

Declaration	
Questions in this exercise are intentionally complex and could be convoluted or confusing. This is by design and to simulate real-life situations where customers seldom give crystal clear requirements and ask unambiguous questions.	

I have read the above statement and agree to these conditions	
I AGREE	ADEKUNLE ADEYINKA ADEGBIE
	<Enter your name above this line to indicate that you are in agreement>

Instructions	
Every screenshot requested in this workbook is compulsory and carries 0.5 points	
Your Azure account ID must be clearly visible in every screenshot using the Azure portal; missing id or using someone else's id is not permitted. Such cases will be considered as plagiarism and severe penalty will be imposed.	
All screenshots must be in the order mentioned under "Expected Screenshots" for every step	
DO NOT WAIT UNTIL THE LAST MINUTE. The program office will not extend the project submission deadline under any circumstances.	
The file should be renamed in the format BATCH_FIRSTNAME_LASTNAME_PROJECT1. For example: PGPCCMAY18_VIJAY_DWIVEDI_PROJECT1.pdf	

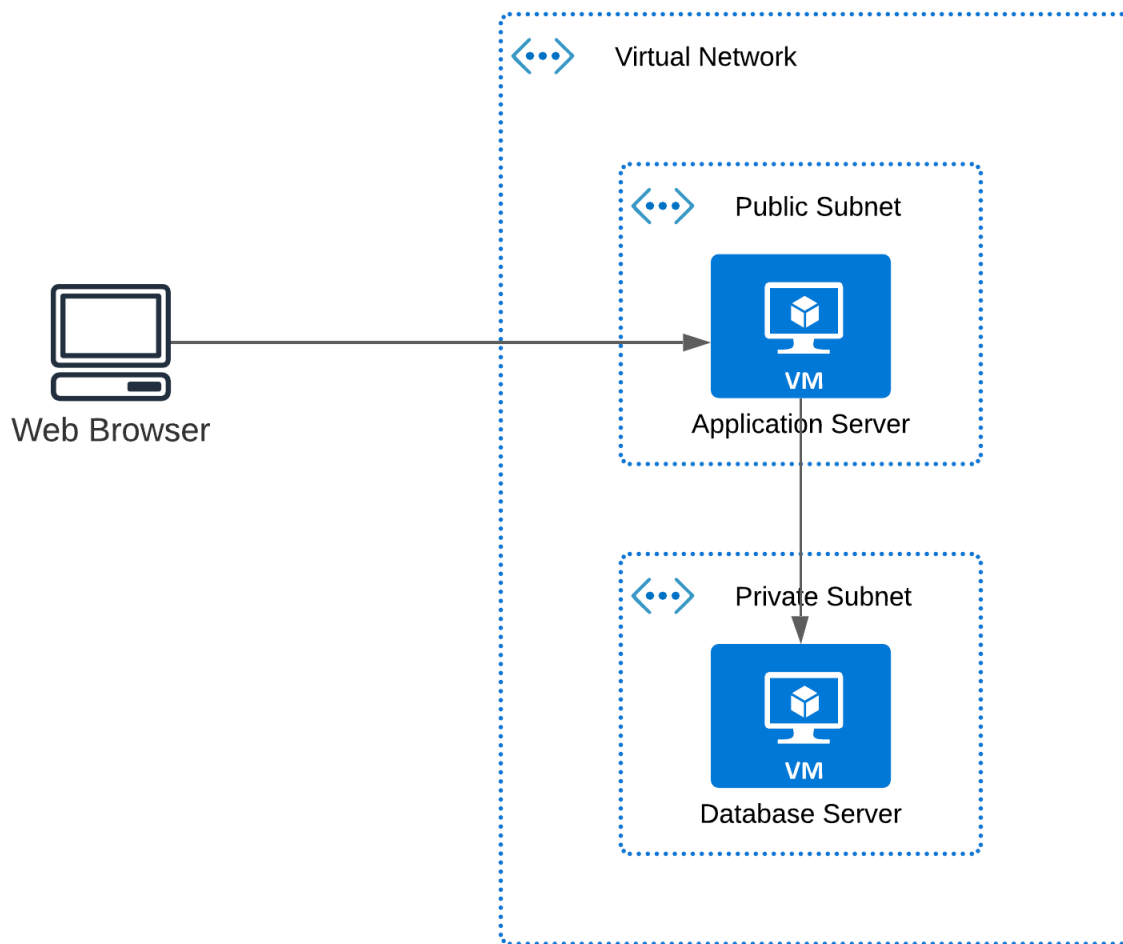
Resource Clean Up	
Cloud is always pay per use model and all resources/services that we consume are chargeable. Cleaning up when you've completed your lab or project is always necessary. This is true whether you're doing a lab or implementing a project at your workplace.	
After completing the lab, make sure to delete each resource created in reverse chronological order.	

Scenario

According to recent research, 40-75% of employees are using Dropbox to share files inside and outside of their businesses. Half of those Dropbox users do this even though they know it's against the rules. More than 40% of businesses have experienced the exposure of confidential information and the estimated average cost of a data breach equaled \$5.5 Million in 2011.

These files, containing sensitive company and customer data, are stored in a public cloud outside of the businesses' control - possibly even outside of the country. The potential for data leakage and security breaches is enormous and companies need to stay compliant with their own policies and procedures for security and governance

Architecture diagram



Architecture Implementation	
1	Implement 2 different subnets (one public and the other private) in a virtual network
2	Install and configure MySQL on an Ubuntu 18.04 virtual machine on the private subnet using the instructions provided. (Hint: Use a bastion host and a NAT gateway)
3	Install and configure OwnCloud on an Ubuntu 18.04 virtual machine on the public subnet using the provided instructions.
4	Configure the network security groups to allow the required ports
5	Test the installation by accessing the IP of the application server in a browser

Step 1: VPC and Subnet Creation

Step number	a
Step name	Creation of Virtual Network
Instructions	<p>1) Create a new resource group. You need to use this resource group to deploy all the resources in this exercise</p> <ul style="list-style-type: none">a) Search for resource groups using the search bar at the top of the screenb) Click on Createc) Enter a name and region of your choice. Remember to use the same region for all deployments in this exercise.d) Click on Review +Create and create the resource group <p>2) Navigate to Virtual Networks and click on Create</p> <ul style="list-style-type: none">a) Name : P1VNETb) IPv4 CIDR Block : 10.0.0.0/16c) Delete the default created subnet and add the following subnets<ul style="list-style-type: none">i) Public subnet with CIDR 10.0.1.0/24ii) Private subnet with CIDR 10.0.2.0/24d) The rest of the options can be set to the default valuese) Click on Create to create the virtual network
Expected screenshots	<ul style="list-style-type: none">1) Created virtual network with properties visible2) Properties of public subnet3) Properties of private subnet

1. CREATED VIRTUAL NETWORK WITH ITS PROPERTIES

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes the Microsoft Azure logo, a search bar, and the user's email address (kadebie@gmail.com). The main content area displays the 'PIVNET' virtual network overview. On the left, a sidebar lists various settings and tools. The main area is divided into sections: 'Essentials' showing resource group, location, subscription, and address space; 'Capabilities' showing DDoS protection, Azure Firewall, Peering, and Microsoft Defender for Cloud; and 'Private endpoints'.

