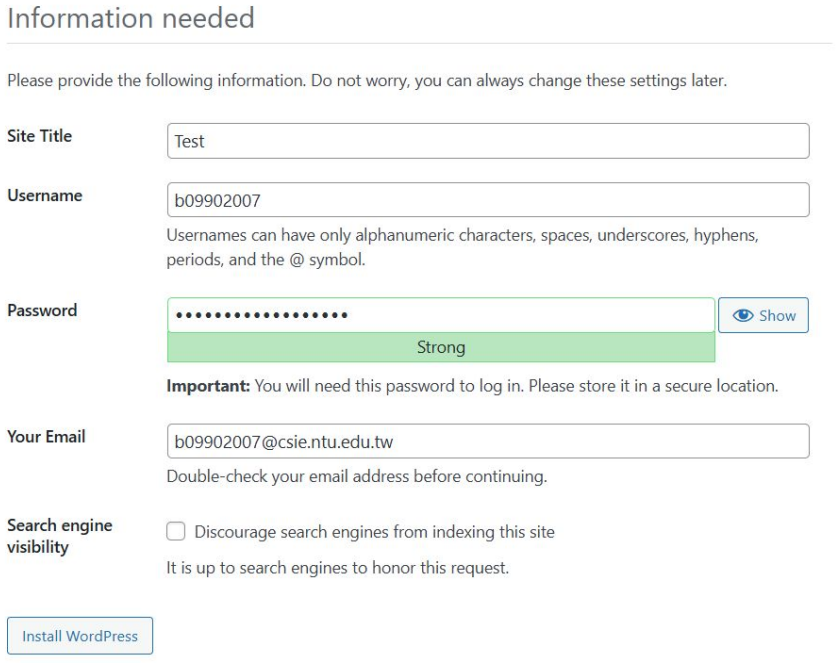
```
$ sudo nano /etc/nginx/sites-available/wordpress.conf
```

```
server {
    . . .
    location / {
        #try_files $uri $uri/ =404;
        try_files $uri $uri/ /index.php$is_args$args;
    }
    . . .
}
```

Wordpress Installation

- Connect to Wordpress in your host browser, set username to Student ID (Remember your password!!)



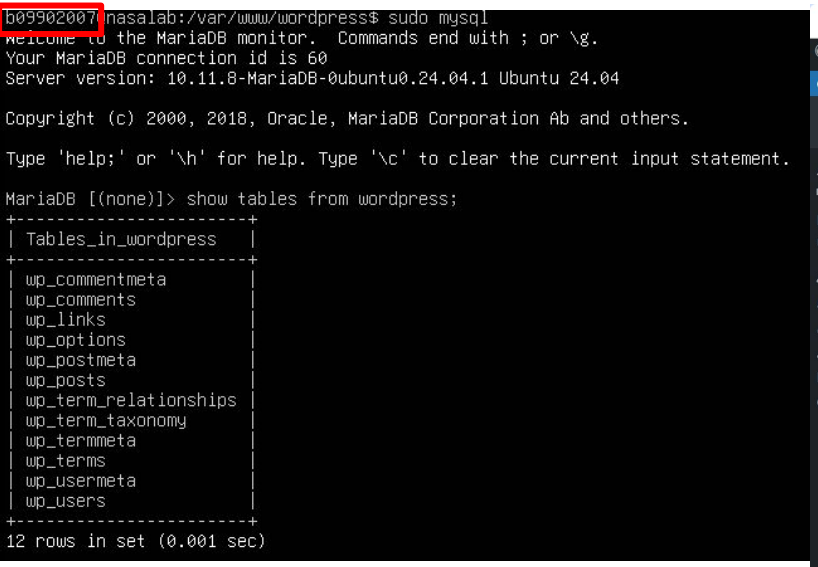


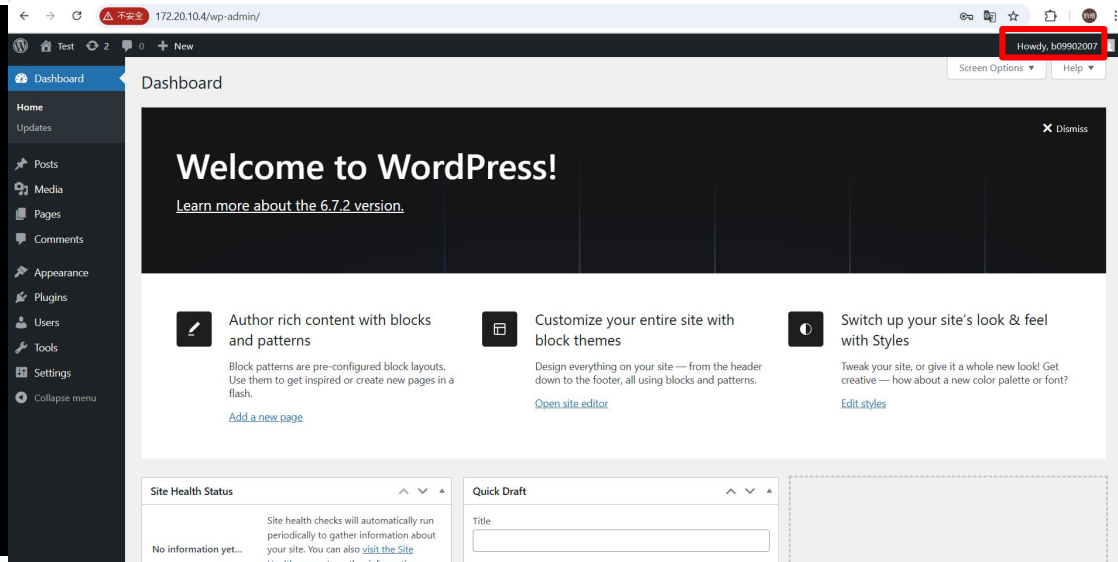
Demo (submit via COOL)

- Submit a **PDF** file to NTU **COOL** Lab7 assignment
- Your PDF file should contain
  - 2 screenshots(both with your Student ID)
    - your wordpress website (with VM Student ID@hostname)
    - tables content from your database (with Student ID on upper right corner)
      - Run `show tables from wordpress;` in MariaDB
    - Check example in next page
- Name your file to [學號]_lab7.pdf

Example

Show your Student ID





Thanks for your attention !

GL&HF :)

Reference:

How to Install LEMP Stack (Nginx, MariaDB, PHP8.3) on Ubuntu 24.04

How to Install WordPress with LEMP Stack on Ubuntu 24.04