AWS Cloud Internship Task: WordPress Deployment in Monolithic and Microservices Architectures

Candidate Name: [Vishnu Singh (OL/TP2758)] Date: [08-11-2024] Internship: Techplement Cloud (AWS) Internship

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1. Introduction

Task Objectives

- Deploy WordPress in two different architectural approaches
- Monolithic: Single EC2 instance hosting WordPress and MySQL
- Microservices: Separate EC2 instances for WordPress and MySQL
- Configure security groups
- Use t2.micro instances with Ubuntu AMI

Technical Environment

- Cloud Provider: Amazon Web Services (AWS)
- Instance Type: t2.micro
- Operating System: Ubuntu
- Services: EC2, Security Groups

2. Monolithic Architecture Deployment

Step-by-Step Process

1. **AWS EC2 Instance Creation**
    - Region: [Your Selected Region]
    - Instance Type: t2.micro
    - AMI: Ubuntu 20.04 LTS

- Security Group Configuration:
    - Inbound Rules:
        - SSH (Port 22): My IP
        - HTTP (Port 80): Anywhere
        - MySQL (Port 3306): Custom

2. Software Installation

```
# Update system packages
sudo apt update && sudo apt upgrade -y
# Install Apache Web Server
sudo apt install apache2 -y
# Install MySQL Server
sudo apt install mysql-server -y
# Install PHP and required modules
sudo apt install php libapache2-mod-php php-mysql -y
# Download WordPress
wget https://wordpress.org/latest.tar.gz
tar -xzvf latest.tar.gz
```

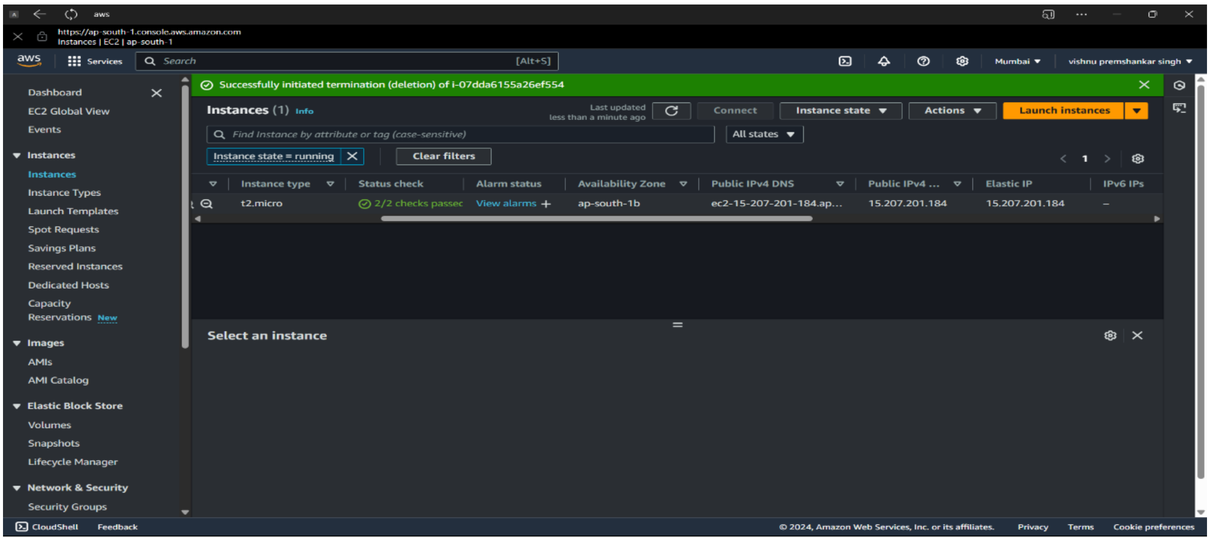
3. MySQL Configuration

```
# Secure MySQL installation
sudo mysql_secure_installation
# Create WordPress database
sudo mysql -e "CREATE DATABASE wordpress;"
sudo mysql -e "CREATE USER 'wpuser'@'localhost' IDENTIFIED BY 'password';"
sudo mysql -e "GRANT ALL PRIVILEGES ON wordpress.* TO 'wpuser'@'localhost';"
sudo mysql -e "FLUSH PRIVILEGES;"
```

4. WordPress Configuration

```
sudo mv wordpress/* /var/www/html/
sudo chown -R www-data:www-data /var/www/html
```

Screenshots



https://ap-south-1.console.aws.amazon.com
Instances | EC2 | ap-south-1

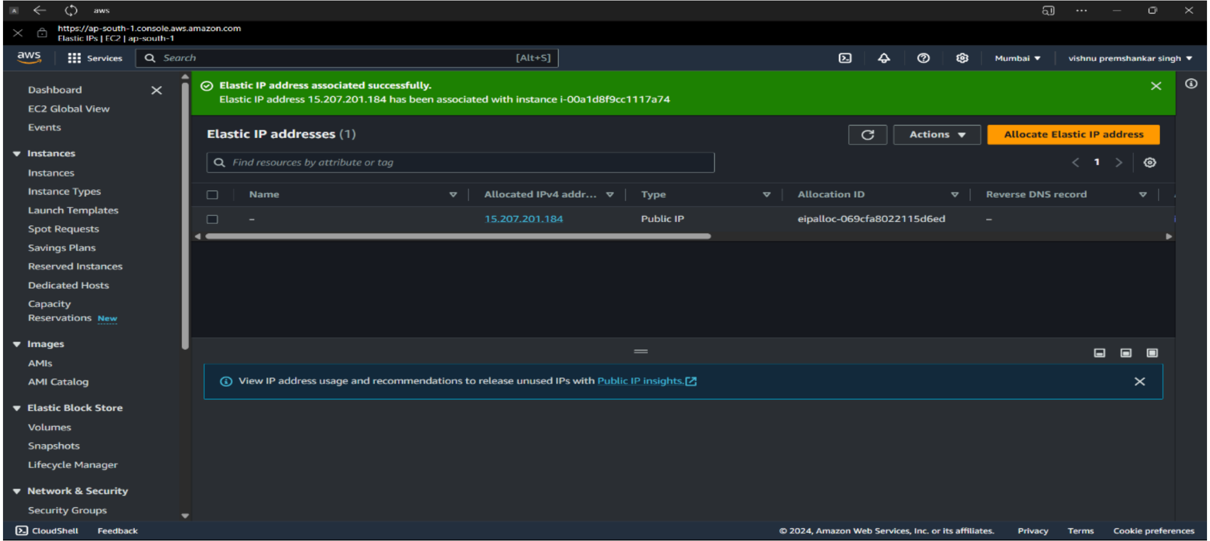
Successfully initiated termination (deletion) of i-07dda6155a26ef554