Essentials

- Resource group: [greatlearningproject1](#)
- Location: [East US](#)
- Subscription: [Azure subscription 1](#)
- Subscription ID: b5a18760-4301-4847-9b9e-f5f6d3e0b431
- Address space: 10.0.0.0/16
- DNS servers: [Azure provided DNS service](#)
- Flow timeout: [Configure](#)
- BGP community string: [Configure](#)
- Virtual network ID: 4cb4cc42-fa70-4914-a0bb-ddcae923c615

Capabilities (5)

- DDoS protection**: Configure additional protection from distributed denial of service attacks.
● Not configured
- Azure Firewall**: Protect your network with a stateful L3-L7 firewall.
● Not configured
- Peering**: Seamlessly connect two or more virtual networks.
● Not configured
- Microsoft Defender for Cloud**: Strengthen the security posture of your environment.
- Private endpoints**: Privately access Azure services without sending traffic across internet.
● Not configured

2. CREATED PUBLIC SUBNET WITH ITS PROPERTIES

The screenshot shows the Microsoft Azure portal interface, specifically the 'PIVNET | Subnets' page. The left sidebar lists various settings and tools. The main area displays a table of subnets. The 'Publicsubnet' configuration panel is open on the right, showing details for the 'Publicsubnet'.

Subnets

Name	IPv4	IPv6	Available IPs
Publicsubnet	10.0.1.0/24	-	251
Privatesubnet	10.0.2.0/24	-	251

Publicsubnet

Name: Publicsubnet

Subnet address range: 10.0.1.0/24 (10.0.1.0 - 10.0.1.255 (251 + 5 Azure reserved addresses))

☐ Add IPv6 address space

NAT gateway: None

Network security group: None

Route table: None

SERVICE ENDPOINTS

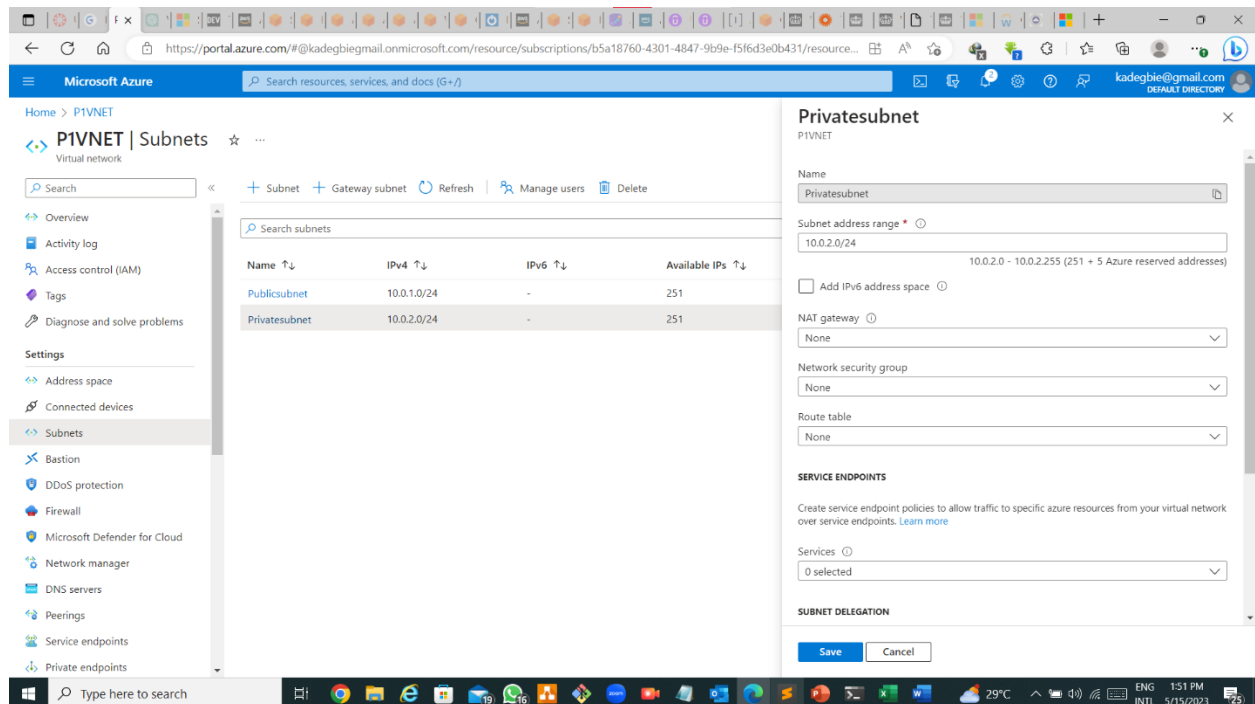
Create service endpoint policies to allow traffic to specific azure resources from your virtual network over service endpoints. [Learn more](#)

Services: 0 selected

SUBNET DELEGATION

[Save](#) [Cancel](#)

