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Student Number: 35343123

Assignment 2: ICT 1711 Cloud Server

Public IP Address: 13.60.232.69

Domain Name: https://tech4youth.me

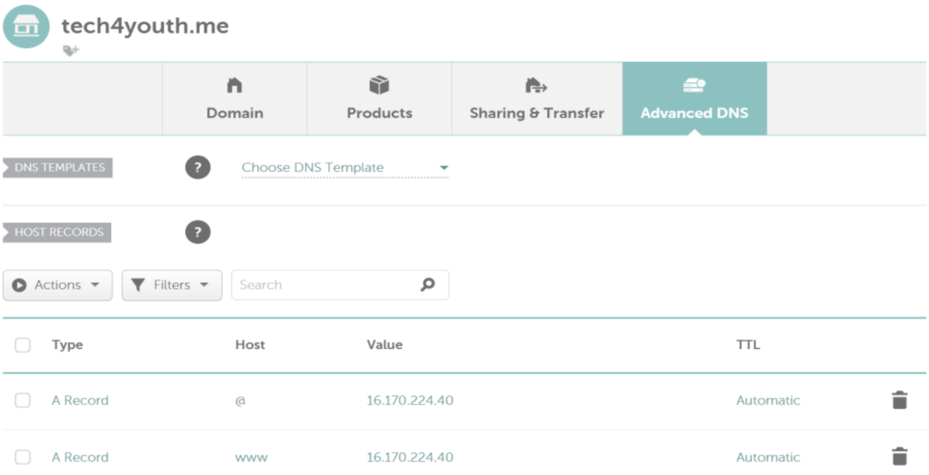
This document outlines the steps I took to build my cloud project, which is an online learning platform. This project builds upon Assignment 1, where I designed the interface of my proposal using basic HTML and CSS. In this assignment, I manually deployed WordPress on my EC2 instance and installed several features to help me manage my website. The features I installed include:

- **UFW**: This tool allows me to easily manage my server's firewall.
- **Certbot**: This enables me to set up HTTPS on my website for free with a free SSL certificate.
- **Adminer**: This tool helps me manage my databases.
- **Fail2Ban**: This protects my server by blocking IP addresses that attempt to hack it.
- **Cockpit**: This is intended to help manage my server; however, it failed to start despite following all the correct steps.

I also deployed Duplicity to back up my files. This decision came after an incident disrupted my server, prompting me to launch a new instance and restart the setup. Fortunately, I was able to do this quickly and easily because I had documented all my steps.

1. *DNS Records (initial):*

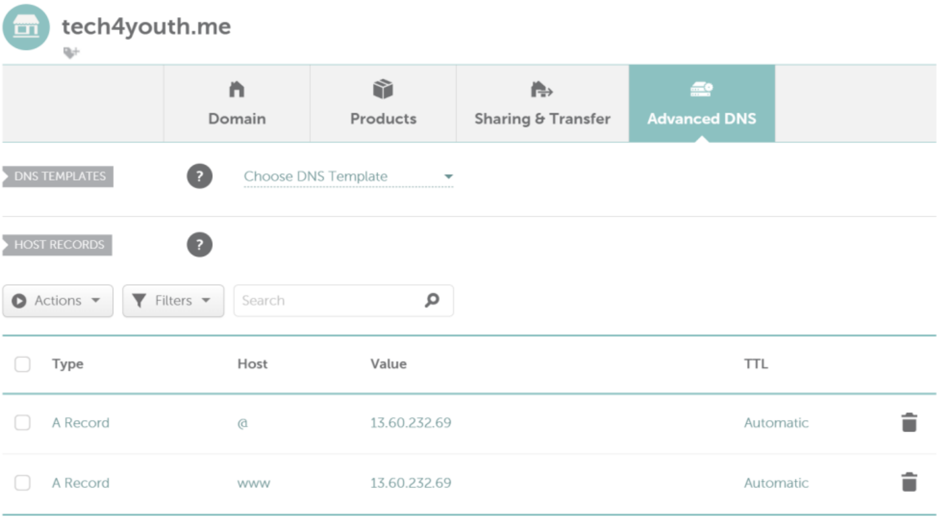
- Type: A Record
- Name: https://tech4youth.me
- Value: 16.170.224.40
- TTL: Automatic



□	Type	Host	Value	TTL
□	A Record	@	16.170.224.40	Automatic
□	A Record	www	16.170.224.40	Automatic

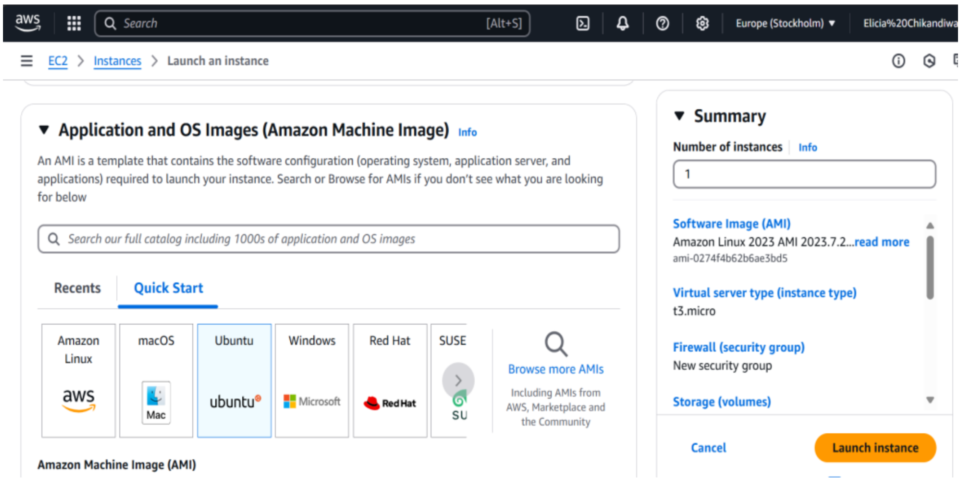
Current DNS Records:

- Type: A Record
- Name: https://tech4youth.me
- Value: 13.60.232.69
- TTL: Automatic



□	Type	Host	Value	TTL
□	A Record	@	13.60.232.69	Automatic
□	A Record	www	13.60.232.69	Automatic

2. *Instance Setup:*



▼ Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

Recents | Quick Start

Amazon Linux | macOS | Ubuntu | Windows | Red Hat | SUSE

Browse more AMIs
Including AMIs from AWS, Marketplace and the Community

Amazon Machine Image (AMI)

▼ Summary

Number of instances Info
1

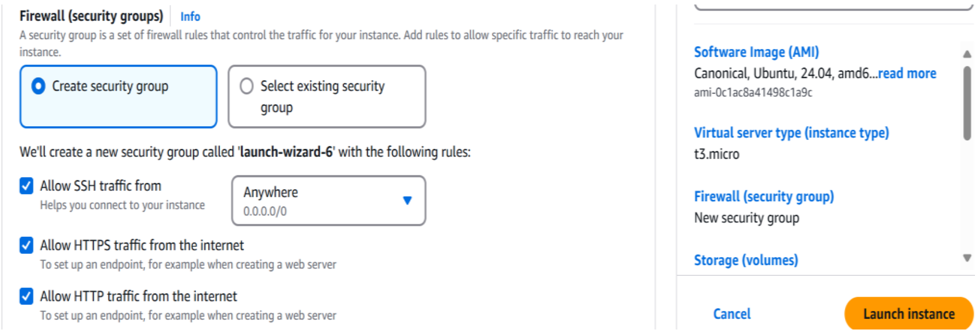
Software Image (AMI)
Amazon Linux 2023 AMI 2023.7.2...read more
ami-0274f4b62b6ae3bd5

Virtual server type (instance type)
t3.micro

Firewall (security group)
New security group

Storage (volumes)

- AWS EC2 instance: Ubuntu


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

We'll create a new security group called '**launch-wizard-6**' with the following rules:

☑ Allow SSH traffic from — Anywhere 0.0.0.0/0
Helps you connect to your instance

☑ Allow HTTPS traffic from the internet
To set up an endpoint, for example when creating a web server

☑ Allow HTTP traffic from the internet
To set up an endpoint, for example when creating a web server