Instances (1) Info

Instance state = running

	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...	Elastic IP	IPv6 IPs
	t2.micro	✓ 2/2 checks passec	View alarms +	ap-south-1b	ec2-15-207-201-184.ap...	15.207.201.184	15.207.201.184	–

Select an instance



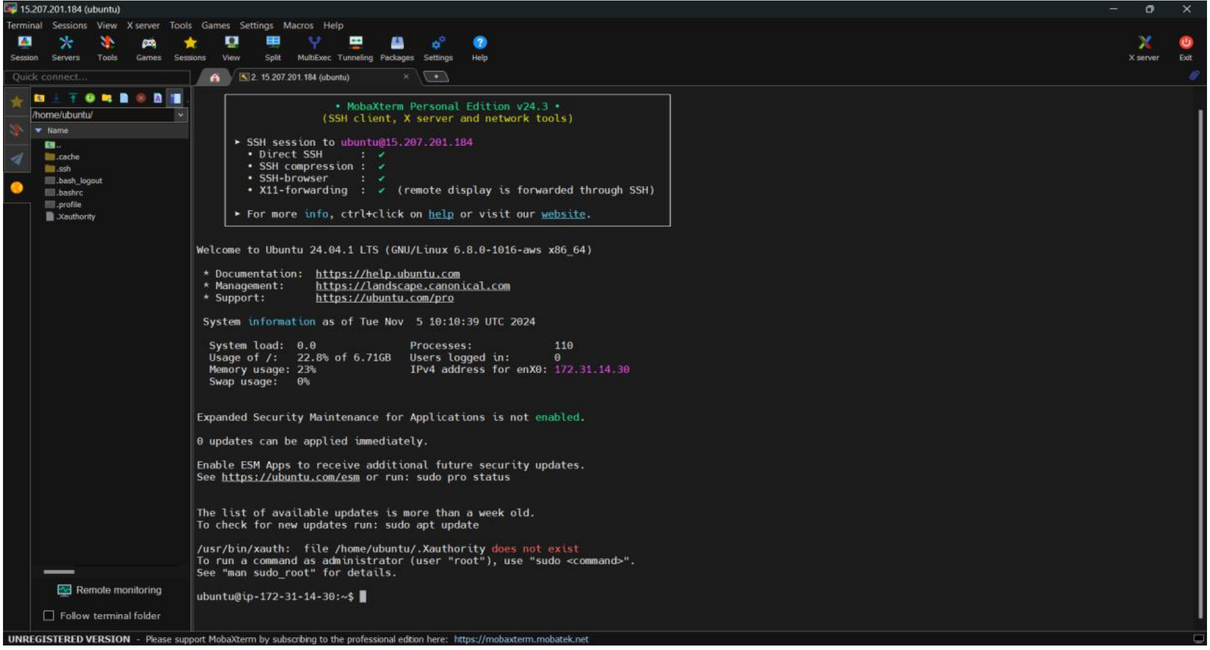
https://ap-south-1.console.aws.amazon.com
Elastic IPs | EC2 | ap-south-1

Elastic IP address associated successfully.
Elastic IP address 15.207.201.184 has been associated with instance i-00a1d8f9cc1117a74

Elastic IP addresses (1)

	Name	Allocated IPv4 addr...	Type	Allocation ID	Reverse DNS record
□	–	15.207.201.184	Public IP	eipalloc-069cfa8022115d6ed	–

View IP address usage and recommendations to release unused IPs with Public IP insights.



15.207.201.184 (ubuntu)

```
      • MobaXterm Personal Edition v24.3 •
     (SSH client, X server and network tools)

 ► SSH session to ubuntu@15.207.201.184
   • Direct SSH      :  ✓
   • SSH compression :  ✓
   • SSH-browser     :  ✓
   • X11-forwarding  :  ✓  (remote display is forwarded through SSH)

 ► For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1016-aws x86_64)

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

 System information as of Tue Nov  5 10:10:39 UTC 2024

  System load:  0.0               Processes:             110
  Usage of /:   22.8% of 6.71GB   Users logged in:       0
  Memory usage: 23%               IPv4 address for enX0: 172.31.14.30
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

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


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

/usr/bin/xauth:  file /home/ubuntu/.Xauthority does not exist
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-14-30:~$
```

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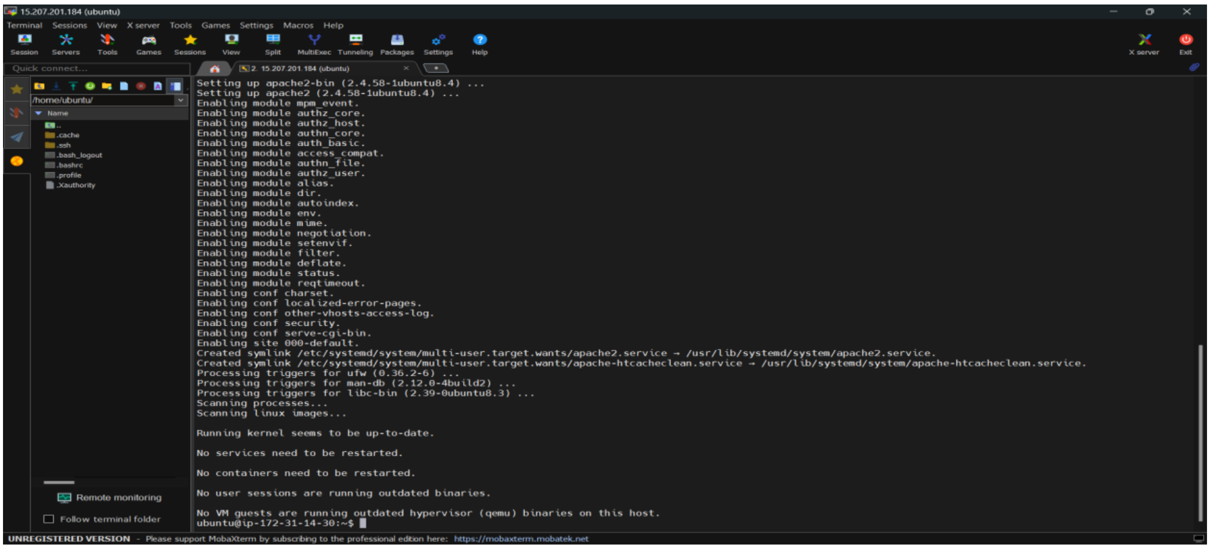
15.207.201.184 (ubuntu)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
2. 15.207.201.184 (ubuntu)
/home/ubuntu/
Name
..
.cache
.ssh
.bash_logout
.bashrc
.profile
.Xauthority
Remote monitoring
Follow terminal folder

```
Setting up apache2-bin (2.4.58-1ubuntu8.4) ...
Setting up apache2 (2.4.58-1ubuntu8.4) ...
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 → /usr/lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /usr/lib/systemd/system/apache-htcacheclean.service.
Processing triggers for ufw (0.36.2-6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.3) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

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-172-31-14-30:~$
```