3. CREATED PRIVATE SUBNET WITH ITS PROPERTIES



Step number

B

Step name

Creation of NAT Gateway

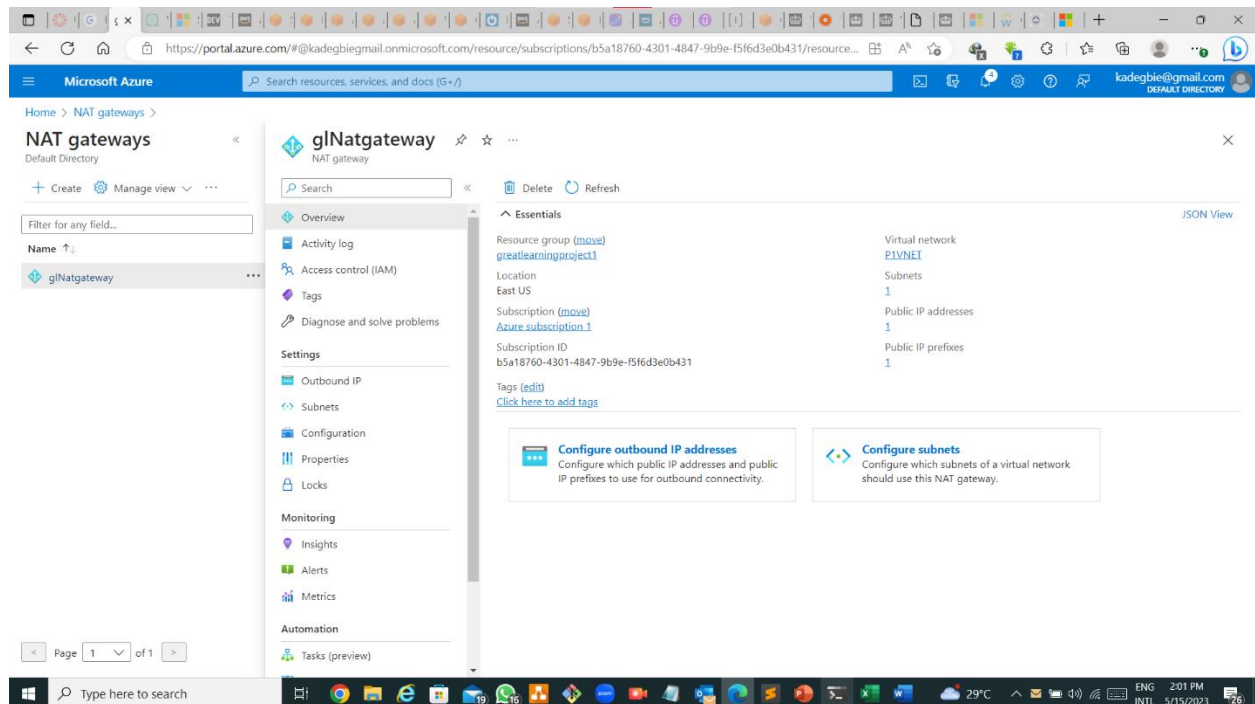
Instructions

- 1) Navigate to NAT Gateways
- 2) Click on "Create"
 - a) Use the resource group created above and the same region it is deployed in
 - b) Use a new public IP and public IP prefix for the NAT gateway. Ensure that the public IP prefix has a CIDR size of /30
 - c) When asked to select the subnet, select the private subnet created above
 - d) Click on Create
- 3) Navigate to virtual network and select the network created above
- 4) Select the private subnet created under Subnets in the menu on the left of the screen.
- 5) Under NAT Gateway, select the gateway created just now and select Save.

Expected screenshots

- 1) Created NAT gateway

4. CREATED NAT GATEWAY



Step number	c
Step name	Creation and configuration of Network security groups
Instructions	<ol style="list-style-type: none">1) Navigate to Network Security Groups2) Click on Create<ol style="list-style-type: none">a) Resource Group: Use the one previously createdb) Enter the name: AppNSGc) Region: Same as the resource group4) Click on Create5) Create another security group with the name DbNSG6) Navigate to the security group AppNSG7) Add inbound rules for ports 22 and 80 for any sources and destinations8) Navigate to the security group DbNSG9) Add inbound rules for ports 3306 and 22 for any sources and destinations
Expected screenshots	<ol style="list-style-type: none">1) AppNSG security rules2) DbNSG security rules

5. CREATED AppNSG WITH ITS SECURITY RULES

The screenshot displays the Microsoft Azure portal interface for configuring the AppNSG Inbound security rules. The left sidebar shows the navigation menu with categories like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings, and Monitoring. The 'Inbound security rules' section is selected under Settings. The main pane shows a table of security rules with columns for Priority, Name, Port, Protocol, Source, Destination, and Action. The rules are listed in descending order of priority.

Priority	Name	Port	Protocol	Source	Destination	Action
100	AllowAnyCustom80Inbound	80	Any	Any	Any	Allow
110	AllowAnyCustom22Inbound	22	Any	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

6. CREATED DbNSG WITH ITS SECURITY RULES

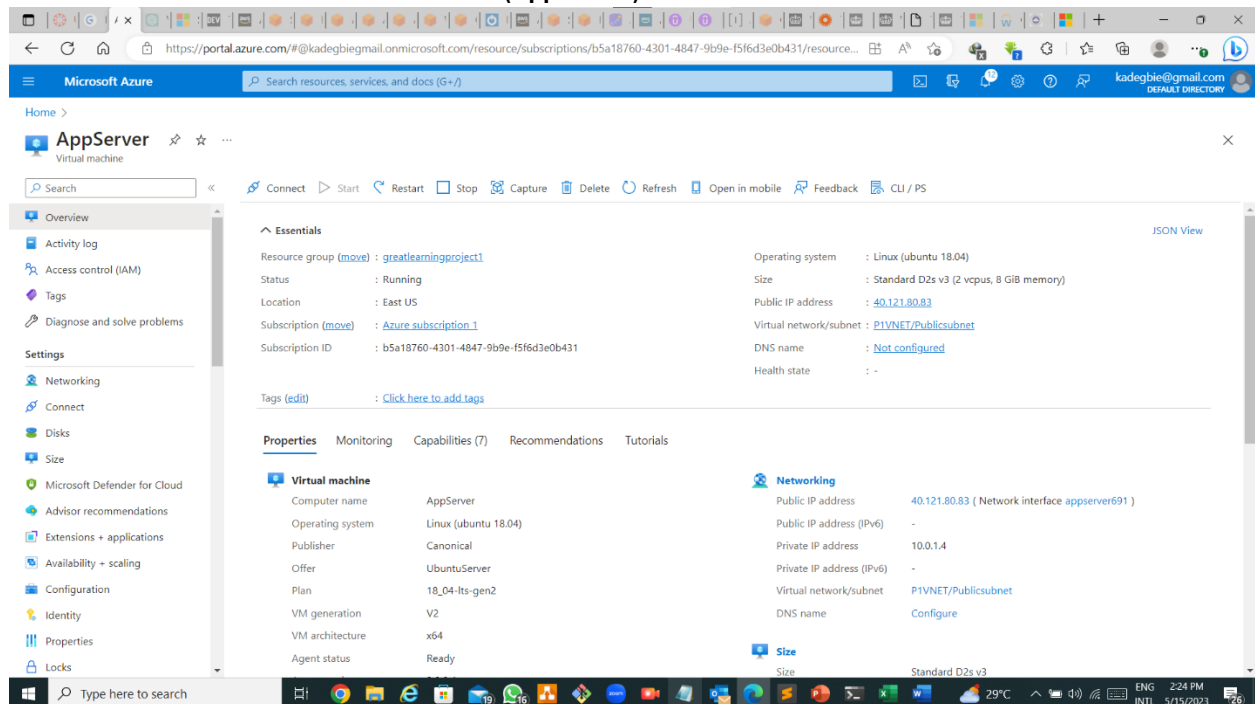
The screenshot displays the Microsoft Azure portal interface for configuring the DbNSG Inbound security rules. The left sidebar shows the navigation menu with categories like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings, and Monitoring. The 'Inbound security rules' section is selected under Settings. The main pane shows a table of security rules with columns for Priority, Name, Port, Protocol, Source, Destination, and Action. The rules are listed in descending order of priority.