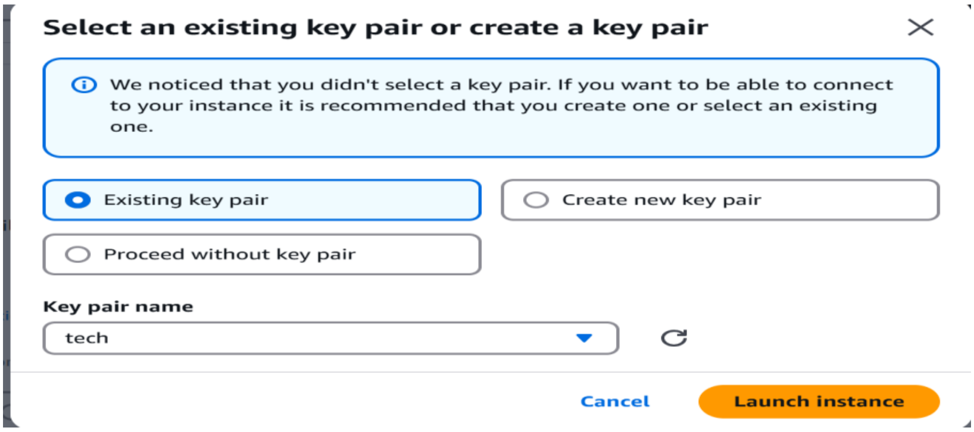
Software Image (AMI)
Canonical, Ubuntu, 24.04, amd6...read more
ami-0c1ac8a41498c1a9c

Virtual server type (instance type)
t3.micro

Firewall (security group)
New security group

Storage (volumes)

Select key pair and launch instance:


Select an existing key pair or create a key pair

We noticed that you didn't select a key pair. If you want to be able to connect to your instance it is recommended that you create one or select an existing one.

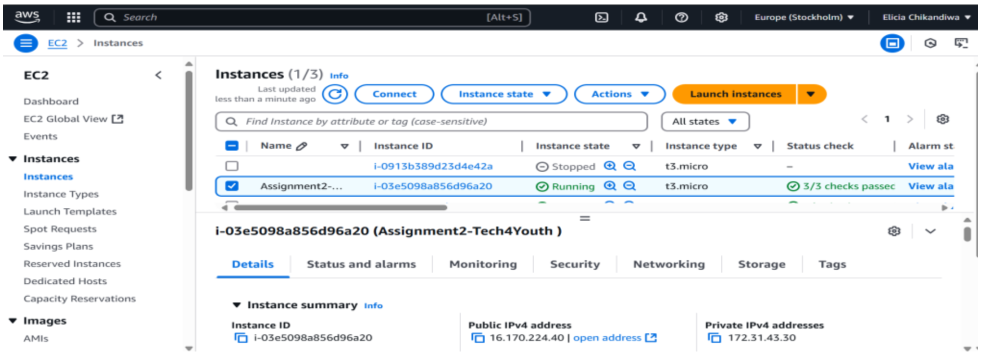
● Existing key pair ○ Create new key pair

○ Proceed without key pair

Key pair name
tech

Select your instance and connect through EC2 instance connect

(Old instance):

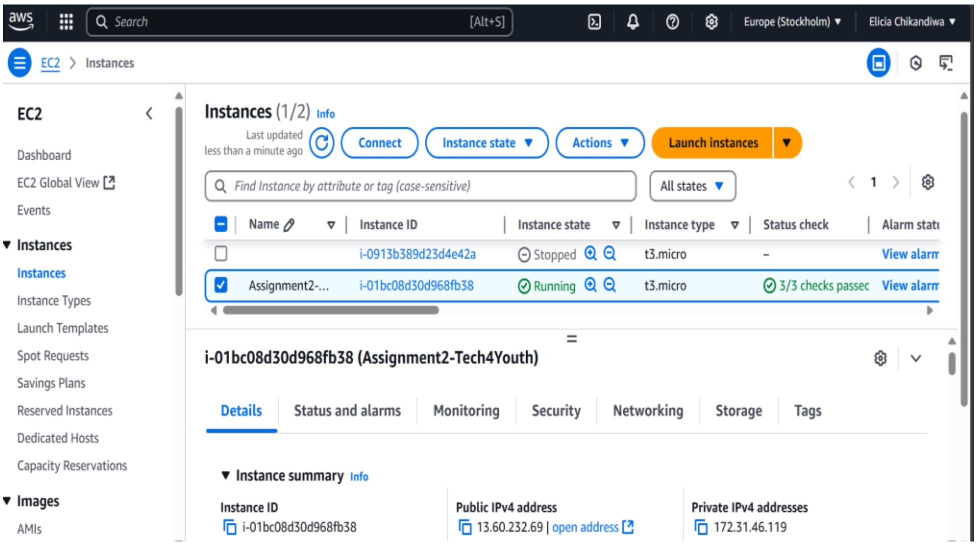


☑	Name	Instance ID	Instance state	Instance type	Status check	Alarm st
□		i-0913b389d23d4e42a	Stopped	t3.micro	–	View ala
☑	Assignment2-...	i-03e5098a856d96a20	Running	t3.micro	3/3 checks passec	View ala

i-03e5098a856d96a20 (Assignment2-Tech4Youth)

Instance ID: i-03e5098a856d96a20
Public IPv4 address: 16.170.224.40 | open address
Private IPv4 addresses: 172.31.43.30

New instance:

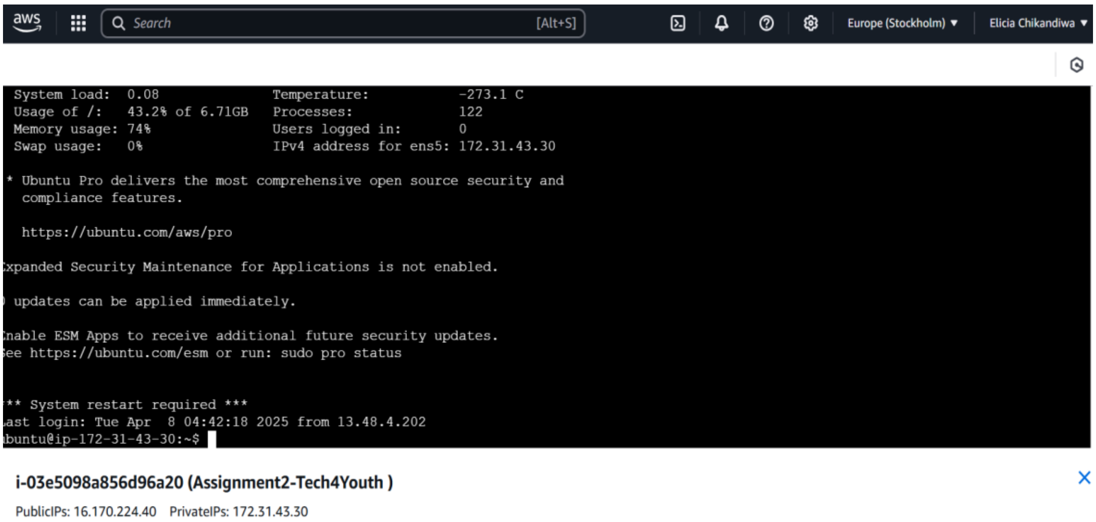


☑	Name	Instance ID	Instance state	Instance type	Status check	Alarm statu
□		i-0913b389d23d4e42a	Stopped	t3.micro	–	View alarm
☑	Assignment2-...	i-01bc08d30d968fb38	Running	t3.micro	3/3 checks passec	View alarm

i-01bc08d30d968fb38 (Assignment2-Tech4Youth)

Instance ID: i-01bc08d30d968fb38
Public IPv4 address: 13.60.232.69 | open address
Private IPv4 addresses: 172.31.46.119

Connect Instance and navigate to terminal (old terminal)