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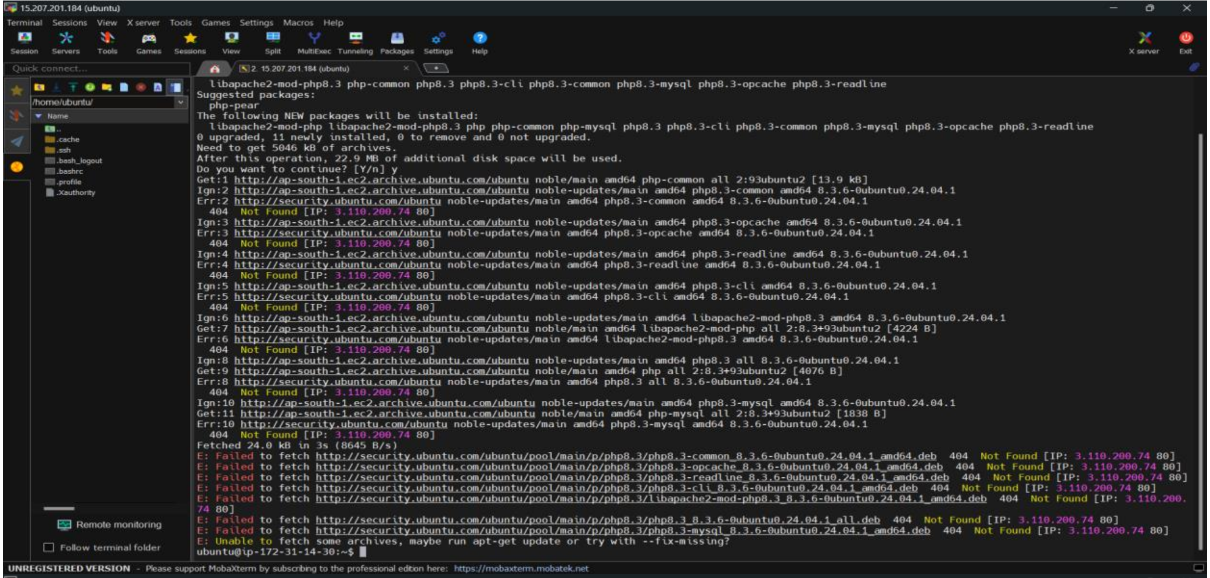
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.profile
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```
  libapache2-mod-php8.3 php-common php8.3 php8.3-cli php8.3-common php8.3-mysql php8.3-opcache php8.3-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php8.3 php php-common php-mysql php8.3 php8.3-cli php8.3-common php8.3-mysql php8.3-opcache php8.3-readline
0 upgraded, 11 newly installed, 0 to remove and 0 not upgraded.
Need to get 5046 kB of archives.
After this operation, 22.9 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 php-common all 2:93ubuntu2 [13.9 kB]
Ign:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-common amd64 8.3.6-0ubuntu0.24.04.1
Err:2 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-common amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-opcache amd64 8.3.6-0ubuntu0.24.04.1
Err:3 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-opcache amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-readline amd64 8.3.6-0ubuntu0.24.04.1
Err:4 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-readline amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-cli amd64 8.3.6-0ubuntu0.24.04.1
Err:5 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-cli amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libapache2-mod-php8.3 amd64 8.3.6-0ubuntu0.24.04.1
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libapache2-mod-php all 2:8.3+93ubuntu2 [4224 B]
Err:6 http://security.ubuntu.com/ubuntu noble-updates/main amd64 libapache2-mod-php8.3 amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3 all 8.3.6-0ubuntu0.24.04.1
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 php all 2:8.3+93ubuntu2 [4076 B]
Err:8 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3 all 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Ign:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-mysql amd64 8.3.6-0ubuntu0.24.04.1
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 php-mysql all 2:8.3+93ubuntu2 [1838 B]
Err:10 http://security.ubuntu.com/ubuntu noble-updates/main amd64 php8.3-mysql amd64 8.3.6-0ubuntu0.24.04.1
  404  Not Found [IP: 3.110.200.74 80]
Fetched 24.0 kB in 3s (8645 B/s)
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3-common_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3-opcache_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3-readline_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3-cli_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/libapache2-mod-php8.3_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.
74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3_8.3.6-0ubuntu0.24.04.1_all.deb  404  Not Found [IP: 3.110.200.74 80]
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/p/php8.3/php8.3-mysql_8.3.6-0ubuntu0.24.04.1_amd64.deb  404  Not Found [IP: 3.110.200.74 80]
E: Unable to fetch some archives, maybe run apt-get update or try with --fix-missing?
ubuntu@ip-172-31-14-30:~$
```

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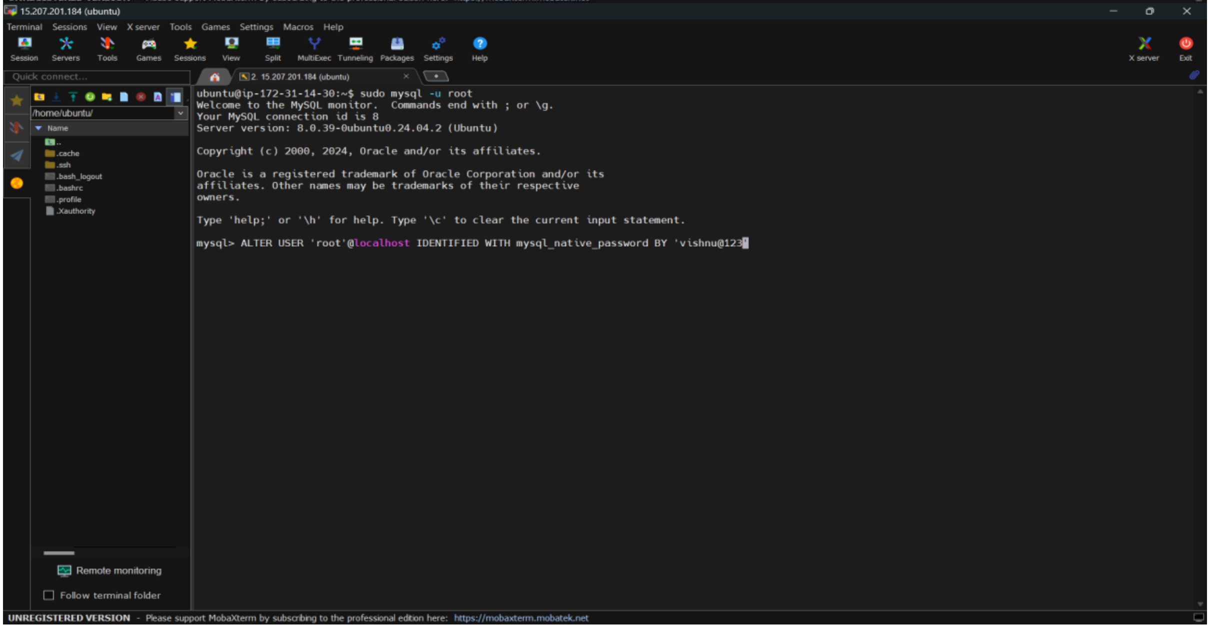
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/home/ubuntu/
Name
..
.cache
.ssh
.bash_logout
.bashrc
.profile
.Xauthority
Remote monitoring
Follow terminal folder