Priority	Name	Port	Protocol	Source	Destination	Action
100	AllowAnyCustom22Inbound	22	Any	Any	Any	Allow
110	AllowAnyMySQLInbound	3306	TCP	Any	Any	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

Step 2 : Instance Creation

Step number	a
Step name	Creation of Application server
Instructions	<ol style="list-style-type: none">1) Navigate to Virtual machines2) Click on "Create"3) Create a virtual machine with the following properties<ol style="list-style-type: none">a) Resource Group: As Created aboveb) Region: Same as used beforec) Image: Ubuntu 18.04 LTSd) Authentication type: SSH public keye) Username: ubuntuf) Create a new key pairg) Inbound rules: Allow 22 and 80h) Virtual Network : P1VNETi) Subnet : Public subnet create abovej) Create a new public IPk) Network security group: Select Advanced and then pick AppNSG from the dropdownl) The rest of the options can be set to their default Values
Expected screenshots	<ol style="list-style-type: none">1) Created Application server Overview page

7. CREATED APPLICATION SERVER (AppServer) OVERVIEW PAGE



Step number B

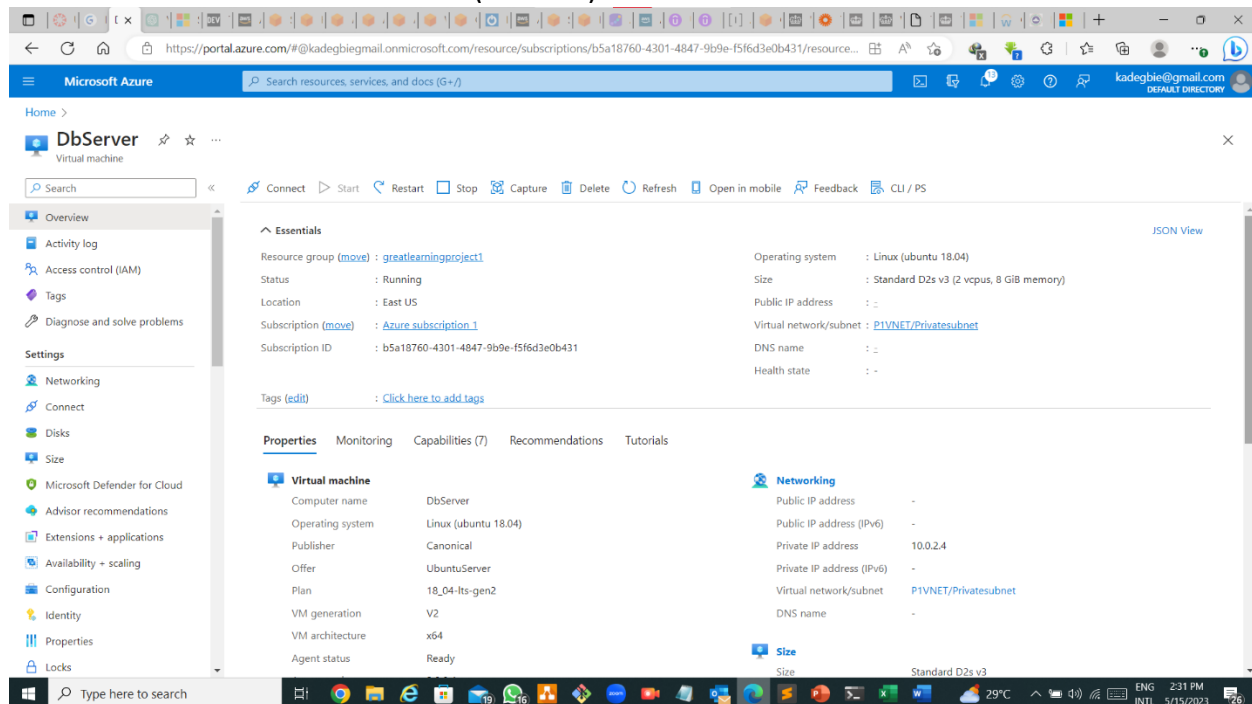
Step name Creation of Database server

- Instructions
- 1) Create a virtual machine with the following properties
 - a) Resource Group: As Created above
 - b) Region: Same as used before
 - c) Image : Ubuntu 18.04 LTS
 - d) Authentication type: SSH public key
 - e) Username: ubuntu
 - f) Create a new key pair (or reuse the one created for the application server)
 - g) Inbound rules: Allow 22 and 80
 - h) Virtual Network : P1VNET
 - i) Subnet : Private subnet create above
 - j) No public IP is required here
 - k) Network security group: Select Advanced and then pick DbNSG from the dropdown
 - l) The rest of the options can be set to their default Values

Expected screenshots

- 1) Created Database server overview page

8. CREATED DATABASE SERVER (DbServer) OVERVIEW PAGE



Step 4: Application and Database Installation and Testing

Step number	A
Step name	Installation and configuration of MySQL
Instructions	<ol style="list-style-type: none">1) Copy the database pem file into the application server using the below command <code>scp -i <application server pem file> <database server pem file> ubuntu@<application server public IP>:/home/ubuntu</code>2) Log into the application server using your SSH client of choice3) From the application server, log into the database server using the pem file copied in step 1 and the private IP address of the database server with the following command <code>ssh -i <database server pem file> ubuntu@<private IP of database server></code>4) Enter the following commands to install and configure MySQL on the database server <code>sudo apt update</code> <code>sudo apt install dos2unix -y</code> <code>wget https://d60pu47qoi4ee.cloudfront.net/azure_install_mysql.sh</code> <code>sudo chmod 700 azure_install_mysql.sh</code> <code>sudo dos2unix azure_install_mysql.sh</code> <code>sudo ./azure_install_mysql.sh</code>5) Type <code>exit</code> to exit the database server and go back to the application server
Expected screenshots	<ol style="list-style-type: none">1) Downloading of the provided script2) Executing the script

