Cloud Computing Assignment 2

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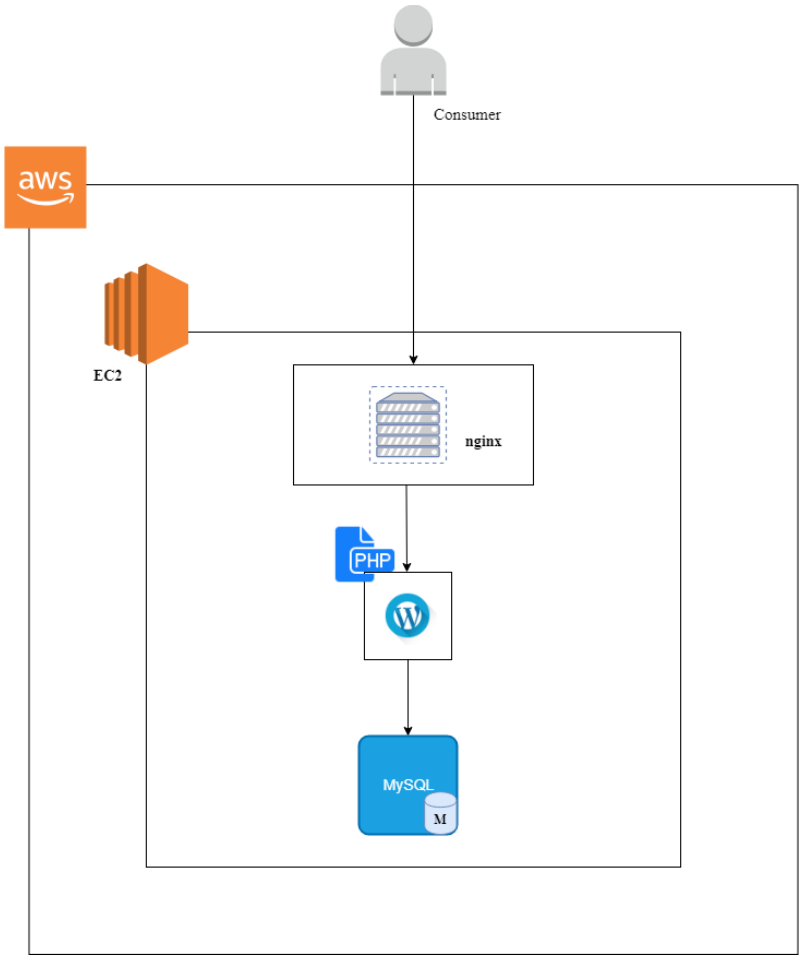
1. What are the purposes of configuring security groups? (1 mark)

Ans: A security group acts as a virtual firewall to controls inbound and outbound traffic for multiple instances. Default security group is applied if there is no explicit definition of security group and rules can be added to each security group to allow inbound and outbound traffic to/from its associated instances. All the rules from all the security groups that are associated with the instance are evaluated to allow traffic to reach an instance. Rules for a security group can be modified at any time and the new rules are automatically applied to all instances within the security group.

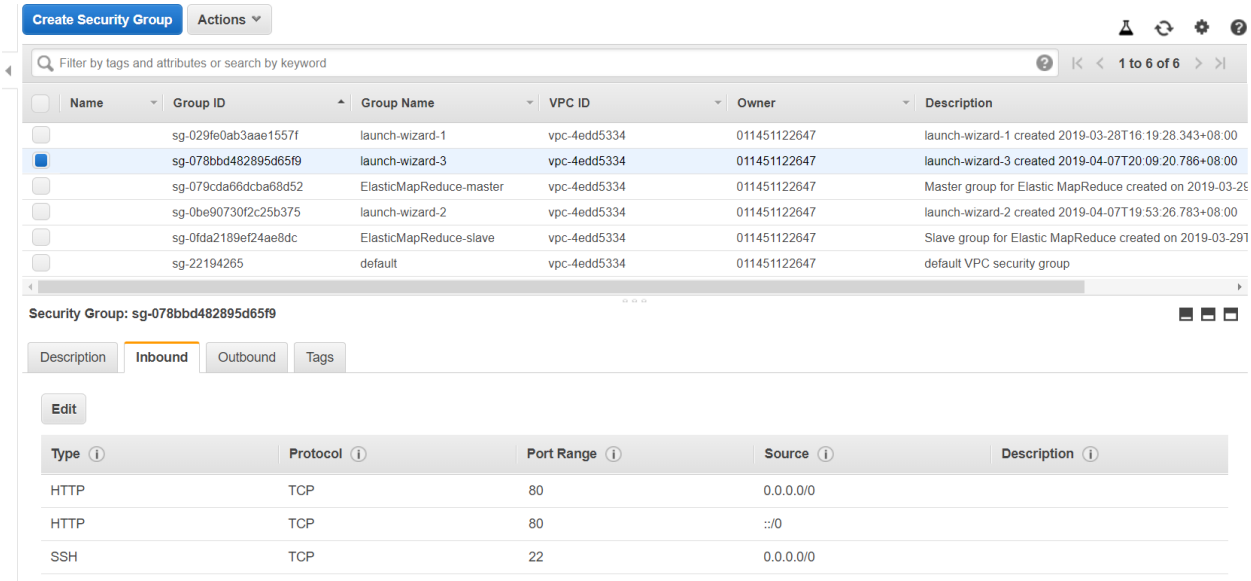
2. Build a WordPress server using EC2 instance (5 marks)

a) Draw a diagram to show your WordPress application consisting of EC2 instance, Linux, database, Apache/Nginx, php, WordPress and other services if any. (1 mark)



b) Configure the security group setting of your EC2 instance. (1 mark)

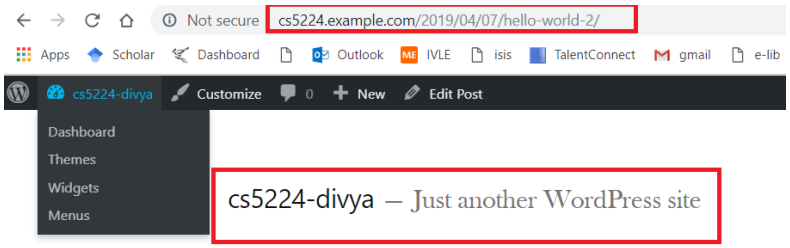
Ans: Allowing port 80 and 22 in inbound rule to access the website and SSH access respectively.