```
ubuntu@ip-172-31-14-30:~$ sudo mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.39-0ubuntu0.24.04.2 (Ubuntu)

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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 'vishnu@123'
```

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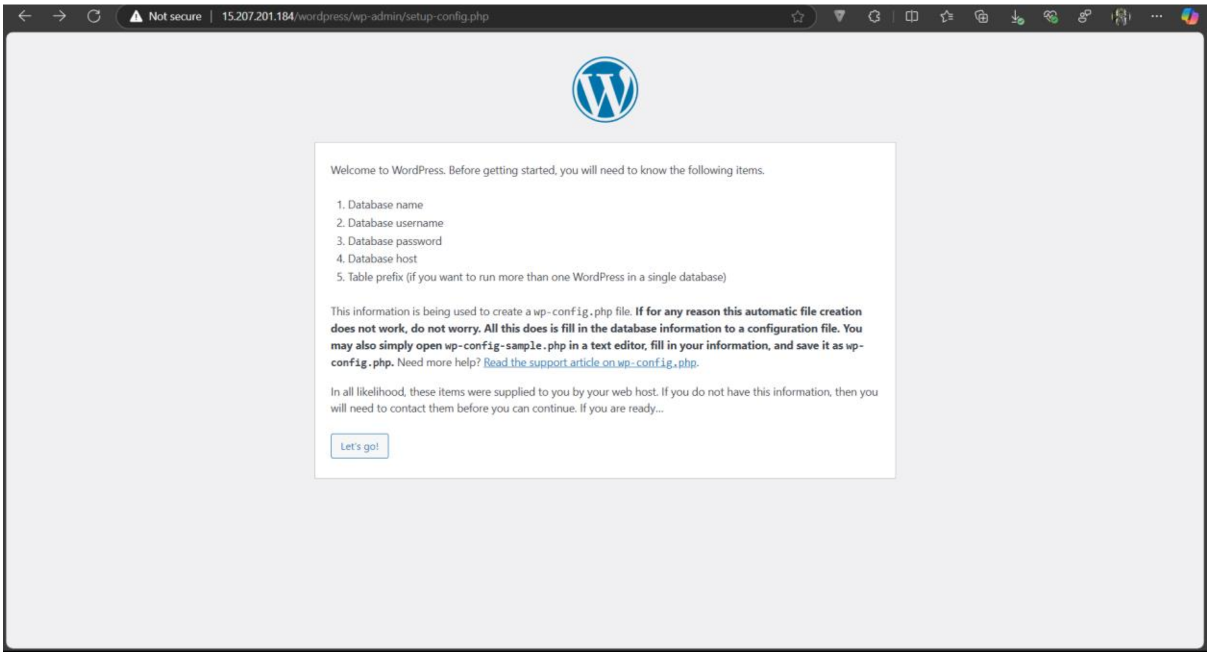


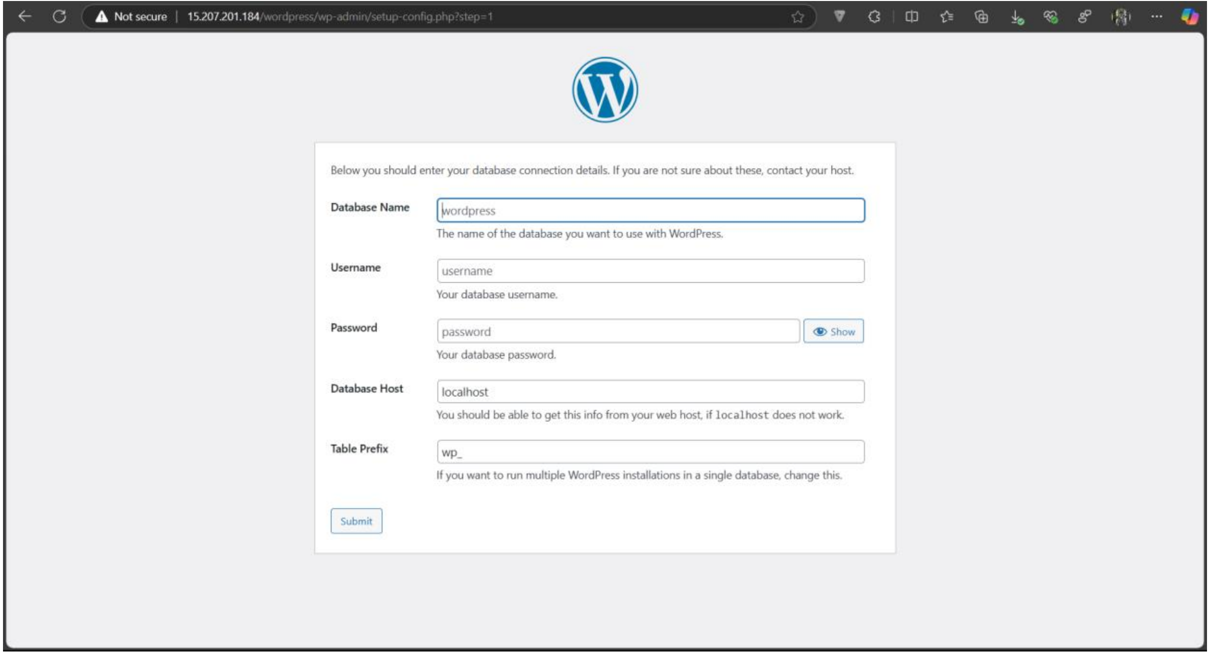
Not secure | 15.207.201.184/wordpress/wp-admin/setup-config.php

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`.

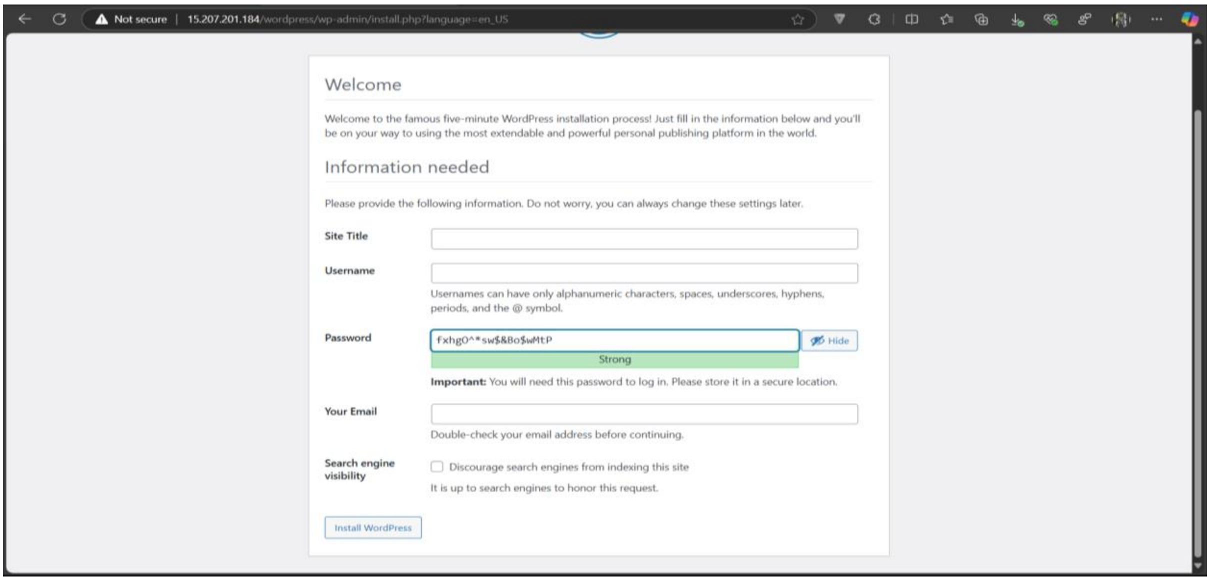
In all likelihood, these items were supplied to you by your web host. If you do not have this information, then you will need to contact them before you can continue. If you are ready…



Not secure | 15.207.201.184/wordpress/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	username Your database username.