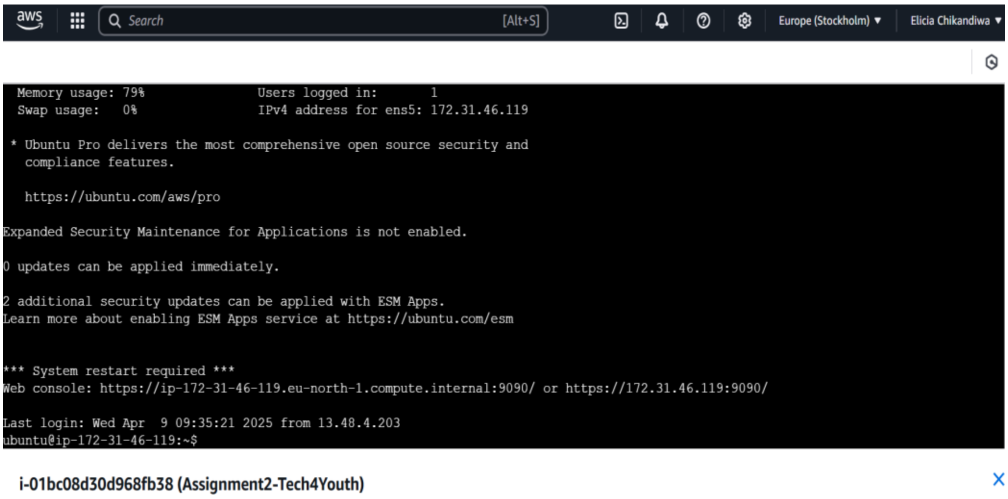


```
 System load:  0.08              Temperature:           -273.1 C
 Usage of /:   43.2% of 6.71GB   Processes:             122
 Memory usage: 74%               Users logged in:       0
 Swap usage:   0%                IPv4 address for ens5: 172.31.43.30

* Ubuntu Pro delivers the most comprehensive open source security and
  compliance features.

  https://ubuntu.com/aws/pro

xpanded Security Maintenance for Applications is not enabled.

 updates can be applied immediately.

nable ESM Apps to receive additional future security updates.
ee https://ubuntu.com/esm or run: sudo pro status


** System restart required ***
ast login: Tue Apr  8 04:42:18 2025 from 13.48.4.202
buntu@ip-172-31-43-30:~$ 
```

i-03e5098a856d96a20 (Assignment2-Tech4Youth)

PublicIPs: 16.170.224.40 PrivateIPs: 172.31.43.30

New terminal



```
 Memory usage: 79%                Users logged in:       1
 Swap usage:   0%                 IPv4 address for ens5: 172.31.46.119

 * Ubuntu Pro delivers the most comprehensive open source security and
   compliance features.

   https://ubuntu.com/aws/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

2 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm


*** System restart required ***
Web console: https://ip-172-31-46-119.eu-north-1.compute.internal:9090/ or https://172.31.46.119:9090/

Last login: Wed Apr  9 09:35:21 2025 from 13.48.4.203
ubuntu@ip-172-31-46-119:~$
```

3. Server Setup

```
# Update server

sudo apt update

sudo apt upgrade -y


# Install Apache

sudo apt install apache2 -y

sudo systemctl enable apache2

sudo systemctl start apache2

sudo ufw allow 'Apache Full'


# Install PHP and extensions

sudo apt install php php-mysql libapache2-mod-php php-cli php-cgi php-gd php-curl
php-mbstring php-xml php-xmlrpc php-soap php-intl php-zip -y


# Install MySQL

sudo apt install mysql-server -y

sudo systemctl start mysql

sudo systemctl enable mysql


# Secure MySQL
```

```
sudo mysql -u root -p
```

CREATE DATABASE wordpress;

CREATE USER 'wpuser'@'localhost' IDENTIFIED BY 'tech4youth';

GRANT ALL PRIVILEGES ON wordpressdb.* TO 'wpuser'@'localhost';

FLUSH PRIVILEGES;

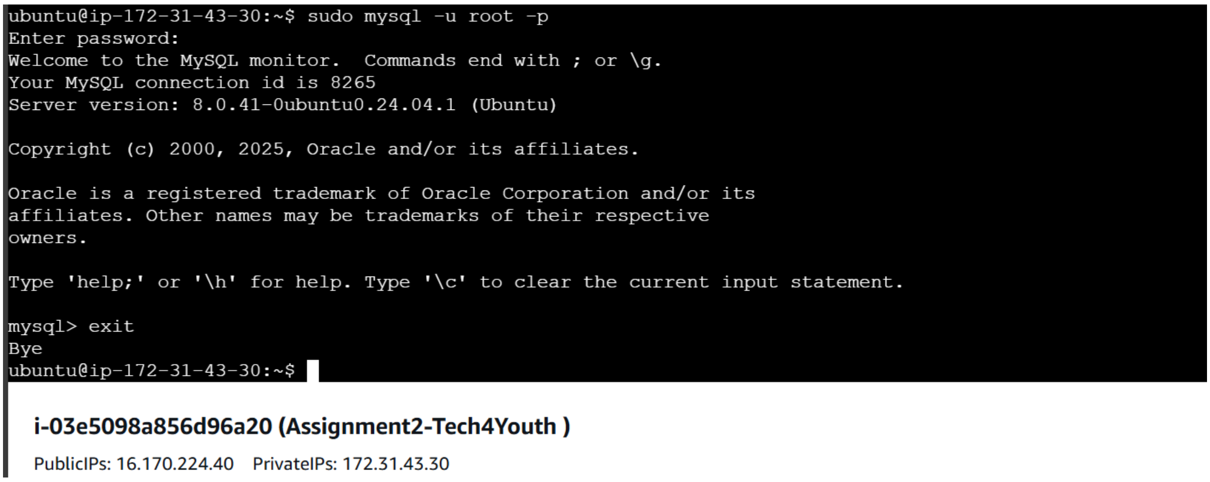
EXIT;

4. Wordpress installation and setup

#Create WordPress database and user

```
sudo mysql -u root -p
```

#Enter mysql password



```
ubuntu@ip-172-31-43-30:~$ sudo mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8265
Server version: 8.0.41-0ubuntu0.24.04.1 (Ubuntu)

Copyright (c) 2000, 2025, Oracle and/or its affiliates.

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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
Bye
ubuntu@ip-172-31-43-30:~$
```

i-03e5098a856d96a20 (Assignment2-Tech4Youth)

PublicIPs: 16.170.224.40 PrivateIPs: 172.31.43.30

CREATE DATABASE wordpress;

CREATE USER 'admin'@'localhost' IDENTIFIED BY 'tech4youth@admin';

GRANT ALL PRIVILEGES ON wordpress_db.* TO 'admin'@'localhost';

FLUSH PRIVILEGES;

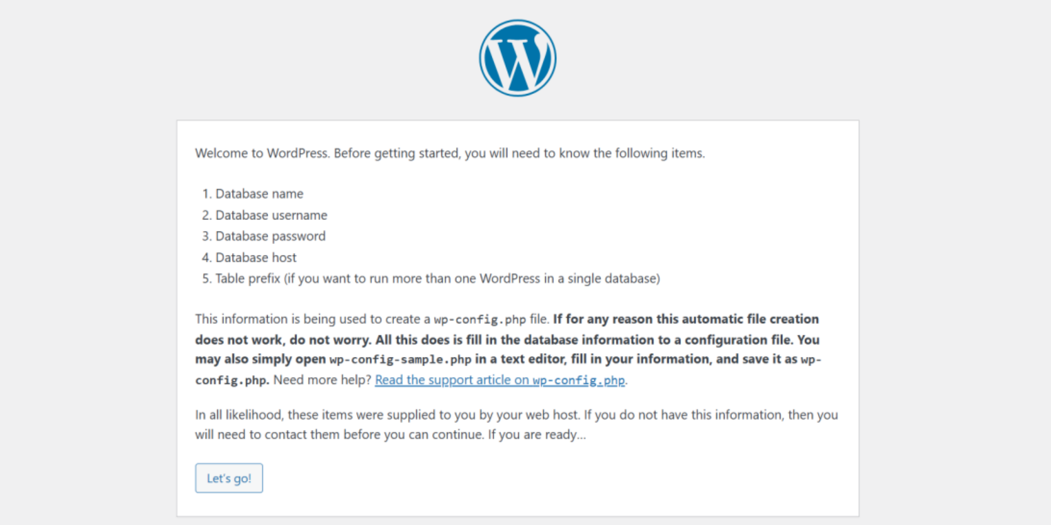
EXIT;

```
# Download and setup WordPress
```

```
cd /tmp

curl -O https://wordpress.org/latest.tar.gz

tar -xvzf latest.tar.gz

sudo mv wordpress/* /var/www/html/


# Set ownership and permissions

sudo chown -R www-data:www-data /var/www/html/

sudo chmod -R 755 /var/www/html/


# Remove default index.html landing page

sudo rm -f /var/www/html/index.html


# Copy wp-config file

cd /var/www/html/

sudo cp wp-config-sample.php wp-config.php


# Restart Apache

sudo systemctl restart apache2
```