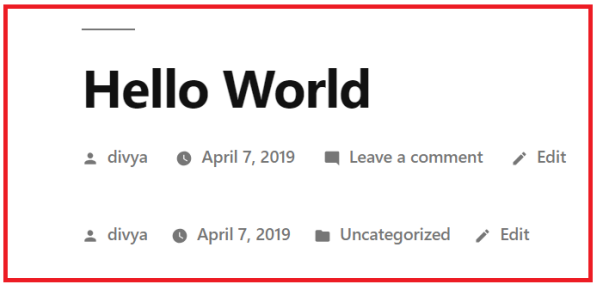


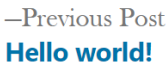
c) Set up environment mentioned in (a) and show how to setup a HelloWorld blog using WordPress that you have set up. (submit screenshots for executing -v or -version command eg. mysql –v, php –version, apachectl –v or other environments you are using) (1 mark)

Ans:

Install nginx and MySQL Server and Word Press Site. Change the configuration to setup Word Press. Login to the Word Press Site and post the article Hello World.





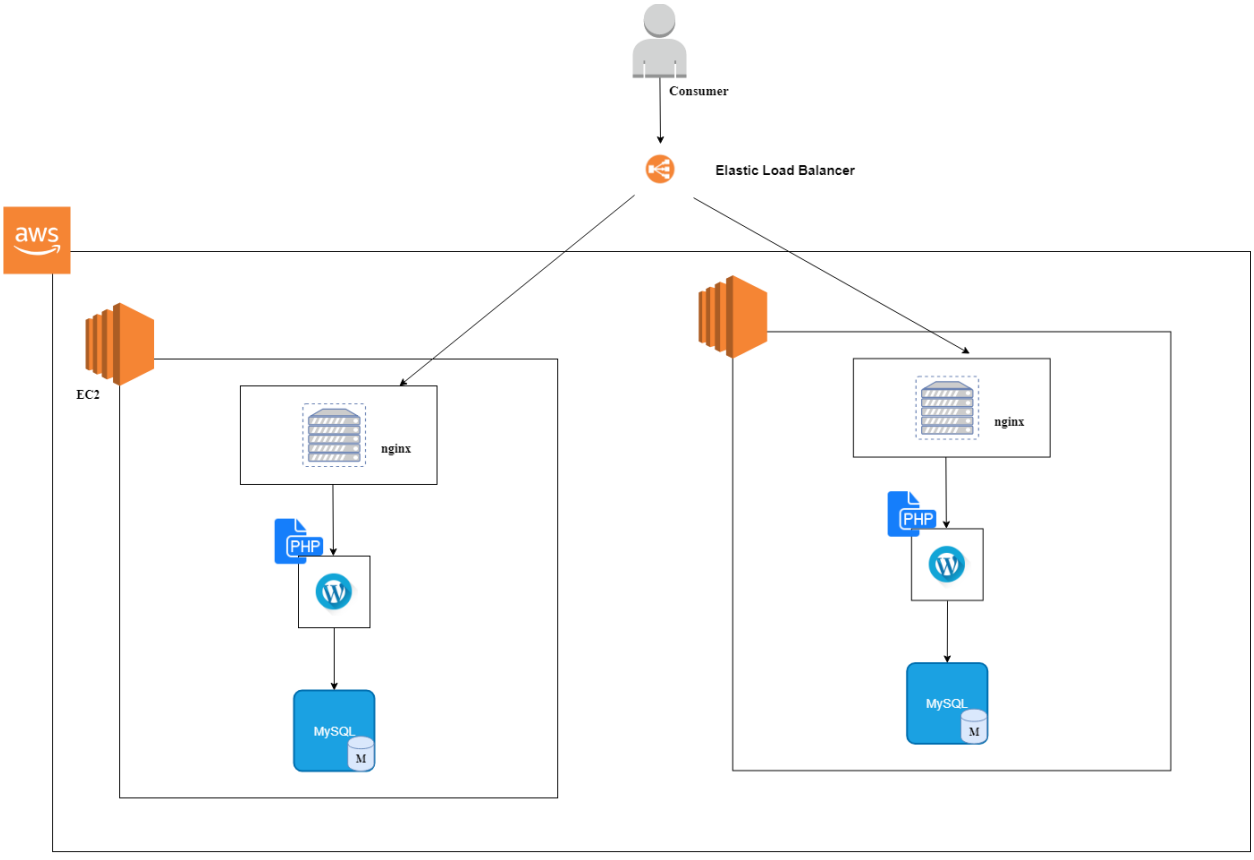


Below is the versions of MySQL, php and nginx installed.

```
ubuntu@ip-172-31-82-164:/$ mysql --version
mysql  Ver 14.14 Distrib 5.7.25, for Linux (x86_64) using  EditLine wrapper
ubuntu@ip-172-31-82-164:/$ php --version
PHP 7.2.15-0ubuntu0.18.04.2 (cli) (built: Mar 22 2019 17:05:14) ( NTS )
Copyright (c) 1997-2018 The PHP Group
Zend Engine v3.2.0, Copyright (c) 1998-2018 Zend Technologies
    with Zend OPcache v7.2.15-0ubuntu0.18.04.2, Copyright (c) 1999-2018, by Zend Technologies
ubuntu@ip-172-31-82-164:/$ nginx -v
nginx version: nginx/1.14.0 (Ubuntu)
ubuntu@ip-172-31-82-164:/$
```