Password	password Show 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.



Not secure | 15.207.201.184/wordpress/wp-admin/install.php?language=en_US

Welcome

Welcome to the famous five-minute WordPress installation process! Just fill in the information below and you'll be on your way to using the most extendable and powerful personal publishing platform in the world.

Information needed

Please provide the following information. Do not worry, you can always change these settings later.

Site Title

Username

Usernames can have only alphanumeric characters, spaces, underscores, hyphens, periods, and the @ symbol.

Password: fxhgO^*sw$&Bo$wMtP

Strong

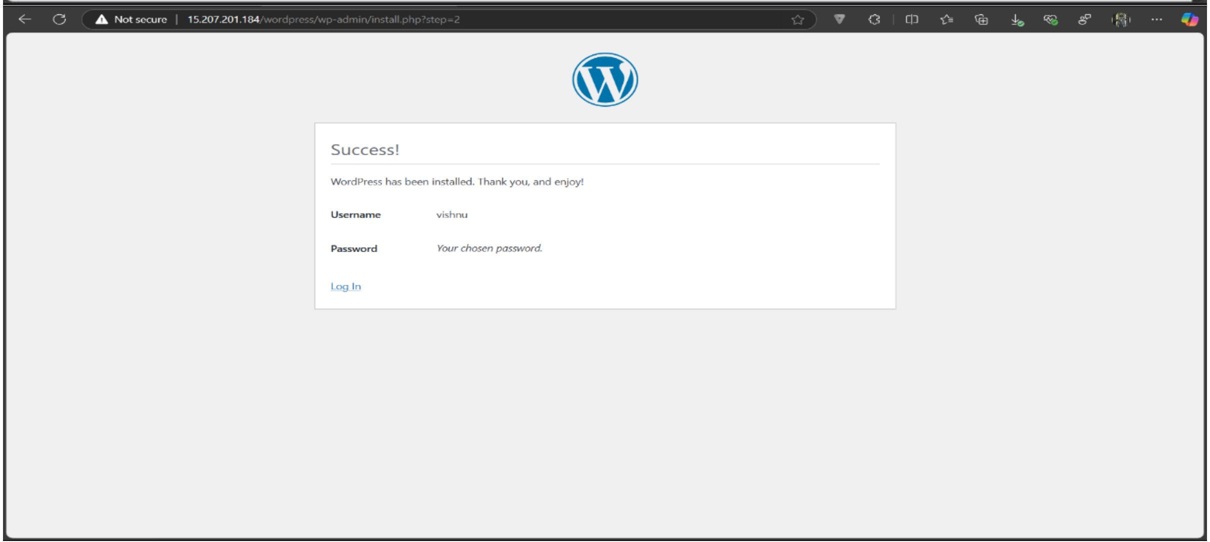
Important: You will need this password to log in. Please store it in a secure location.

Your Email

Double-check your email address before continuing.

Search engine visibility: □ Discourage search engines from indexing this site