9. DOWNLOADING OF THE PROVIDED SCRIPT

```
MINGW64/c/Users/Kunle/Downloads
Kunle@Kunle-PC MINGW64 ~/Downloads
$ scp -i AppServer_key.pem DbServer_key.pem ubuntu@40.121.80.83:/home/ubuntu
DbServer_key.pem                                100% 2494   10.2KB/s   00:00
Kunle@Kunle-PC MINGW64 ~/Downloads
$ |
```

10. EXECUTING THE SCRIPTS

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

New release '20.04.6 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@AppServer:~$ ssh -i DbServer_key.pem ubuntu@10.0.2.4
The authenticity of host '10.0.2.4 (10.0.2.4)' can't be established.
ECDSA key fingerprint is SHA256:Ude8bplRFScw4sU4cpl10ix3Nj39/xQkazuME608.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.2.4' (ECDSA) to the list of known hosts.
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@                 WARNING: UNPROTECTED PRIVATE KEY FILE!                 @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
Permissions 0644 for 'DbServer_key.pem' are too open.
It is required that your private key files are NOT accessible by others.
This private key will be ignored.
Load key "DbServer_key.pem": bad permissions
ubuntu@10.0.2.4: Permission denied (publickey).
ubuntu@AppServer:~$ chmod 400 DbServer_key.pem
ubuntu@AppServer:~$ ssh -i DbServer_key.pem ubuntu@10.0.2.4
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-1107-azure x86_64)

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

System information as of Mon May 15 13:53:42 UTC 2023
System load:  0.0          Processes:    108
Usage of /:   4.5% of 28.89GB Users logged in:  0
Memory usage: 2%          IP address for eth0: 10.0.2.4
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 programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@DbServer:~$ |
```

11. EXECUTING THE SCRIPTS

```
ubuntu@DbServer:~$
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 programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@DbServer:~$
ubuntu@DbServer:~$
ubuntu@DbServer:~$ sudo apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu bionic-backports InRelease [83.3 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8570 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu bionic/universe Translation-en [4941 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [2990 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [545 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [1269 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu bionic-updates/restricted Translation-en [176 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu bionic-updates/universe amd64 Packages [1903 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [417 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [25.6 kB]
Get:16 http://azure.archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6088 B]
Get:17 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.3 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]
Get:19 http://azure.archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.1 kB]
Get:20 http://azure.archive.ubuntu.com/ubuntu bionic-backports/universe Translation-en [8668 B]
Get:21 http://azure.archive.ubuntu.com/ubuntu bionic-security/main amd64 Packages [2660 kB]
Get:22 http://azure.archive.ubuntu.com/ubuntu bionic-security/main Translation-en [459 kB]
Get:23 http://azure.archive.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [1240 kB]
Get:24 http://azure.archive.ubuntu.com/ubuntu bionic-security/restricted Translation-en [172 kB]
Get:25 http://azure.archive.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1294 kB]
Get:26 http://azure.archive.ubuntu.com/ubuntu bionic-security/universe Translation-en [305 kB]
Get:27 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]
Get:28 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3928 B]
Fetched 27.6 MB in 7s (4116 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
ubuntu@DbServer:~$
ubuntu@DbServer:~$
ubuntu@DbServer:~$
ubuntu@DbServer:~$
```

12. EXECUTING THE SCRIPTS

```
ubuntu@DbServer:~$
ubuntu@DbServer:~$ sudo apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu bionic-backports InRelease [83.3 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu bionic/universe amd64 Packages [8570 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu bionic/universe Translation-en [4941 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu bionic/multiverse amd64 Packages [151 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu bionic/multiverse Translation-en [108 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu bionic-updates/main amd64 Packages [2990 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu bionic-updates/main Translation-en [545 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu bionic-updates/restricted amd64 Packages [1269 kB]
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Get:16 http://azure.archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6088 B]
Get:17 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.3 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]
Get:19 http://azure.archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.1 kB]
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Get:21 http://azure.archive.ubuntu.com/ubuntu bionic-security/main amd64 Packages [2660 kB]
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Get:27 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]
Get:28 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3928 B]
Fetched 27.6 MB in 7s (4116 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
ubuntu@DbServer:~$
ubuntu@DbServer:~$
ubuntu@DbServer:~$ sudo apt install dos2unix -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  dos2unix
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 351 kB of archives.
After this operation, 1267 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu bionic/universe amd64 dos2unix 7.3.4-3 [351 kB]
Fetched 351 kB in 0s (856 kB/s)
Selecting previously unselected package dos2unix.
(Reading database ... 59120 files and directories currently installed.)
Preparing to unpack .../dos2unix_7.3.4-3_amd64.deb ...
Unpacking dos2unix (7.3.4-3) ...
Setting up dos2unix (7.3.4-3) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
ubuntu@DbServer:~$
ubuntu@DbServer:~$
ubuntu@DbServer:~$
```

13. EXECUTING THE SCRIPTS