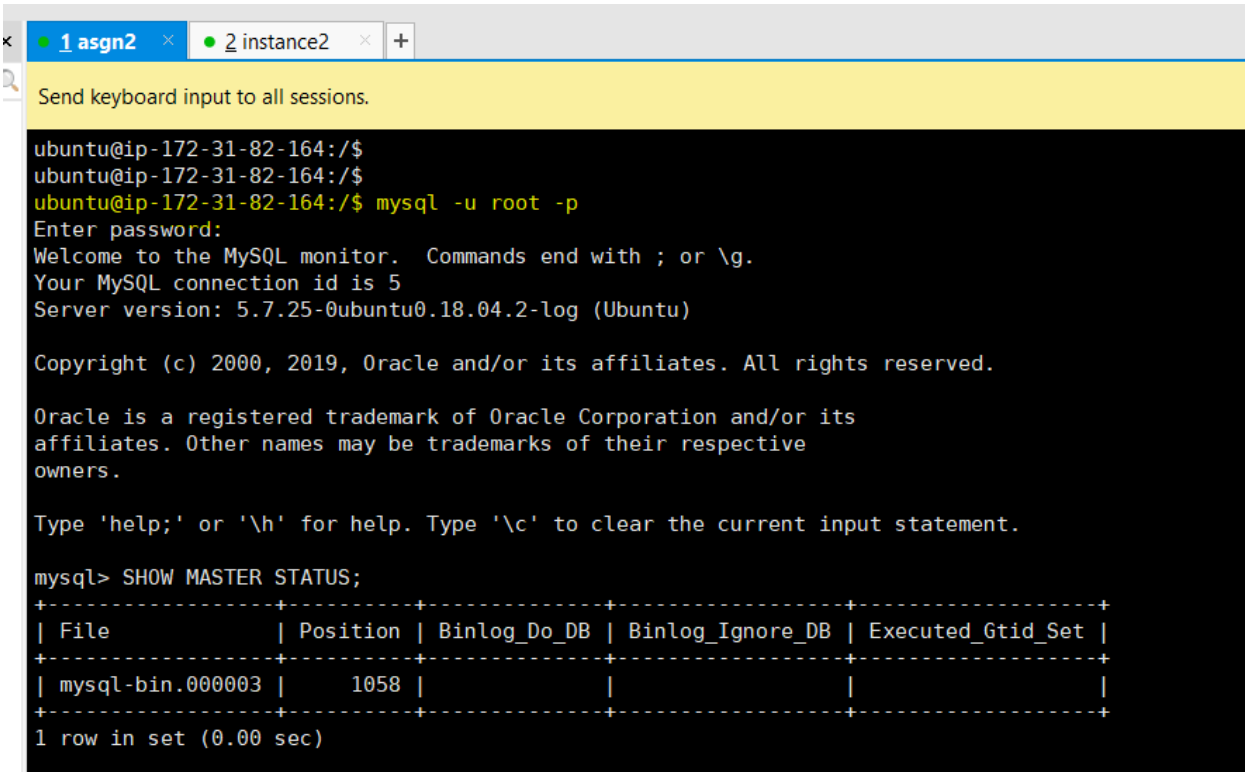
d) To provision for blogging traffic, you are given two EC2 instances to host you WordPress site. Briefly explain how you would reconfigure your WordPress setup with two EC2 instances (hint: modify the diagram in (a)). Next, setup the WordPress site with two EC2 instances and show that it works (submit the screenshots). (2 mark)

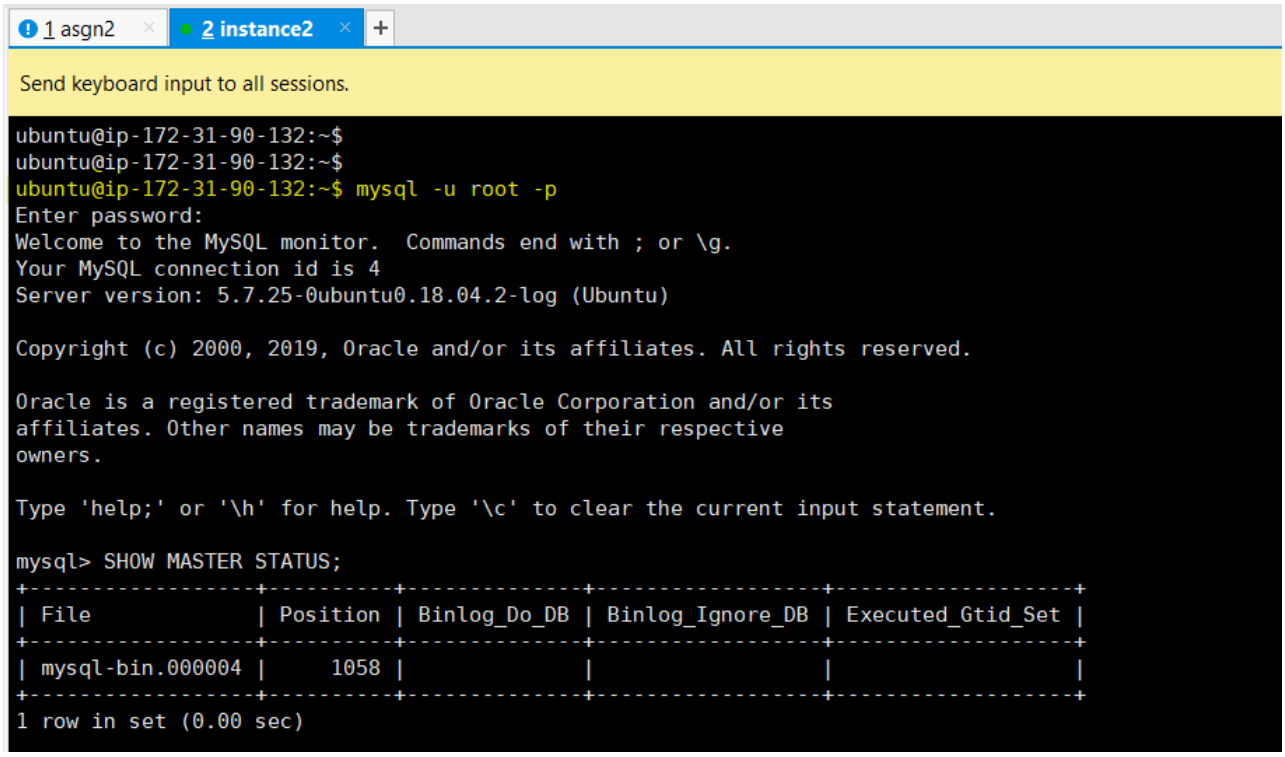
Ans: Create two instances and install an Elastic Load Balancer to balance the traffic between two instances. Here, the consumer reaches the load balancer to access word press and load balance will send the traffic.