Log into wordpress through: https://domain/wp-admin/

OR https://IPadress/wp-admin

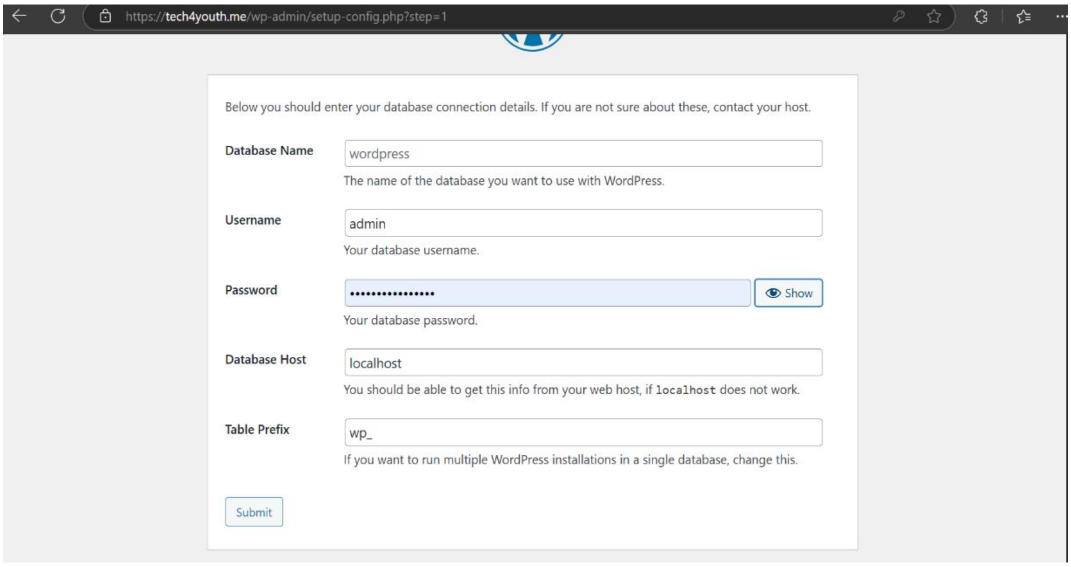


Welcome to WordPress. Before getting started, you will need to know the following items.

1. Database name
2. Database username
3. Database password
4. Database host
5. Table prefix (if you want to run more than one WordPress in a single database)

This information is being used to create a `wp-config.php` file. **If for any reason this automatic file creation does not work, do not worry. All this does is fill in the database information to a configuration file. You may also simply open `wp-config-sample.php` in a text editor, fill in your information, and save it as `wp-config.php`.** Need more help? Read the support article on `wp-config.php`.

In all likelihood, these items were supplied to you by your web host. If you do not have this information, then you will need to contact them before you can continue. If you are ready…



https://tech4youth.me/wp-admin/setup-config.php?step=1

Below you should enter your database connection details. If you are not sure about these, contact your host.

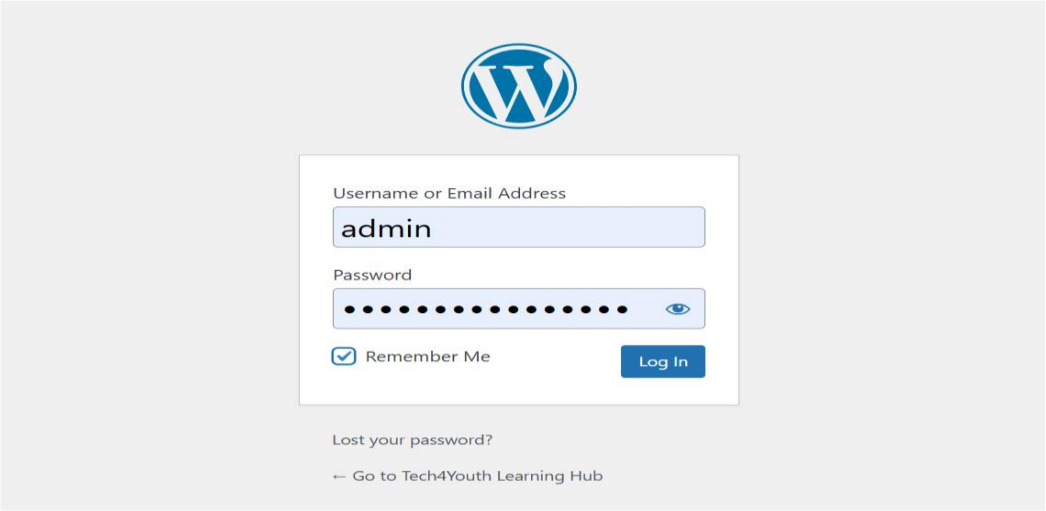
Database Name: wordpress
The name of the database you want to use with WordPress.

Username: admin
Your database username.

Password: ••••••••••••••••
Your database password.

Database Host: localhost
You should be able to get this info from your web host, if `localhost` does not work.

Table Prefix: wp_
If you want to run multiple WordPress installations in a single database, change this.

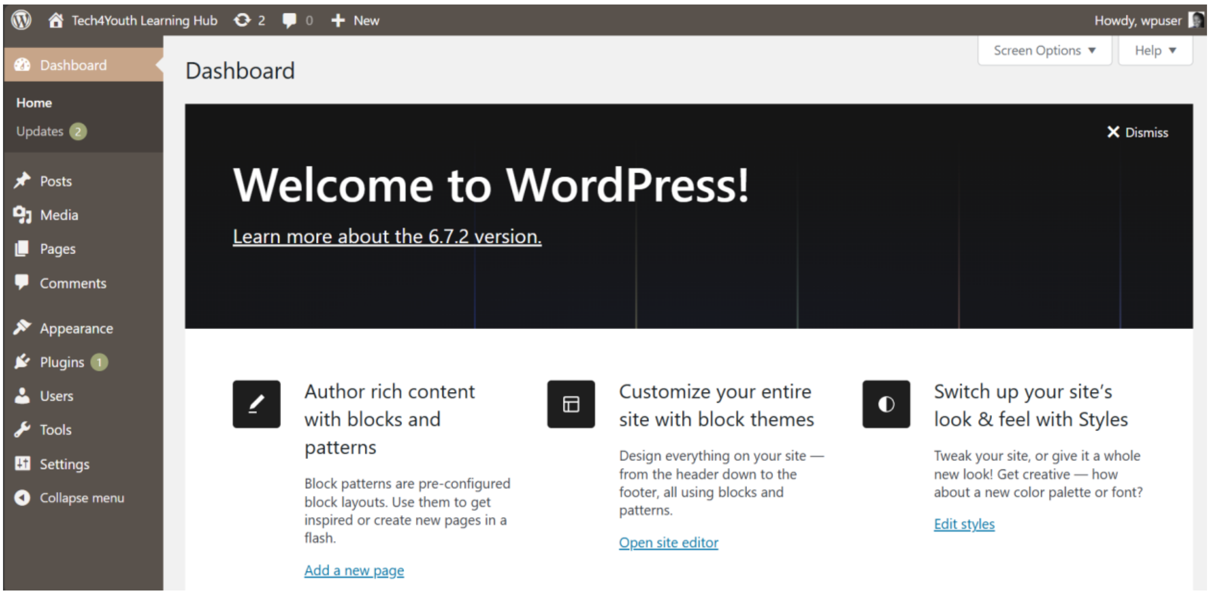


Username or Email Address: admin

Password: ••••••••••••••••

☑ Remember Me

Navigate to your dashboard



Dashboard

Welcome to WordPress!

Learn more about the 6.7.2 version.

Author rich content with blocks and patterns

Block patterns are pre-configured block layouts. Use them to get inspired or create new pages in a flash.

Add a new page

Customize your entire site with block themes

Design everything on your site — from the header down to the footer, all using blocks and patterns.

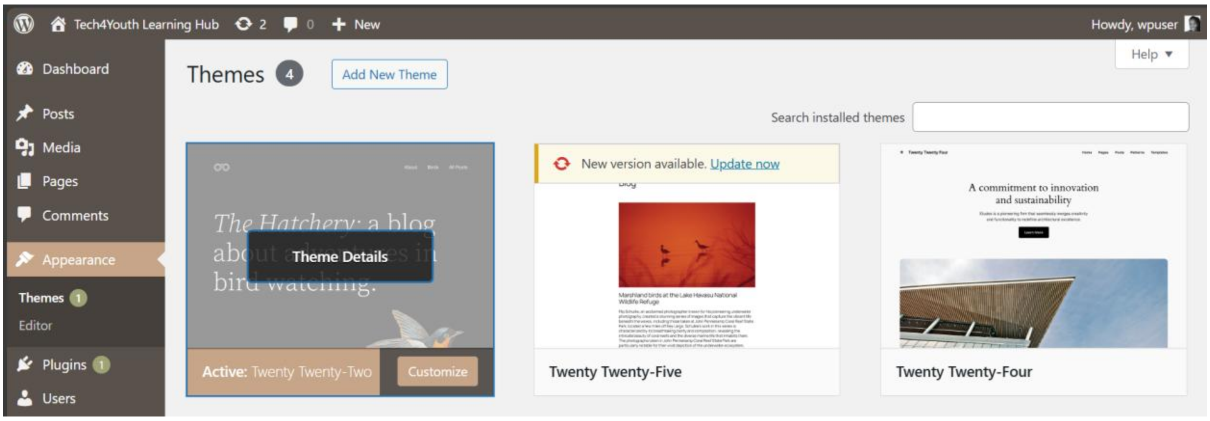
Open site editor

Switch up your site's look & feel with Styles

Tweak your site, or give it a whole new look! Get creative — how about a new color palette or font?