```
ubuntu@DbServer:~$  
Get:14 http://azure.archive.ubuntu.com/ubuntu bionic-updates/universe Translation-en [417 kB]  
Get:15 http://azure.archive.ubuntu.com/ubuntu bionic-updates/multiverse amd64 Packages [25.6 kB]  
Get:16 http://azure.archive.ubuntu.com/ubuntu bionic-updates/multiverse Translation-en [6088 B]  
Get:17 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main amd64 Packages [53.2 kB]  
Get:18 http://azure.archive.ubuntu.com/ubuntu bionic-backports/main Translation-en [14.6 kB]  
Get:19 http://azure.archive.ubuntu.com/ubuntu bionic-backports/universe amd64 Packages [18.1 kB]  
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Fetched 27.6 MB in 7s (4116 kB/s)  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
1 package can be upgraded. Run 'apt list --upgradable' to see it.  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ sudo apt install dos2unix -y  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following NEW packages will be installed:  
  dos2unix  
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.  
Need to get 351 kB of archives.  
After this operation, 1267 kB of additional disk space will be used.  
Get:1 http://azure.archive.ubuntu.com/ubuntu bionic/universe amd64 dos2unix amd64 7.3.4-3 [351 kB]  
Fetched 351 kB in 0s (856 kB/s)  
Selecting previously unselected package dos2unix.  
(Reading database ... 59120 files and directories currently installed.)  
Preparing to unpack .../dos2unix_7.3.4-3_amd64.deb ...  
Unpacking dos2unix (7.3.4-3) ...  
Setting up dos2unix (7.3.4-3) ...  
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ wget https://d6opu47qoi4ee.cloudfront.net/azure_install_mysql.sh  
--2023-05-15 13:59:27-- https://d6opu47qoi4ee.cloudfront.net/azure_install_mysql.sh  
Resolving d6opu47qoi4ee.cloudfront.net (d6opu47qoi4ee.cloudfront.net)... 108.138.61.214, 108.138.61.189, 108.138.61.60, ...  
Connecting to d6opu47qoi4ee.cloudfront.net (d6opu47qoi4ee.cloudfront.net)|108.138.61.214|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 1105 (1.1K) [text/x-sh]  
Saving to: 'azure_install_mysql.sh'  
  
azure_install_mysql.sh 100%[=====] 1.08K --.-KB/s in 0s  
  
2023-05-15 13:59:28 (120 MB/s) - 'azure_install_mysql.sh' saved [1105/1105]  
  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$
```

14. EXECUTING THE SCRIPTS

```
ubuntu@DbServer:~$  
Get:21 http://azure.archive.ubuntu.com/ubuntu bionic-security/main amd64 Packages [2660 kB]  
Get:22 http://azure.archive.ubuntu.com/ubuntu bionic-security/main Translation-en [459 kB]  
Get:23 http://azure.archive.ubuntu.com/ubuntu bionic-security/restricted amd64 Packages [1240 kB]  
Get:24 http://azure.archive.ubuntu.com/ubuntu bionic-security/restricted Translation-en [172 kB]  
Get:25 http://azure.archive.ubuntu.com/ubuntu bionic-security/universe amd64 Packages [1294 kB]  
Get:26 http://azure.archive.ubuntu.com/ubuntu bionic-security/universe Translation-en [305 kB]  
Get:27 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse amd64 Packages [19.8 kB]  
Get:28 http://azure.archive.ubuntu.com/ubuntu bionic-security/multiverse Translation-en [3928 B]  
Fetched 27.6 MB in 7s (4116 kB/s)  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
1 package can be upgraded. Run 'apt list --upgradable' to see it.  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ sudo apt install dos2unix -y  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following NEW packages will be installed:  
  dos2unix  
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.  
Need to get 351 kB of archives.  
After this operation, 1267 kB of additional disk space will be used.  
Get:1 http://azure.archive.ubuntu.com/ubuntu bionic/universe amd64 dos2unix amd64 7.3.4-3 [351 kB]  
Fetched 351 kB in 0s (856 kB/s)  
Selecting previously unselected package dos2unix.  
(Reading database ... 59120 files and directories currently installed.)  
Preparing to unpack .../dos2unix_7.3.4-3_amd64.deb ...  
Unpacking dos2unix (7.3.4-3) ...  
Setting up dos2unix (7.3.4-3) ...  
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ wget https://d6opu47qoi4ee.cloudfront.net/azure_install_mysql.sh  
--2023-05-15 13:59:27-- https://d6opu47qoi4ee.cloudfront.net/azure_install_mysql.sh  
Resolving d6opu47qoi4ee.cloudfront.net (d6opu47qoi4ee.cloudfront.net)... 108.138.61.214, 108.138.61.189, 108.138.61.60, ...  
Connecting to d6opu47qoi4ee.cloudfront.net (d6opu47qoi4ee.cloudfront.net)|108.138.61.214|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 1105 (1.1K) [text/x-sh]  
Saving to: 'azure_install_mysql.sh'  
  
azure_install_mysql.sh 100%[=====] 1.08K --.-KB/s in 0s  
  
2023-05-15 13:59:28 (120 MB/s) - 'azure_install_mysql.sh' saved [1105/1105]  
  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ sudo chmod 700 azure_install_mysql.sh  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$ sudo dos2unix azure_install_mysql.sh  
dos2unix: converting file azure_install_mysql.sh to unix format...  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$  
ubuntu@DbServer:~$
```

[illegible]

Instructions 1) Enter the following commands after logging into the application server via SSH to install and configure Mattermost

```
sudo apt update
sudo apt install dos2unix -y
wget https://d6opu47qoi4ee.cloudfront.net/install\_owncloud.sh
sudo dos2unix install_owncloud.sh
sudo chmod 700 install_owncloud.sh
sudo ./install_owncloud.sh
sudo systemctl restart apache2
```


2) Check whether the server has been successfully deployed by visiting the public IP of the web server in the web browser.

Expected screenshots

- 1) Downloading the script
- 2) Executing the script
- 3) Accessing the application via web browser

16. DOWNLOADING & EXECUTING THE SCRIPTS