Step1: Configure the databases in both the instances.

Step 2: Observe the Master Status in both instances.

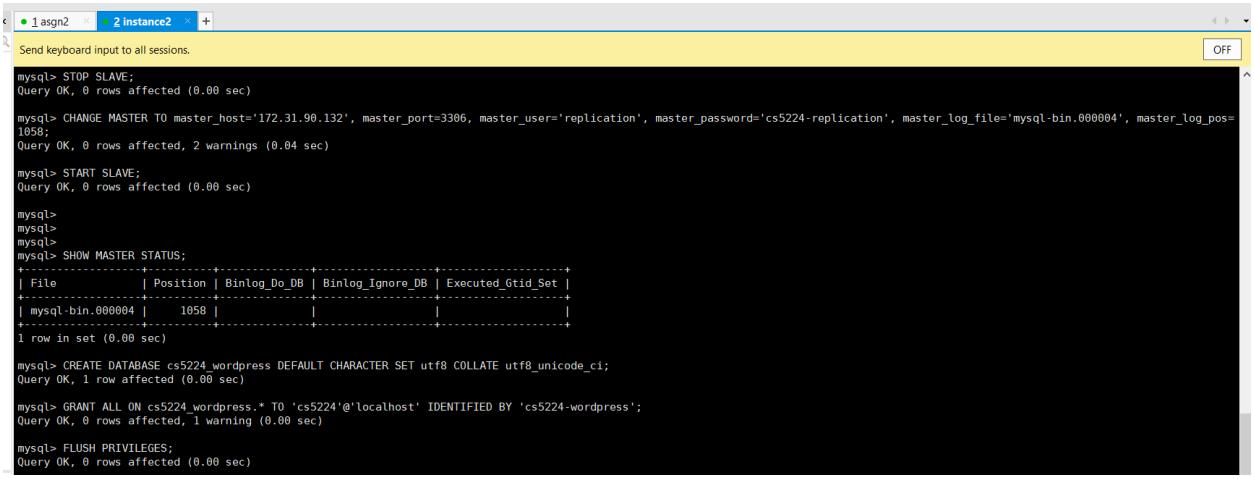




Step 3: In Instance 2:

- STOP SLAVE;
- CHANGE MASTER TO master_host='172.31.88.53', master_port=3306, master_user='replication', master_password='cs5224-replication', master_log_file='mysql-bin.000001', master_log_pos=4998;

- START SLAVE;
- SHOW MASTER STATUS;



Step4: Instance 1:

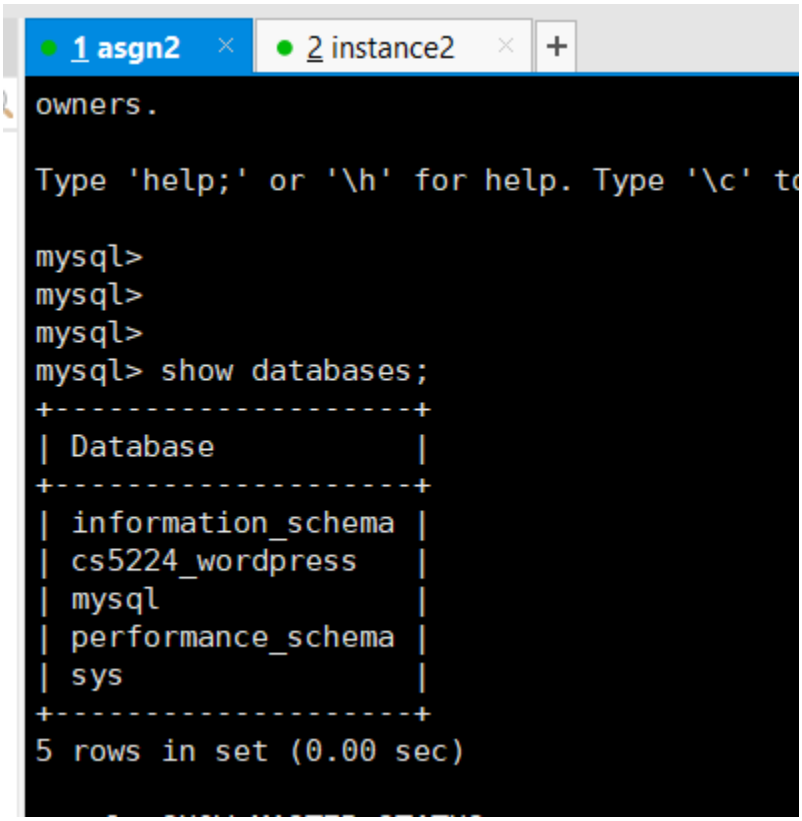
- STOP SLAVE;
- CHANGE MASTER TO master_host='172.31.93.213', master_port=3306, master_user='replication', master_password='cs5224-replication', master_log_file='mysql-bin.000002', master_log_pos=154;
- START SLAVE;