Edit styles

Add a theme and customize your webpage to your liking



Themes 4

The Hatchery: a blog about adventures in bird watching.

Active: Twenty Twenty-Two

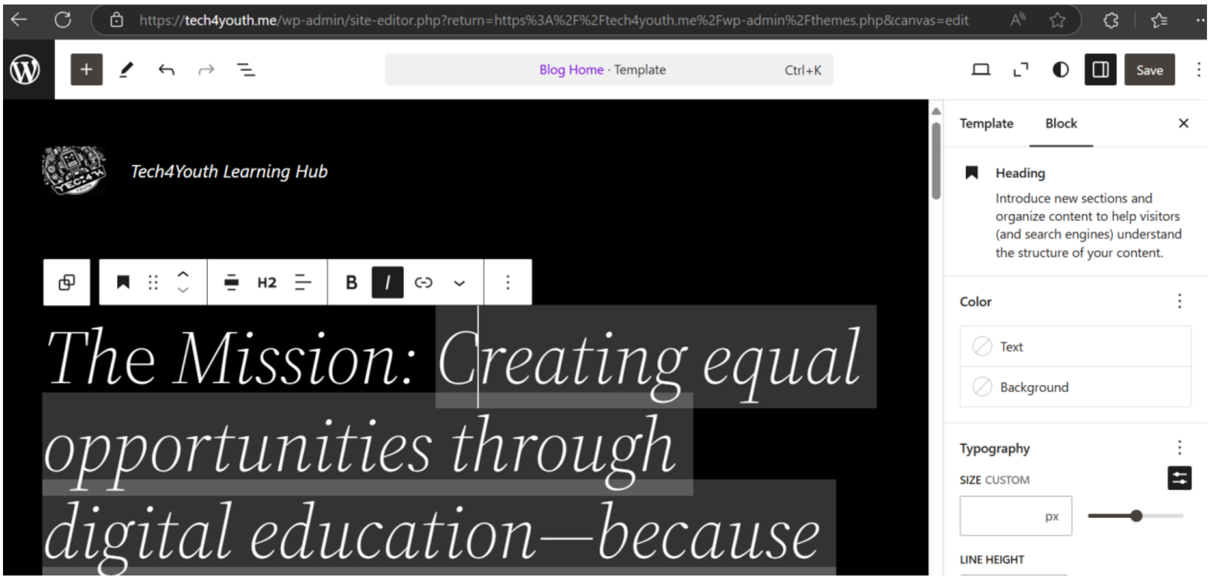
New version available. Update now

Twenty Twenty-Five

A commitment to innovation and sustainability

Twenty Twenty-Four

Customize and save (Old wordpress page)



https://tech4youth.me/wp-admin/site-editor.php?return=https%3A%2F%2Ftech4youth.me%2Fwp-admin%2Fthemes.php&canvas=edit

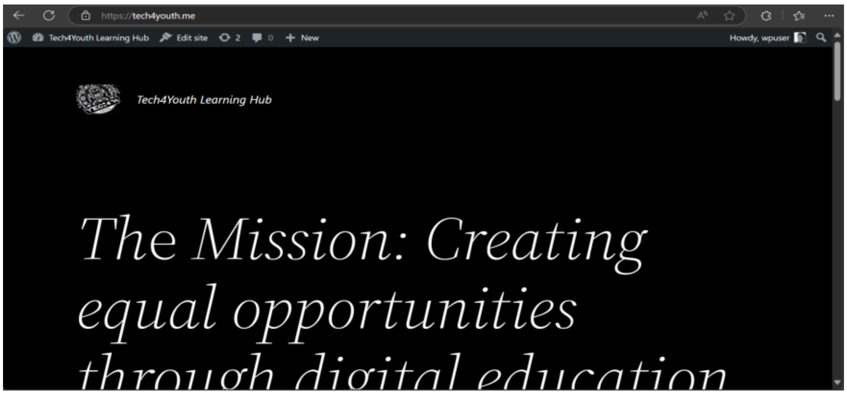
Tech4Youth Learning Hub

The Mission: Creating equal opportunities through digital education—because

Heading

Introduce new sections and organize content to help visitors (and search engines) understand the structure of your content.

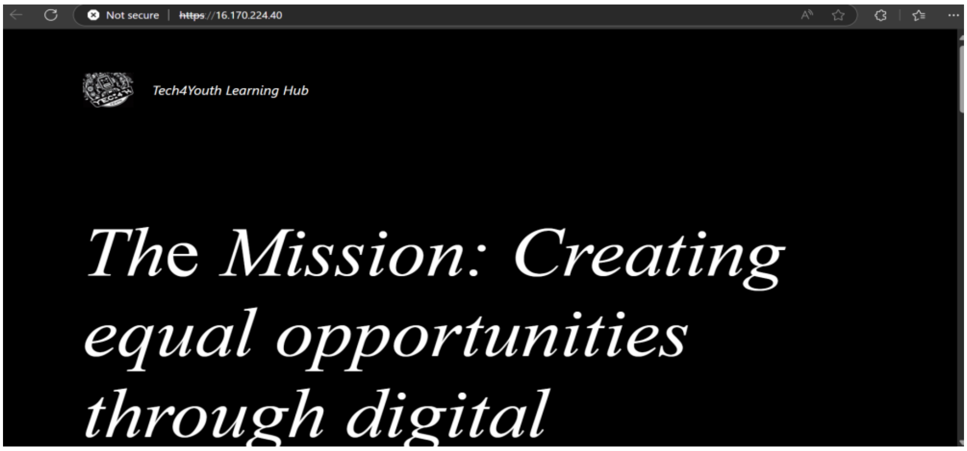
Your webpage should be accessible through both the IP and the domain



https://tech4youth.me

Tech4Youth Learning Hub

The Mission: Creating equal opportunities through digital education



Not secure | https://16.170.224.40

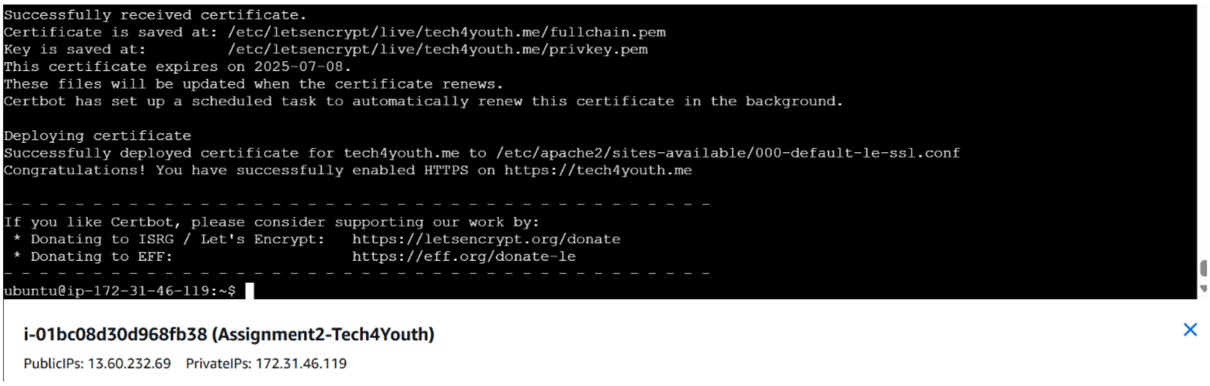
Tech4Youth Learning Hub

The Mission: Creating equal opportunities through digital

5. *SSH settings*

```
sudo apt update

sudo apt install certbot python3-certbot-apache

sudo ufw allow 'Apache Full'

sudo certbot –apache
```