It is up to search engines to honor this request.



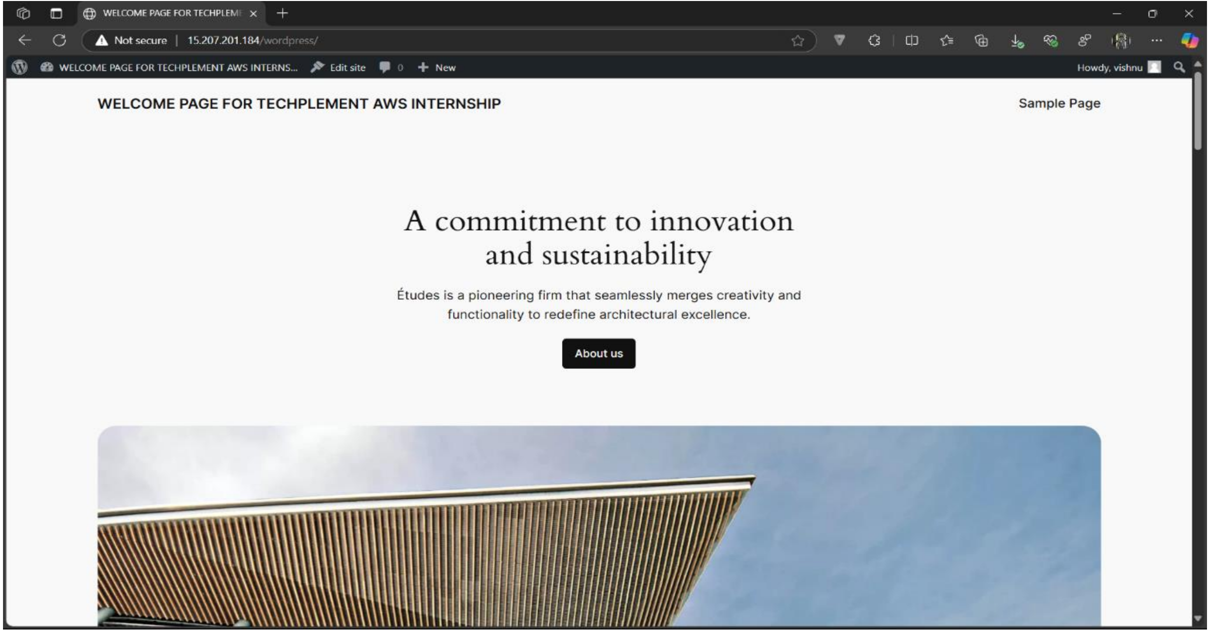
Not secure | 15.207.201.184/wordpress/wp-admin/install.php?step=2

Success!

WordPress has been installed. Thank you, and enjoy!

Username: vishnu

Password: *Your chosen password.*



WELCOME PAGE FOR TECHPLEME
Not secure | 15.207.201.184/wordpress/
WELCOME PAGE FOR TECHPLEMENT AWS INTERNS...
Edit site
0
New
Howdy, vishnu

WELCOME PAGE FOR TECHPLEMENT AWS INTERNSHIP

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3. Microservices Architecture Deployment

Instance 1: MySQL Server

1. **EC2 Instance Creation**
    - Separate t2.micro instance
    - Security Group:
        - Allow MySQL port (3306)
        - Restrict access from WordPress instance IP
2. **MySQL Configuration**

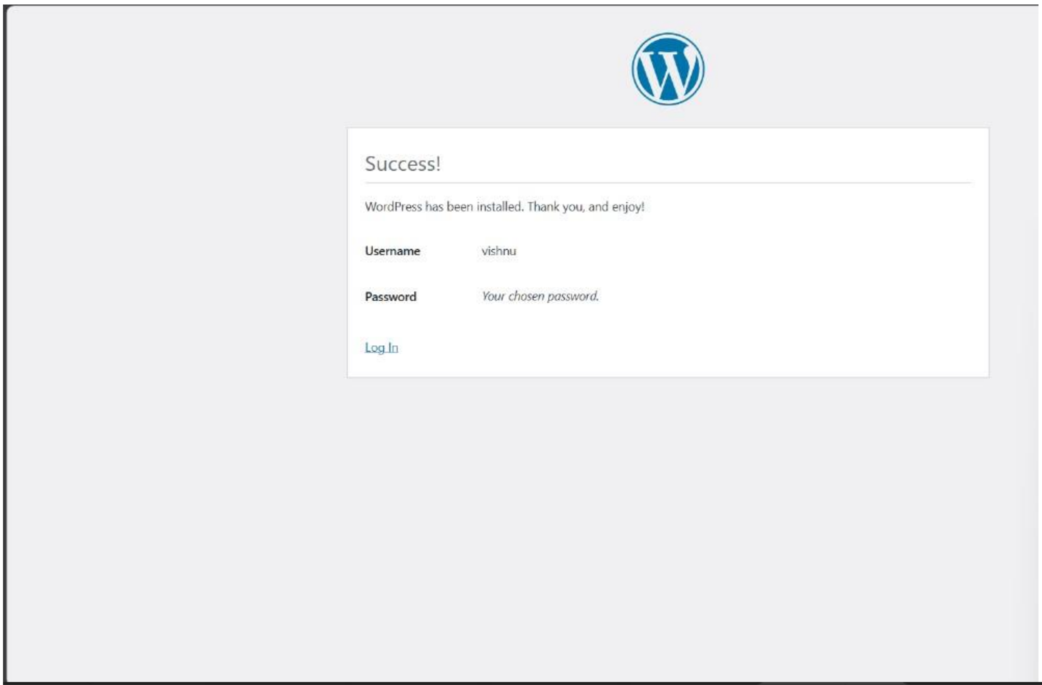
```
 # Install MySQL
sudo apt update
sudo apt install mysql-server -y