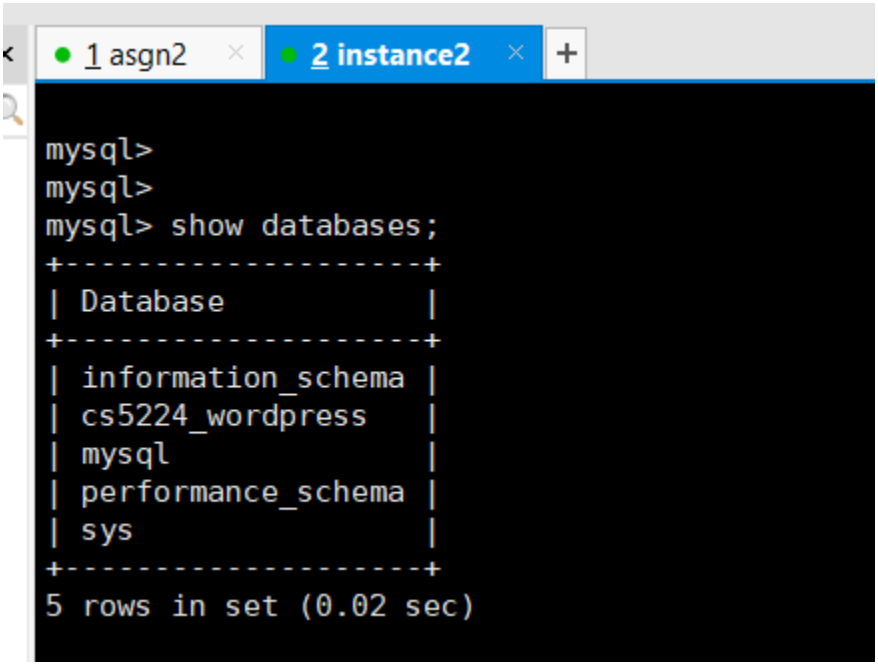
```
mysql> STOP SLAVE;
Query OK, 0 rows affected, 1 warning (0.00 sec)

mysql> SHOW MASTER STATUS;
+------------------+----------+--------------+------------------+-------------------+
| File             | Position | Binlog_Do_DB | Binlog_Ignore_DB | Executed_Gtid_Set |
+------------------+----------+--------------+------------------+-------------------+
| mysql-bin.000004 |     1058 |              |                  |                   |
+------------------+----------+--------------+------------------+-------------------+
1 row in set (0.00 sec)

mysql>
mysql> CHANGE MASTER TO master_host='172.31.82.164', master_port=3306, master_user='replication', master_password='cs5224-replication', master_log_file='mysql-bin.000003', master_log_p
1058;
Query OK, 0 rows affected, 2 warnings (0.10 sec)

mysql> START SLAVE;
Query OK, 0 rows affected (0.01 sec)

mysql> SHOW MASTER STATUS;
+------------------+----------+--------------+------------------+-------------------+
| File             | Position | Binlog_Do_DB | Binlog_Ignore_DB | Executed_Gtid_Set |
+------------------+----------+--------------+------------------+-------------------+
| mysql-bin.000004 |     1058 |              |                  |                   |
+------------------+----------+--------------+------------------+-------------------+
1 row in set (0.00 sec)
```

Step 5: Instance 1:

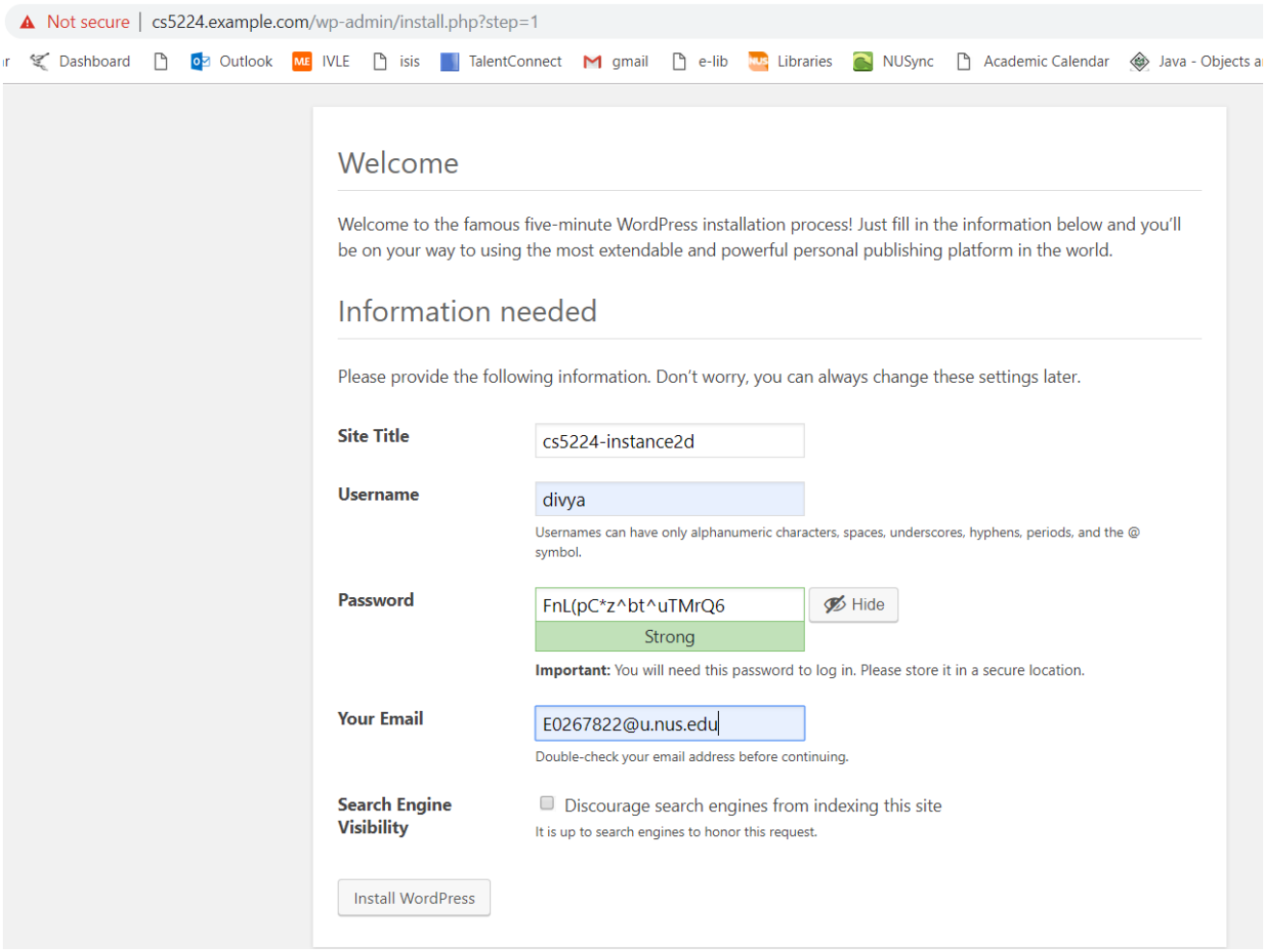
- SHOW DATABASES;
- SELECT * FROM mysql.user;