Enter your domain name e.g tech4youth.me

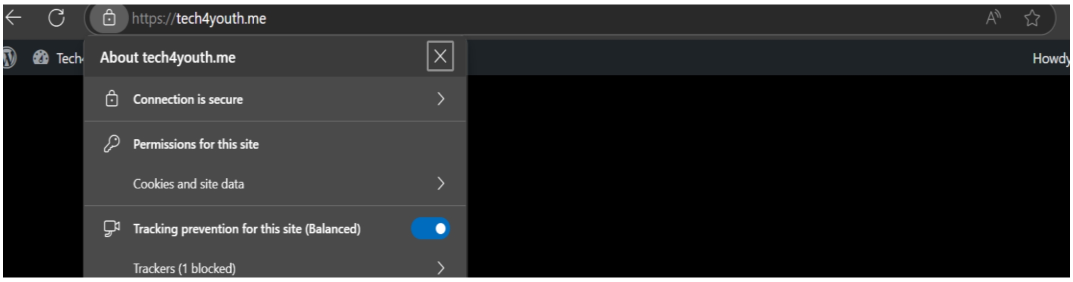


```
Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/tech4youth.me/fullchain.pem
Key is saved at:         /etc/letsencrypt/live/tech4youth.me/privkey.pem
This certificate expires on 2025-07-08.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for tech4youth.me to /etc/apache2/sites-available/000-default-le-ssl.conf
Congratulations! You have successfully enabled HTTPS on https://tech4youth.me

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
If you like Certbot, please consider supporting our work by:
 * Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
 * Donating to EFF:                    https://eff.org/donate-le
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
ubuntu@ip-172-31-46-119:~$
```

i-01bc08d30d968fb38 (Assignment2-Tech4Youth)

PublicIPs: 13.60.232.69 PrivateIPs: 172.31.46.119

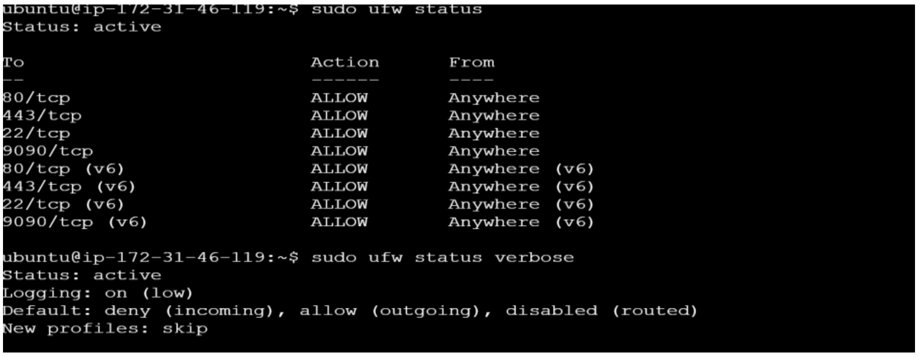
Your webpage you have the secured symbol of a lock:



6. Install Fail2Ban, UFW, Cockpit and Adminer

```
#!/bin/bash


# Update and upgrade the server

sudo apt update && sudo apt upgrade -y


# Install Fail2Ban

sudo apt install fail2ban -y
```

```
# Enable and start Fail2Ban

sudo systemctl enable fail2ban

sudo systemctl start fail2ban


# Install UFW (Uncomplicated Firewall)

sudo apt install ufw -y


# Allow SSH connections (important if connected via SSH)

sudo ufw allow ssh


# Allow HTTP and HTTPS

sudo ufw allow http

sudo ufw allow https


# Enable UFW

sudo ufw enable


# Set default policies (Deny incoming, allow outgoing)

sudo ufw default deny incoming

sudo ufw default allow outgoing


# Check UFW status

sudo ufw status verbose
```



```
ubuntu@ip-172-31-46-119:~$ sudo ufw status
Status: active

To                         Action      From
--                         ------      ----
80/tcp                     ALLOW       Anywhere
443/tcp                    ALLOW       Anywhere
22/tcp                     ALLOW       Anywhere
9090/tcp                   ALLOW       Anywhere
80/tcp (v6)                ALLOW       Anywhere (v6)
443/tcp (v6)               ALLOW       Anywhere (v6)
22/tcp (v6)                ALLOW       Anywhere (v6)
9090/tcp (v6)              ALLOW       Anywhere (v6)

ubuntu@ip-172-31-46-119:~$ sudo ufw status verbose
Status: active
Logging: on (low)
Default: deny (incoming), allow (outgoing), disabled (routed)
New profiles: skip
```

```
# Install Adminer

sudo mkdir /var/www/adminer
```

```
cd /var/www/adminer
sudo wget https://www.adminer.org/latest.php -O adminer.php

# Set proper permissions
sudo chown -R www-data:www-data /var/www/adminer
sudo chmod -R 755 /var/www/adminer

# Create Apache config for Adminer
echo "<VirtualHost *:80>
    DocumentRoot /var/www/adminer
    ServerName adminer.yourdomain.com
    <Directory /var/www/adminer>
        AllowOverride All
        Require all granted
    </Directory>
</VirtualHost>" | sudo tee /etc/apache2/sites-available/adminer.conf > /dev/null

# Enable the site and restart Apache
sudo a2ensite adminer.conf
sudo systemctl restart apache2

# Install Cockpit
sudo apt install cockpit -y

# Enable and start Cockpit
sudo systemctl enable cockpit
sudo systemctl start cockpit

# Allow Cockpit through UFW
sudo ufw allow 9090
```

7. *Bash SSH Script:*

```
#!/bin/bash


# Update and upgrade server

sudo apt update && sudo apt upgrade -y


# Install Apache

sudo apt install apache2 -y

sudo systemctl enable apache2

sudo systemctl start apache2

sudo ufw allow 'Apache Full'


# Install PHP and necessary extensions

sudo apt install php php-mysql libapache2-mod-php php-cli php-cgi php-gd php-curl
php-mbstring php-xml php-xmlrpc php-soap php-intl php-zip -y


# Install MySQL Server

sudo apt install mysql-server -y

sudo systemctl start mysql

sudo systemctl enable mysql


# Create WordPress database and user

sudo mysql <<EOF

CREATE DATABASE IF NOT EXISTS wordpress;

CREATE USER IF NOT EXISTS 'wpuser'@'localhost' IDENTIFIED BY 'strongpassword1';

GRANT ALL PRIVILEGES ON wordpress.* TO 'wpuser'@'localhost';

FLUSH PRIVILEGES;

EOF


# Download and setup WordPress

cd /tmp

curl -O https://wordpress.org/latest.tar.gz

tar -xvzf latest.tar.gz
```

```
sudo mv wordpress/* /var/www/html/


# Set ownership and permissions

sudo chown -R www-data:www-data /var/www/html/

sudo chmod -R 755 /var/www/html/


# Remove default Apache landing page if it exists

sudo rm -f /var/www/html/index.html


# Copy wp-config file (manual editing required)

cd /var/www/html/

sudo cp wp-config-sample.php wp-config.php


# Restart Apache to apply changes

sudo systemctl restart apache2
```

8. *Edit wp-config.php file:*

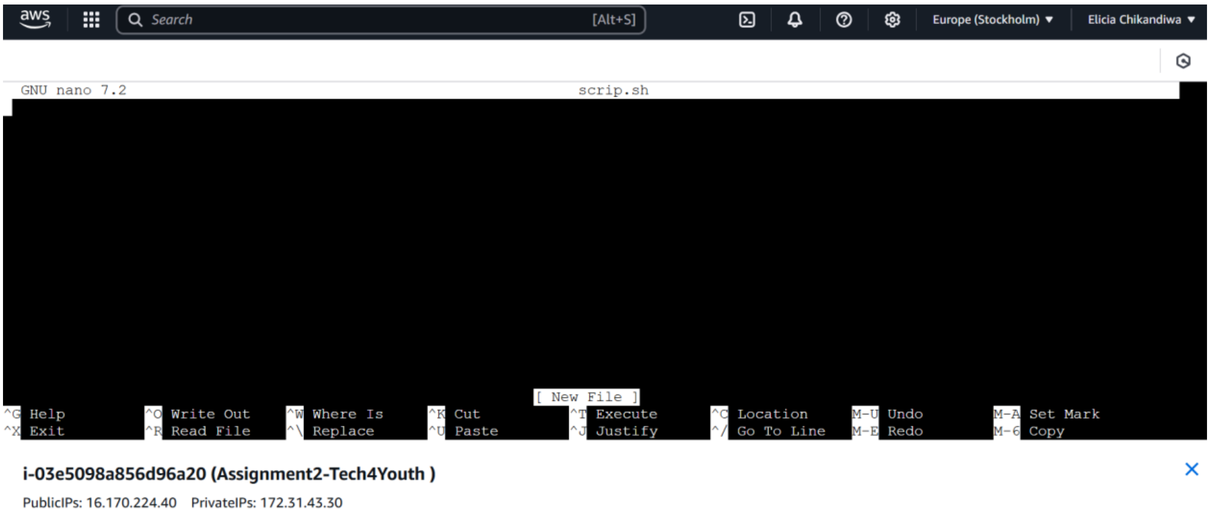
```
sudo nano /var/www/html/wp-config.php
```