```
ubuntu@AppServer: ~  
Setting up fonts-dejavu-core (2.37-1) ...  
Setting up poppler-data (0.4.8-2) ...  
Setting up php7.2-curl (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/curl.ini with new version  
Setting up php-curl (1:7.2+60ubuntu1) ...  
Setting up libjpeg-turbo8:amd64 (1:3.2-0ubuntu5.18.04.6) ...  
Setting up libfreet6:amd64 (3.3.7-1) ...  
Setting up owncloud-files (10.1.0-1+1.1) ...  
Setting up php7.2-mbstring (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/mbstring.ini with new version  
Setting up php-mb (1:7.2+60ubuntu1) ...  
Setting up fonts-noto-mono (20171026-2) ...  
Setting up libzip4:amd64 (1.1.2-1.1) ...  
Setting up php7.2-bz2 (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/bz2.ini with new version  
Setting up libcupsmime2:amd64 (2.2.7-1ubuntu2.9) ...  
Setting up liblqr-1-0:amd64 (0.4.2-2.1) ...  
Setting up libjbig2dec0:amd64 (0.13-6) ...  
Setting up php-mbstring (1:7.2+60ubuntu1) ...  
Setting up libltdl7:amd64 (2.4.6-2) ...  
Setting up libijs-0.35:amd64 (0.35-13) ...  
Setting up libxpm4:amd64 (1:3.5.12-1ubuntu0.18.04.2) ...  
Setting up php7.2-intl (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/intl.ini with new version  
Setting up php-intl (1:7.2+60ubuntu1) ...  
Setting up libwebp6:amd64 (0.6.1-2ubuntu0.18.04.1) ...  
Setting up libjpeg8:amd64 (8c-2ubuntu8) ...  
Setting up fontconfig-config (2.12.6-0ubuntu2) ...  
Setting up php7.2-zip (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/zip.ini with new version  
Setting up php-bz2 (1:7.2+60ubuntu1) ...  
Setting up ttf-dejavu-core (2.37-1) ...  
Setting up libtiff5:amd64 (4.0.9-5ubuntu0.10) ...  
Setting up php-zip (1:7.2+60ubuntu1) ...  
Setting up libcupsfilters1:amd64 (1.20.2-0ubuntu3.1) ...  
Setting up libfontconfig1:amd64 (2.12.6-0ubuntu2) ...  
Setting up libmagickcore-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.15) ...  
Setting up libgd1:amd64 (2.2.5-4ubuntu0.5) ...  
Setting up libmagickwand-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.15) ...  
Setting up libgs9:amd64 (9.26-dfsg+0-0ubuntu0.18.04.18) ...  
Setting up php7.2-gd (7.2.24-0ubuntu0.18.04.17) ...  
  
Creating config file /etc/php/7.2/mods-available/gd.ini with new version  
Setting up php-imagick (3.4.3-rc2-2ubuntu4.1) ...  
Setting up php-gd (1:7.2+60ubuntu1) ...  
Processing triggers for libc-bin (2.27-3ubuntu1.6) ...  
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...  
Processing triggers for libapache2-mod-php7.2 (7.2.24-0ubuntu0.18.04.17) ...  
ubuntu@AppServer:~$  
ubuntu@AppServer:~$  
ubuntu@AppServer:~$  
ubuntu@AppServer:~$
```


17. DOWNLOADING & EXECUTING THE SCRIPTS

```
ubuntu@AppServer:~$ sudo ./install.sh
Setting up php-curl (1:7.24-0ubuntu1) ...
Setting up libjpeg-turbo8:amd64 (1:5.2-0ubuntu5.18.04.6) ...
Setting up libffi3-dbg:amd64 (3.3.7-1) ...
Setting up owncld-files (10.1.0-1.1) ...
Setting up php7.2-mbstring (7.2.24-0ubuntu0.18.04.17) ...

Creating config file /etc/php/7.2/mods-available/mbstring.ini with new version
Setting up php-xml (1:7.2-0ubuntu1) ...
Setting up fonts-noto-mono (20171026-2) ...
Setting up libzip4:amd64 (1:1.2-1.1) ...
Setting up php7.2-bz2 (7.2.24-0ubuntu0.18.04.17) ...

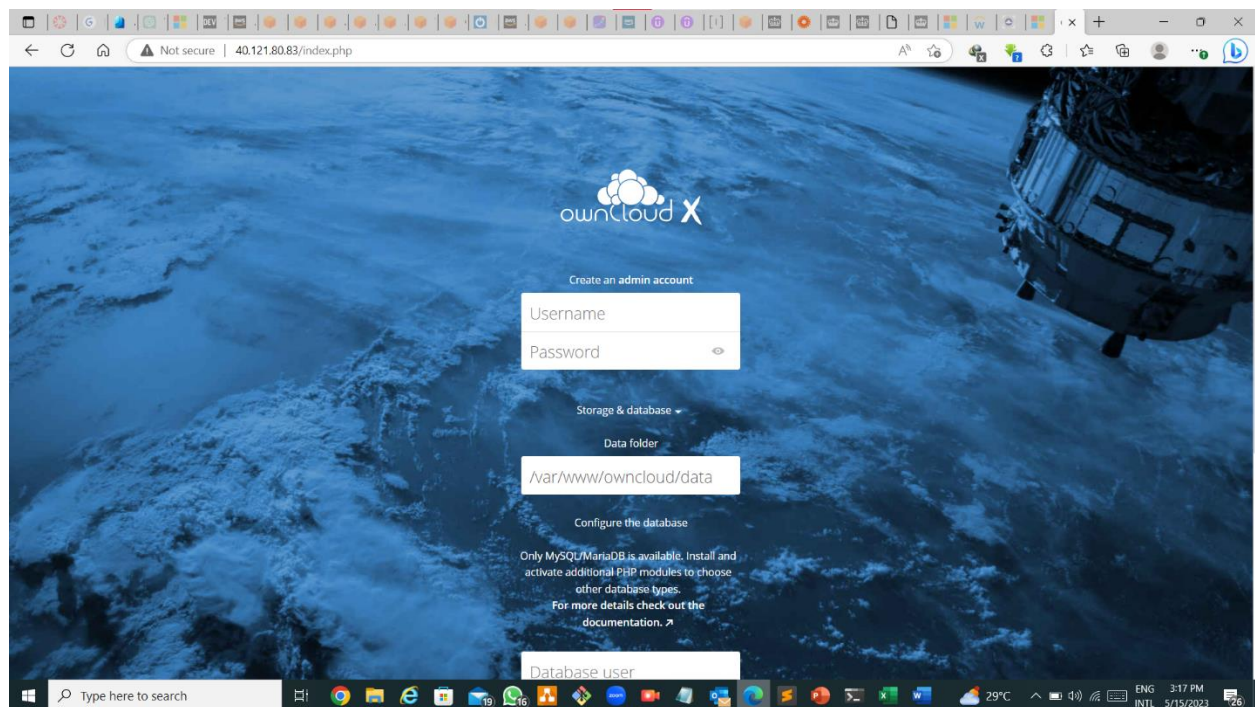
Creating config file /etc/php/7.2/mods-available/bz2.ini with new version
Setting up libcupsimage2:amd64 (2.2.7-1ubuntu2.9) ...
Setting up liblqr-1-0:amd64 (0.4.2-2.1) ...
Setting up libjpeg8:amd64 (0.13-6) ...
Setting up php-mbstring (1:7.2-0ubuntu1) ...
Setting up libltdl7:amd64 (2.4.6-2) ...
Setting up libijs-0.35:amd64 (0.35-13) ...
Setting up libxpm6:amd64 (1:3.5.12-1ubuntu0.18.04.2) ...
Setting up php7.2-intl (7.2.24-0ubuntu0.18.04.17) ...