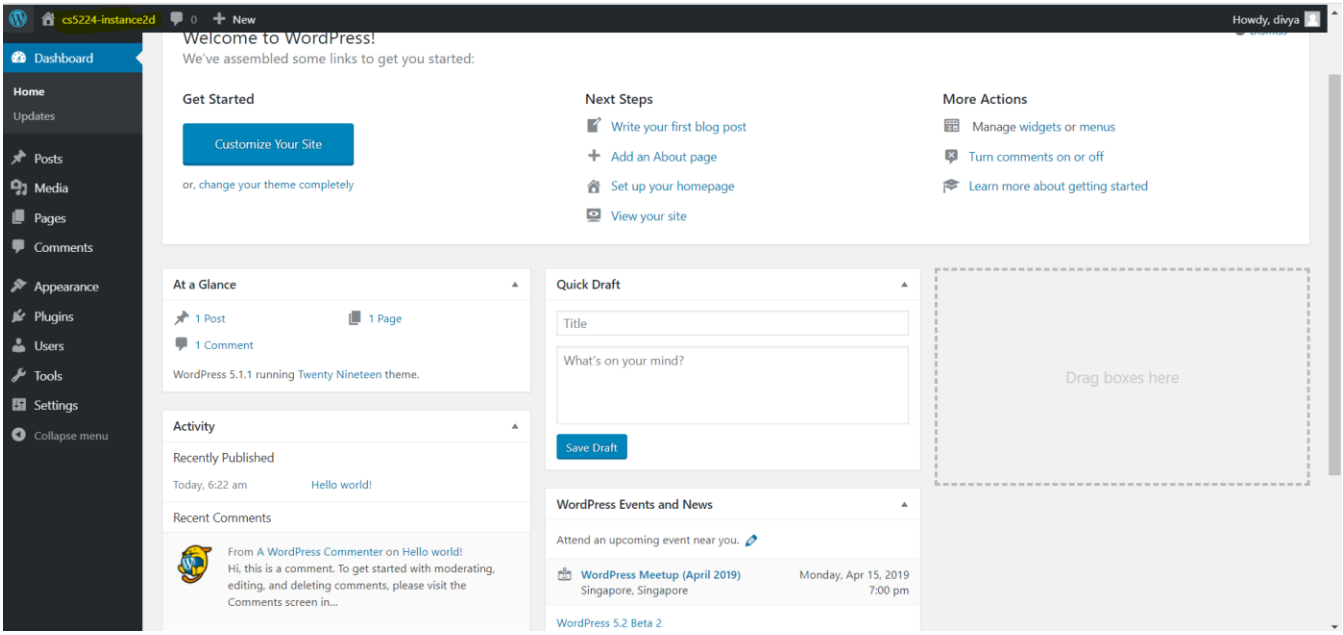
Observe the databases in both the instance. Both have the same DB instances.