# Configure MySQL to accept remote connections
sudo sed -i 's/bind-address.*/bind-address = 0.0.0.0/' /etc/mysql/mysql.conf.d/mysqld.cnf

# Create WordPress database and user
sudo mysql -e "CREATE DATABASE wordpress;"
sudo mysql -e "CREATE USER 'wpuser'@'%' IDENTIFIED BY 'password';"
sudo mysql -e "GRANT ALL PRIVILEGES ON wordpress.* TO 'wpuser'@'%';"
sudo mysql -e "FLUSH PRIVILEGES;"
```

Screenshots:

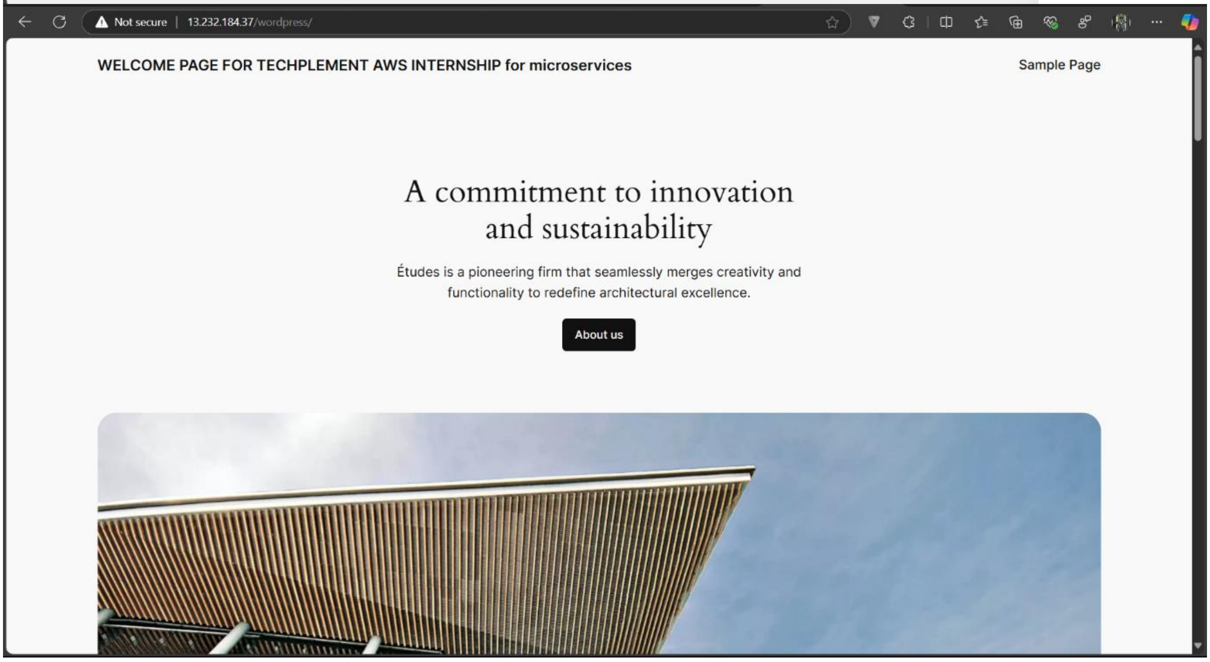
Note* [Video of instance creation is uploaded differently]



Success!

WordPress has been installed. Thank you, and enjoy!

Username	vishnu
Password	*Your chosen password.*



Not secure | 13.232.184.37/wordpress/

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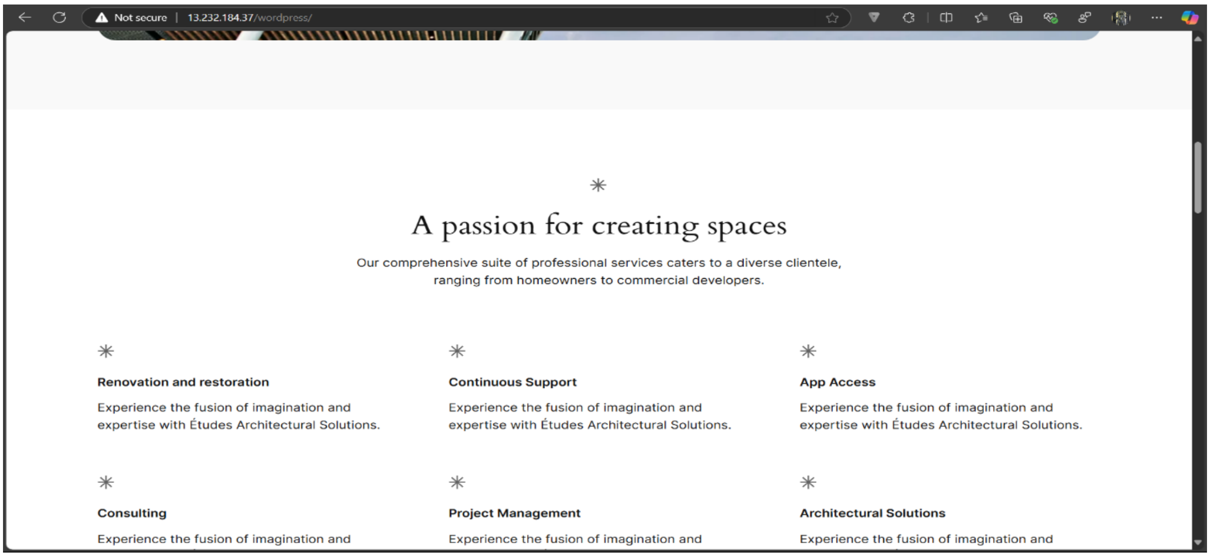

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✳ **Project Management**

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✳ **Architectural Solutions**

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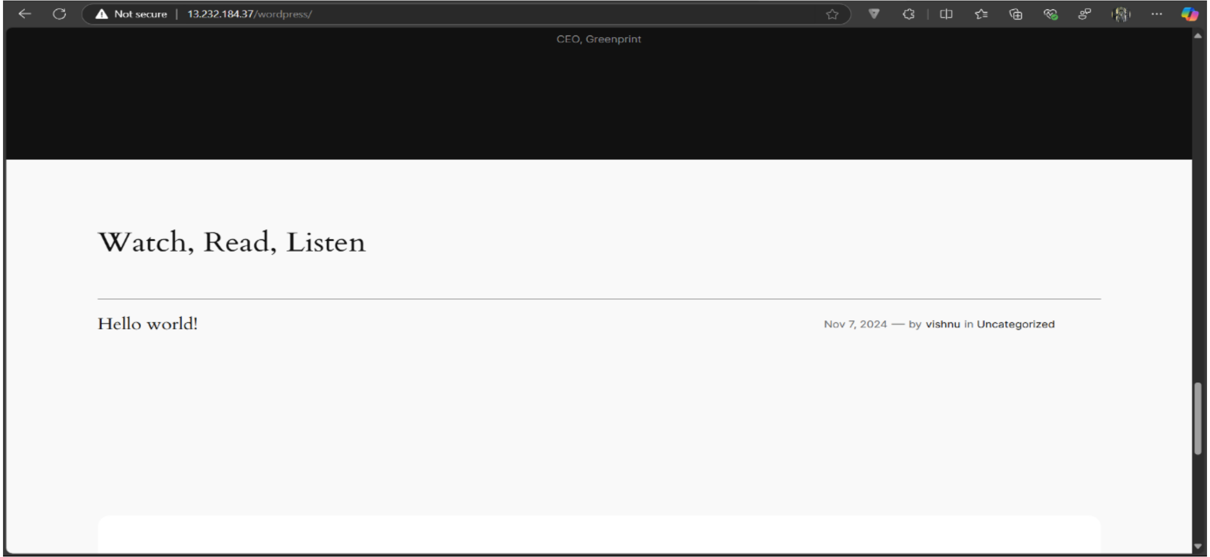
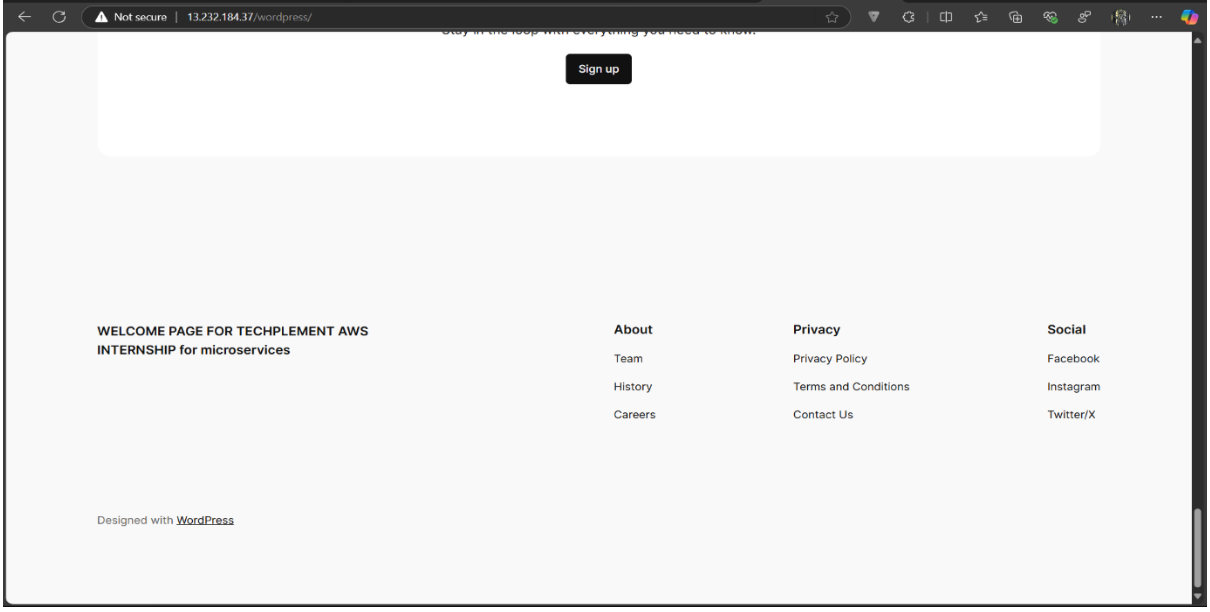


CEO, Greenprint

Watch, Read, Listen

Hello world! Nov 7, 2024 — by vishnu in Uncategorized



Stay in the loop with everything you need to know.

WELCOME PAGE FOR TECHPLEMENT AWS INTERNSHIP for microservices

About
- Team
- History
- Careers

Privacy
- Privacy Policy
- Terms and Conditions
- Contact Us

Social
- Facebook
- Instagram
- Twitter/X

Designed with WordPress

4. Comparative Analysis

Monolithic Architecture

Pros:

- Simpler setup
- Lower initial complexity
- Easier to deploy

Cons:

- Limited scalability
- Performance bottlenecks
- Single point of failure

Microservices Architecture

Pros:

- Better scalability
- Improved performance
- Independent service management

Cons:

- More complex configuration
- Higher network latency
- Increased management overhead

5. Challenges and Solutions

1. **Network Configuration**
    - Challenge: Configuring security groups
    - Solution: Carefully manage IP ranges and port access
2. **Database Connection**
    - Challenge: Connecting WordPress to remote MySQL
    - Solution: Proper user privileges and network settings

6. Learning Outcomes

- Practical experience in AWS EC2 deployment
- Understanding architectural differences

- Hands-on Linux server configuration
- WordPress installation techniques
- Network and security group management

7. Resources Used

1. [AWS Documentation]
2. [Ubuntu Server Guide]
3. [WordPress Installation Guide]

Conclusion

This task provided comprehensive insights into deploying WordPress using different architectural approaches, highlighting the nuances of cloud infrastructure and service deployment.