Replace existing data with this data, when done save (CTRL O) and exit (CRTL X):

```
define( 'DB_NAME', 'wordpress' );

define( 'DB_USER', 'admin' );

define( 'DB_PASSWORD', 'tech4youth' );
```

9. *Steps to deploy the bash script:*

- Sudo nano script.sh
- Paste the script inside



```
GNU nano 7.2                              scrip.sh





                                       [ New File ]
^G Help        ^O Write Out   ^W Where Is    ^K Cut         ^T Execute     ^C Location    M-U Undo       M-A Set Mark
^X Exit        ^R Read File   ^\ Replace     ^U Paste       ^J Justify     ^/ Go To Line  M-E Redo       M-6 Copy
```

i-03e5098a856d96a20 (Assignment2-Tech4Youth)

PublicIPs: 16.170.224.40 PrivateIPs: 172.31.43.30

1. Press Ctrl + O to save
2. Press CRL + X to exit
3. Make it executable:

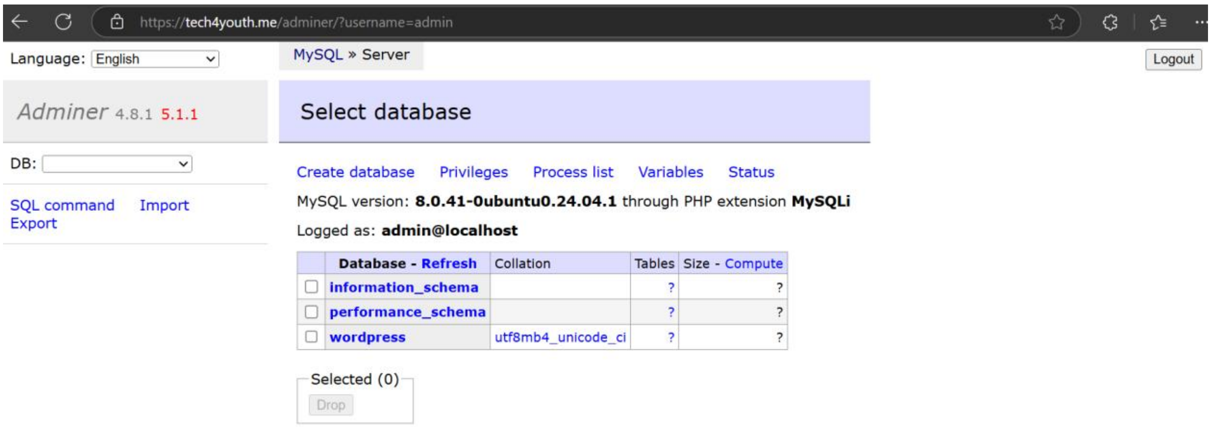
```
chmod +x setup-wordpress.sh
```

4. Run the scrip:

```
./setup-wordpress.sh
```

5. Type your answers and press enter

Adminer dashboard:


https://tech4youth.me/adminer/?username=admin
Language: English
MySQL » Server
Logout
Adminer 4.8.1 5.1.1
DB:
SQL command Import
Export
Create database Privileges Process list Variables Status
Drop

Select database

MySQL version: **8.0.41-0ubuntu0.24.04.1** through PHP extension **MySQLi**

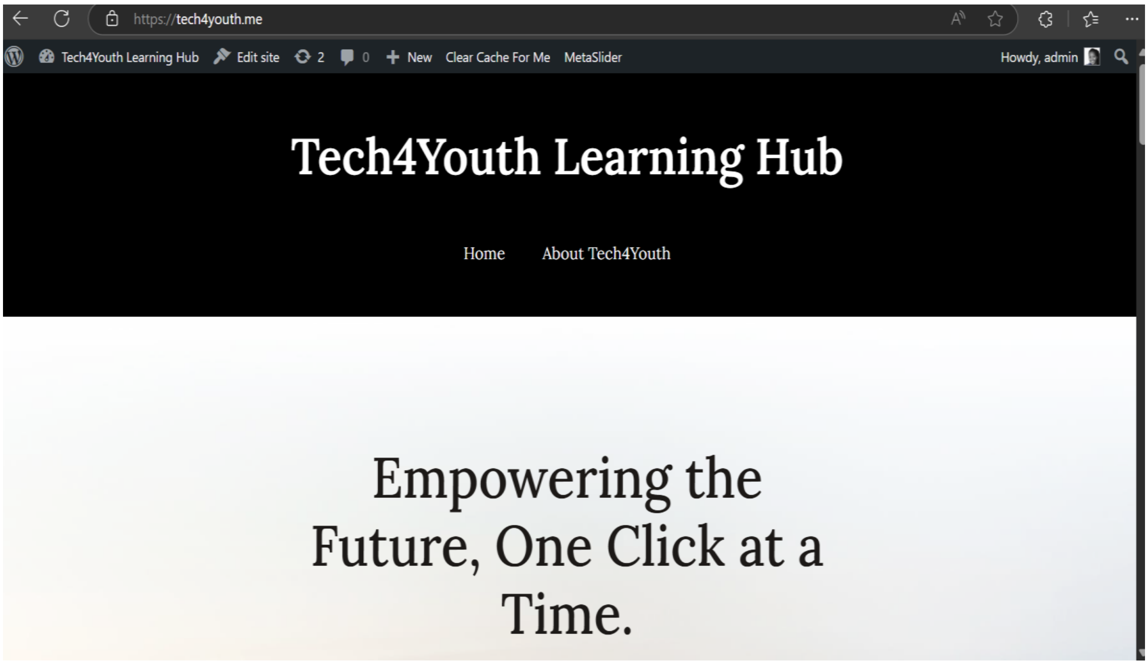
Logged as: **admin@localhost**

	Database - Refresh	Collation	Tables	Size - Compute
□	information_schema		?	?
□	performance_schema		?	?
□	wordpress	utf8mb4_unicode_ci	?	?

Selected (0)

Webpage snapshot (new)

Https accessibility:



Tech4Youth Learning Hub

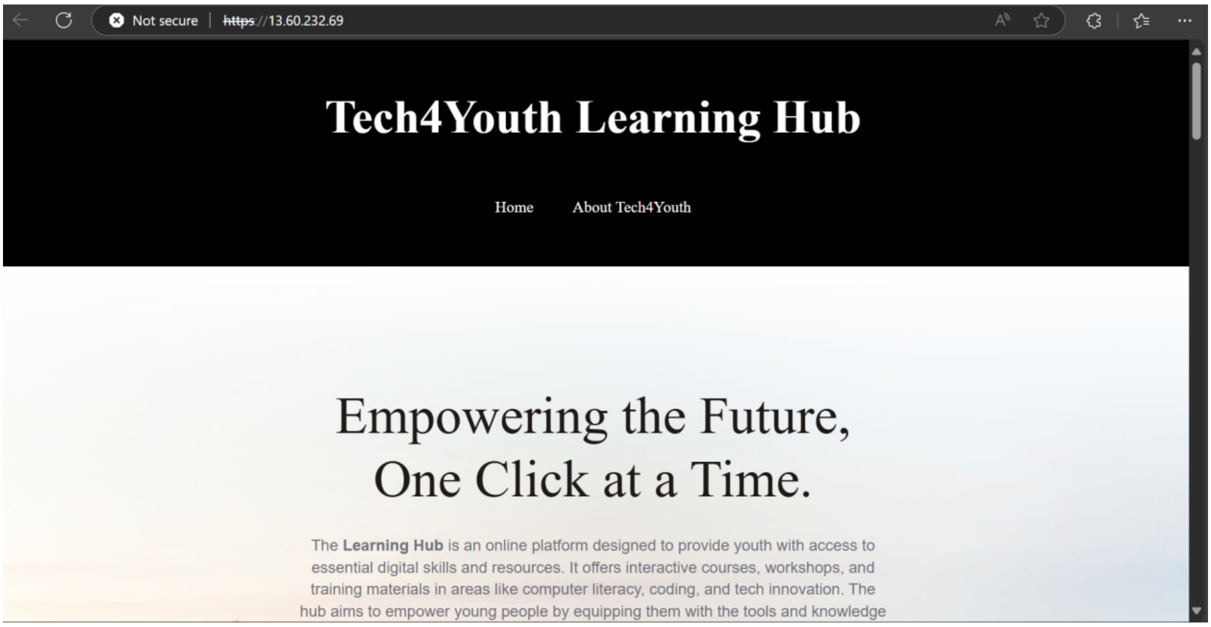
Home About Tech4Youth

Empowering the Future, One Click at a Time.