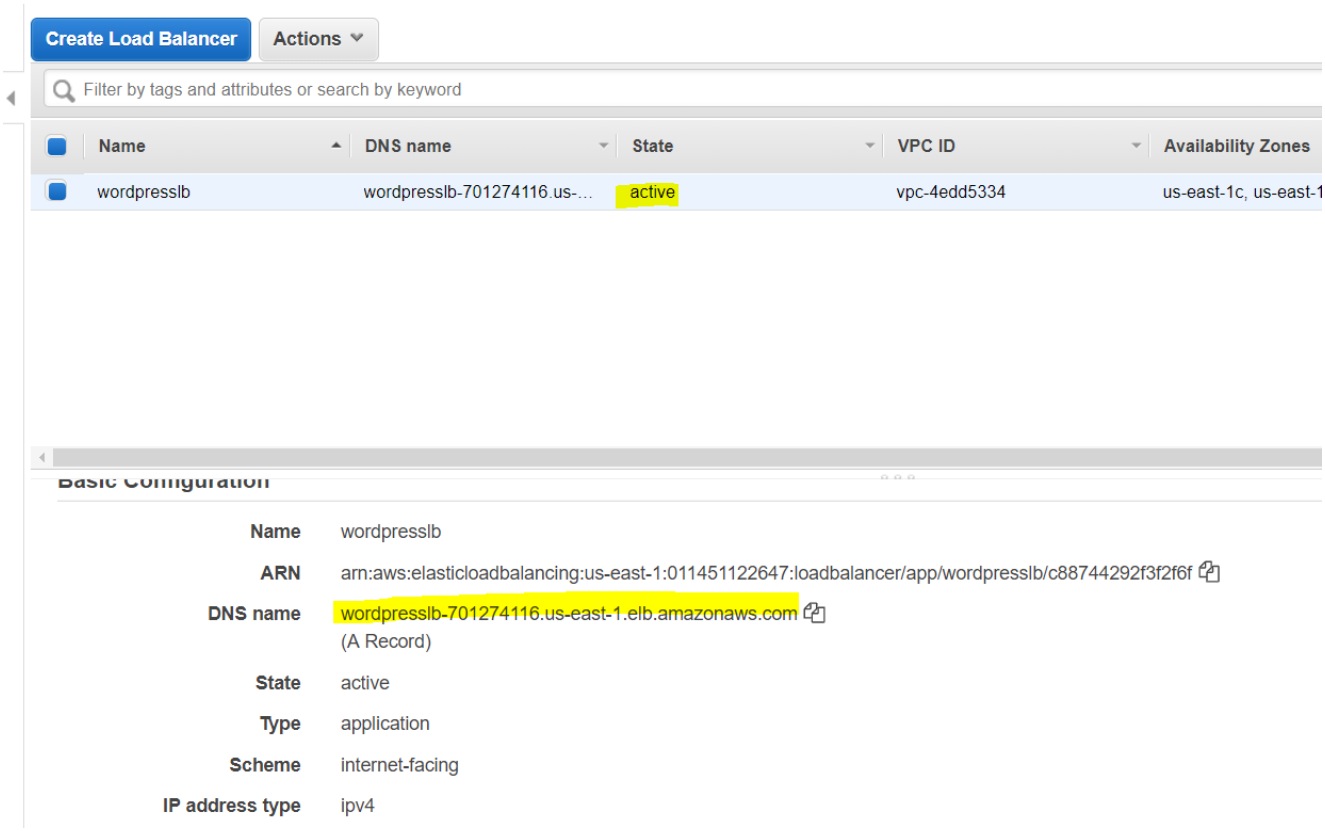


Register and Install the WordPress in the browser





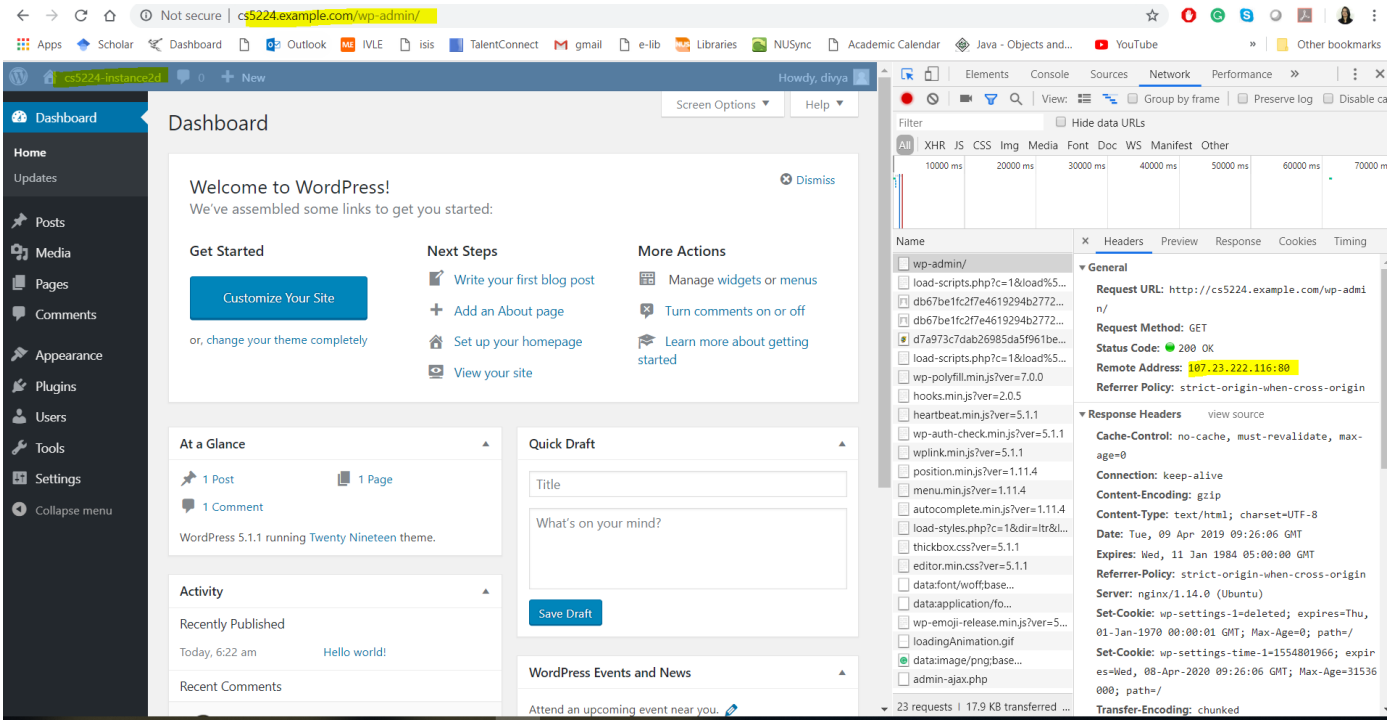
In the load balancer created below, identify the DNS Name of the load balancer.

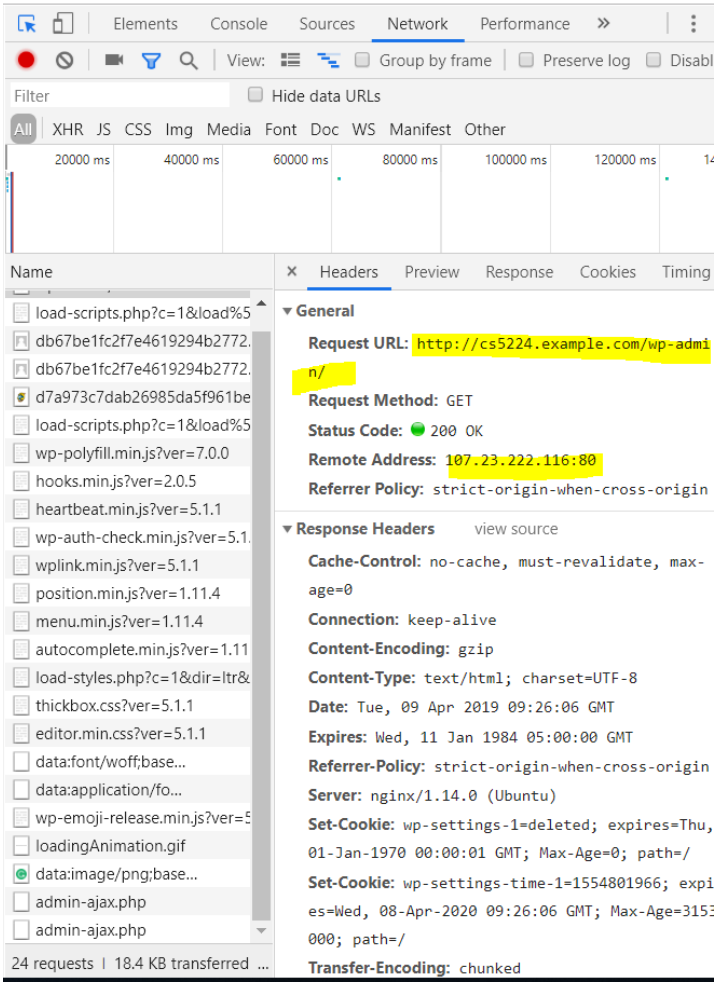


Resolve the DNS name using Nslookup. We use this IP to load the website. The load balancer in AWS will send the traffic to any of the instances.

```
C:\Users\Divya>nslookup wordpresslb-701274116.us-east-1.elb.amazonaws.com
Server:  dns0.comp.nus.edu.sg
Address:  192.168.140.2

Non-authoritative answer:
Name:    wordpresslb-701274116.us-east-1.elb.amazonaws.com
Address:  107.23.222.116
```

When the site is loaded, we can observe the Public IP of the Load balancer.


Not secure | cs5224.example.com/wp-admin/
Dashboard
Welcome to WordPress!
We've assembled some links to get you started:
Get Started
Customize Your Site
Next Steps
Write your first blog post
Add an About page
Set up your homepage
View your site
More Actions
Manage widgets or menus
Turn comments on or off
Learn more about getting started
At a Glance
Quick Draft
Activity
WordPress Events and News
Request URL: http://cs5224.example.com/wp-admin/
Request Method: GET
Status Code: 200 OK
Remote Address: 107.23.222.116:80
Referrer Policy: strict-origin-when-cross-origin


Elements
Console
Sources
Network
Performance
Hide data URLs
Name
Headers
Preview
Response
Cookies
Timing
General
Request URL: http://cs5224.example.com/wp-admin/
Request Method: GET
Status Code: 200 OK
Remote Address: 107.23.222.116:80
Referrer Policy: strict-origin-when-cross-origin
Response Headers
view source
Cache-Control: no-cache, must-revalidate, max-age=0
Connection: keep-alive
Content-Encoding: gzip
Content-Type: text/html; charset=UTF-8
Date: Tue, 09 Apr 2019 09:26:06 GMT
Expires: Wed, 11 Jan 1984 05:00:00 GMT
Referrer-Policy: strict-origin-when-cross-origin
Server: nginx/1.14.0 (Ubuntu)
Set-Cookie: wp-settings-1=deleted; expires=Thu, 01-Jan-1970 00:00:01 GMT; Max-Age=0; path=/
Set-Cookie: wp-settings-time-1=1554801966; expires=Wed, 08-Apr-2020 09:26:06 GMT; Max-Age=31536000; path=/
Transfer-Encoding: chunked
24 requests | 18.4 KB transferred

3. What are the benefits of using AWS EMR instead of using a local cluster? (1 marks)

Ans: EMR is hosted framework that allows to run distributed frameworks on AWS. Below are the benefits

1.Scalability and Flexibility: AWS EMR provides flexibility to resize cluster depending on the computing need. The consumer can add instances at peak workload and remove instances when the workloads subside to control costs. EMR leverage multiple data stores.

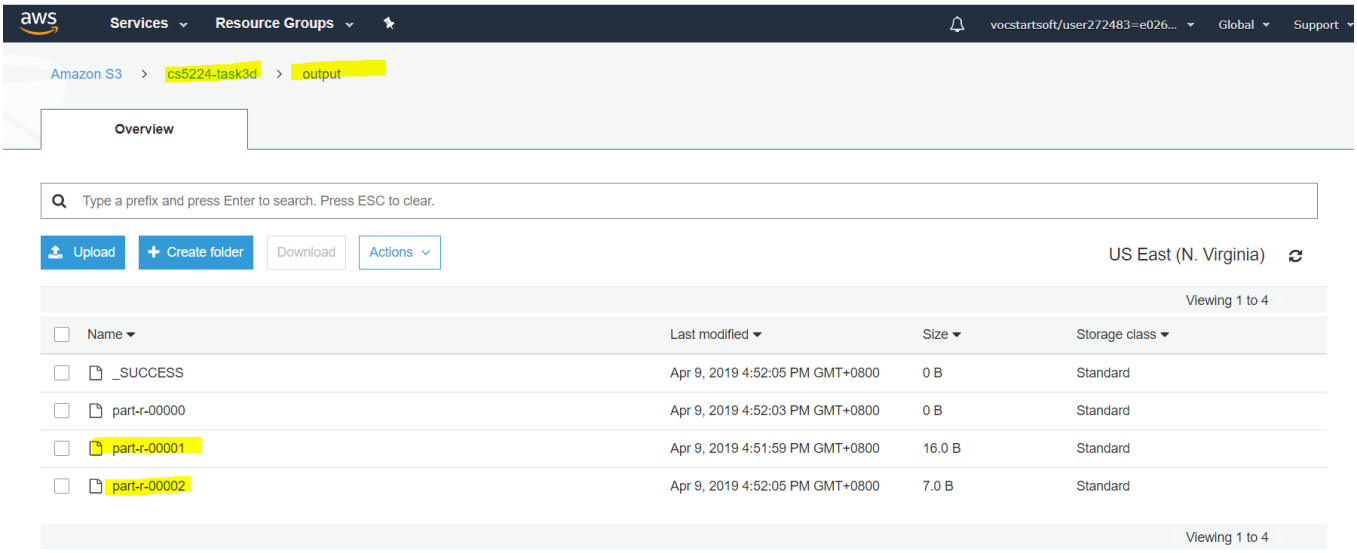
2. Reliability: AWS EMR provides monitoring service to monitor nodes in the cluster and provides configuration options to automatically or manually terminate and replace an instance in case of failure.

3. Security: AWS EMR starts it's instances in two security groups, one for the master node and another for the other cluster nodes. By default, both the security groups are configured to not allow access from any external sources, and these can be fine-tuned according to the requirement. For additional security, customers may prefer to encrypt the data before uploading to AWS and encryption and decryption process occurs in the EMRFS client.

4. Master Instance and Worker Instance: Master program creates data localized tasks to minimize network communication whereas Worker nodes switch between mapper and reducer and they work in parallel.

4. Modify WordCount.java so that it only counts these three words "the", "a" and "an" in input file. (submit the modified program and screenshots of the output) (3 marks)

Ans: The output is generated in output folder. Download and check the word count.



Open the folder using Notepad++ to view the output count. Below screenshots for reference.

part-r-00001 (1) part-r-00002

```
1  an   120
2  the  3091
3
```

part-r-00001 (1) part-r-00002

```
1  a    1454
2
```