IP address accessibility:

(certbot does not issue an SSH certificate for IP addresses so it is unsecured when accessed directly through its IP)

Home Page:



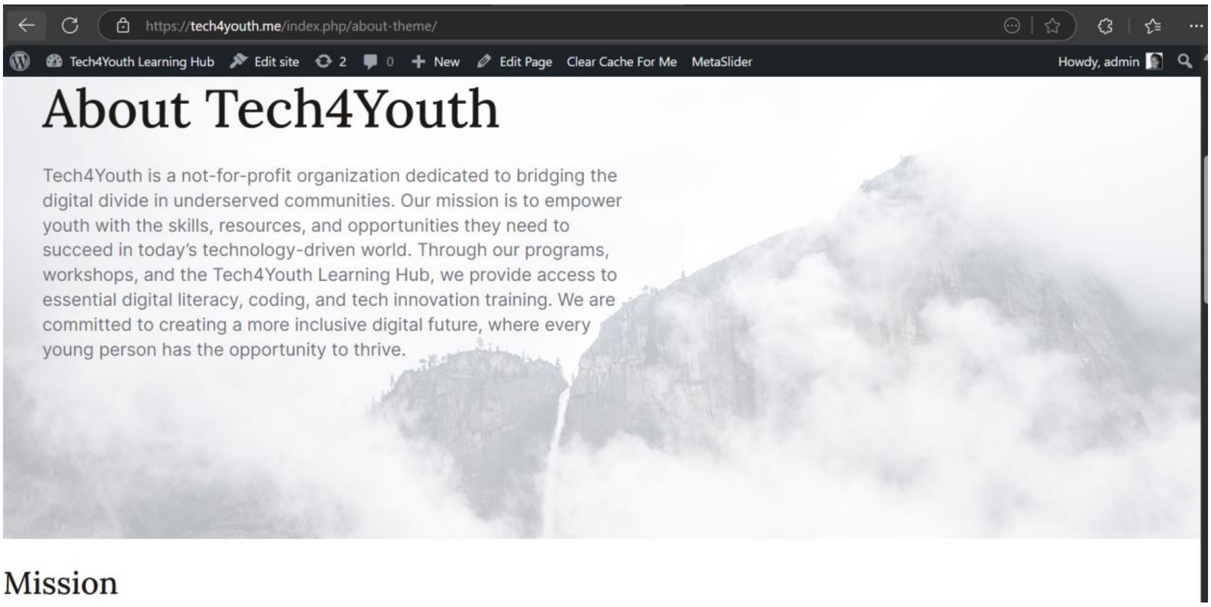
Tech4Youth Learning Hub

Home About Tech4Youth

Empowering the Future, One Click at a Time.

The **Learning Hub** is an online platform designed to provide youth with access to essential digital skills and resources. It offers interactive courses, workshops, and training materials in areas like computer literacy, coding, and tech innovation. The hub aims to empower young people by equipping them with the tools and knowledge

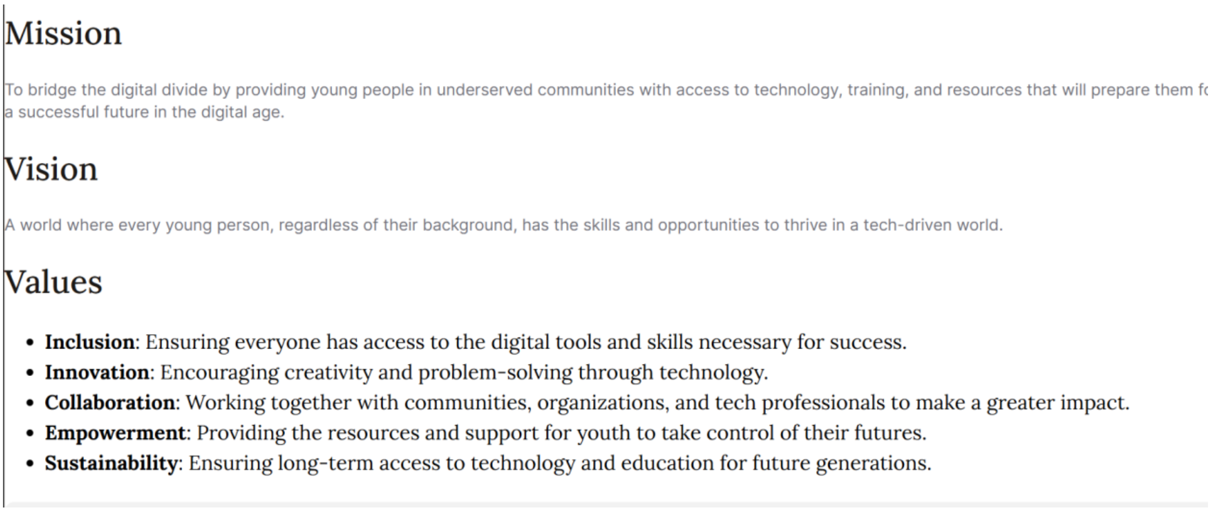
About page:



About Tech4Youth

Tech4Youth is a not-for-profit organization dedicated to bridging the digital divide in underserved communities. Our mission is to empower youth with the skills, resources, and opportunities they need to succeed in today's technology-driven world. Through our programs, workshops, and the Tech4Youth Learning Hub, we provide access to essential digital literacy, coding, and tech innovation training. We are committed to creating a more inclusive digital future, where every young person has the opportunity to thrive.

Mission



Mission

To bridge the digital divide by providing young people in underserved communities with access to technology, training, and resources that will prepare them fc a successful future in the digital age.

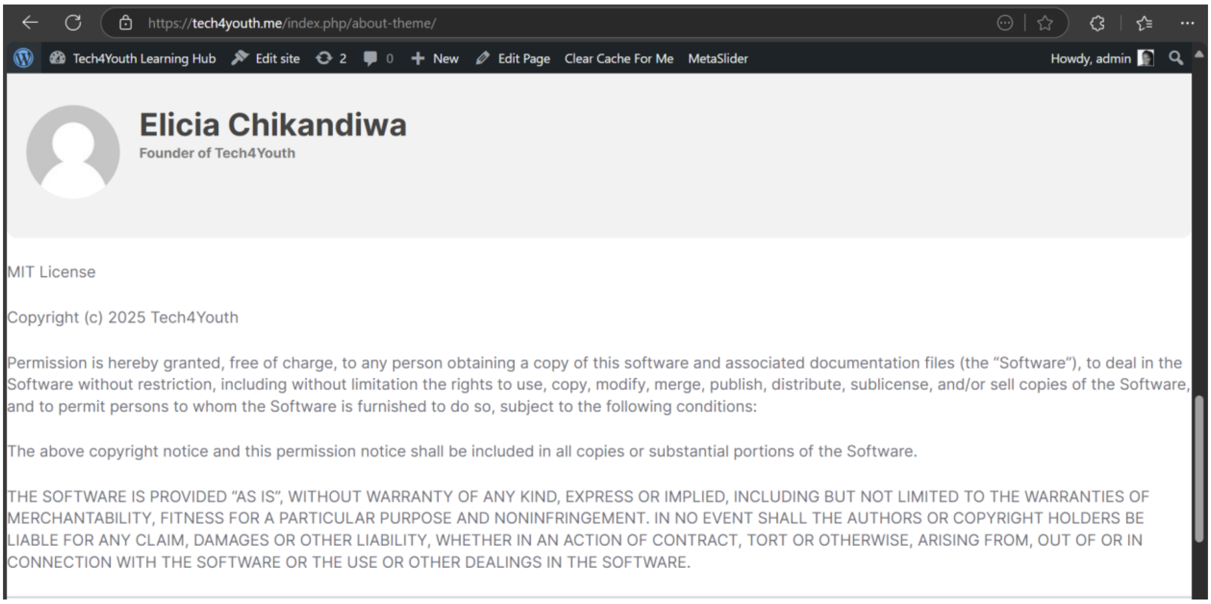
Vision

A world where every young person, regardless of their background, has the skills and opportunities to thrive in a tech-driven world.

Values

- **Inclusion**: Ensuring everyone has access to the digital tools and skills necessary for success.
- **Innovation**: Encouraging creativity and problem-solving through technology.
- **Collaboration**: Working together with communities, organizations, and tech professionals to make a greater impact.
- **Empowerment**: Providing the resources and support for youth to take control of their futures.
- **Sustainability**: Ensuring long-term access to technology and education for future generations.

License:



Elicia Chikandiwa

Founder of Tech4Youth

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