Creating config file /etc/php/7.2/mods-available/intl.ini with new version
Setting up php-intl (1:7.2-0ubuntu1) ...
Setting up libwebp6:amd64 (0.6.1-2ubuntu0.18.04.1) ...
Setting up libjpeg8:amd64 (8c-2ubuntu8) ...
Setting up fontconfig-config (2.12.6-0ubuntu2) ...
Setting up php7.2-zip (7.2.24-0ubuntu0.18.04.17) ...

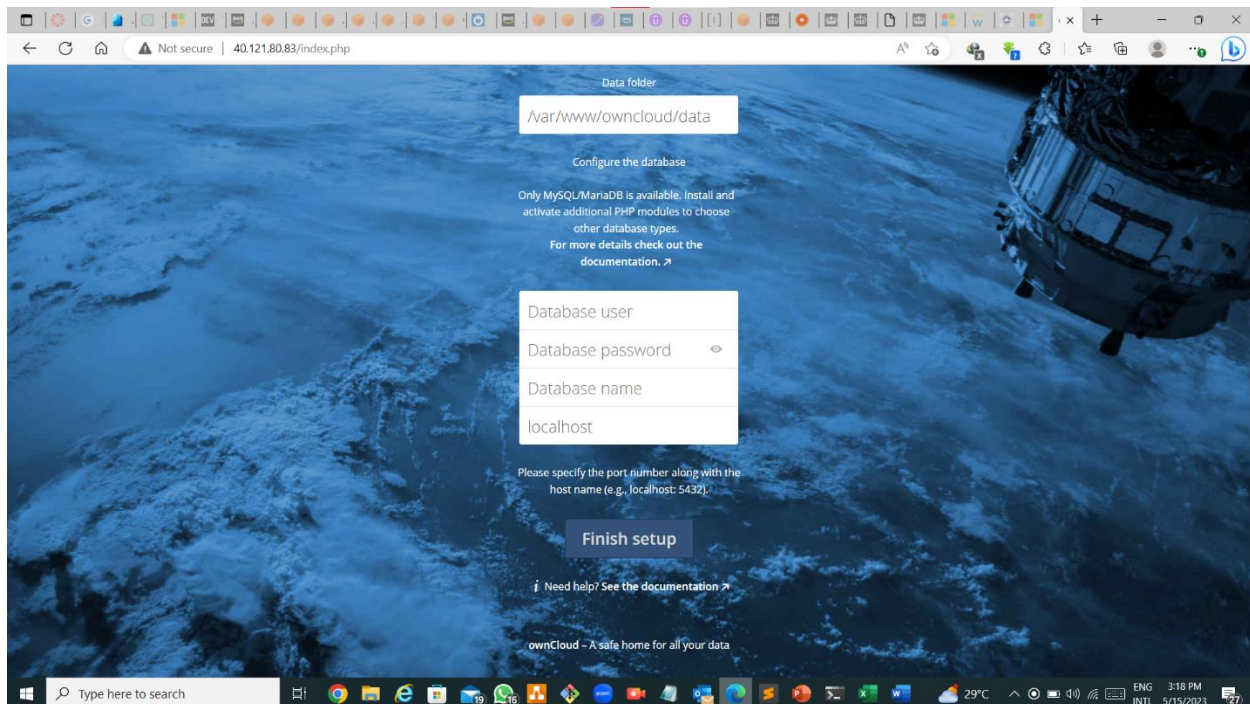
Creating config file /etc/php/7.2/mods-available/zip.ini with new version
Setting up php-bz2 (1:7.2-0ubuntu1) ...
Setting up ttf-dejavu-core (2.37-1) ...
Setting up libtiff5:amd64 (4.0.9-3ubuntu0.10) ...
Setting up php-zip (1:7.2-0ubuntu1) ...
Setting up libcupsfilters1:amd64 (1.20.2-0ubuntu3.1) ...
Setting up libfontconfig1:amd64 (2.12.6-0ubuntu2) ...
Setting up libjpeg8:amd64 (8c-2ubuntu8) ...
Setting up libmagickcore-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.15) ...
Setting up libgd3:amd64 (2.2.5-4ubuntu0.5) ...
Setting up libmagickwand-6.q16-3:amd64 (8:6.9.7.4+dfsg-16ubuntu6.15) ...
Setting up libgs9:amd64 (9.26-0ubuntu0.18.04.15) ...
Setting up php7.2-gd (7.2.24-0ubuntu0.18.04.17) ...

Creating config file /etc/php/7.2/mods-available/gd.ini with new version
Setting up php-imagick (3.4.3-rc2-2ubuntu4.1) ...
Setting up ghostscript (9.26-0ubuntu0.18.04.18) ...
Setting up php-gd (1:7.2-0ubuntu1) ...
Processing triggers for libc-bin (2.27-3ubuntu1.6) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for libapache2-mod-php7.2 (7.2.24-0ubuntu0.18.04.17) ...
ubuntu@AppServer:~$ sudo systemctl restart apache2
ubuntu@AppServer:~$
```

18. ACCESSING THE APPLICATION VIA WEB BROWSER



19. ACCESSING THE APPLICATION VIA WEB BROWSER



Step 5: Answer the following questions

- 1) Which of the following resources is optional at the time of VM creation?
 - a) Public IP address ✓
 - b) Virtual Network
 - c) Network Interface
 - d) Resource Group
- 2) Network Security group rules are evaluated in order of PORT NUMBER
 - a) Priority
 - b) Name (Alphabetical)
 - c) Direction
 - d) Port number ✓
- 3) Which of the following properties may change depending on the size of the VM?
 - a) All of these ✓
 - b) Max number of disks
 - c) Memory
 - d) vCPUs

- 4) Which of the following qualifies as a destination for inbound NSG rules?
- a) NIC
 - b) Virtual Network
 - c) Resource Group
 - d) Virtual machine ✓
- 5) Which of the following is not true about local VNET Peering?
- a) It is transitive
 - b) It is commutative
 - c) The 2 networks need to be in the same region
 - d) All of these ✓
- 6) Which of the following would qualify as a point-to-site VPN connection?
- a) Local machine to VPN gateway ✓
 - b) VM to VM within the same virtual network
 - c) VM to VM within the different virtual network
 - d) VM to MySQL deployment within the same virtual network
- 7) Which of the following is not a property of an incoming load balancer request?
- a) Source IP
 - b) Protocol
 - c) Destination port
 - d) Name of virtual network ✓

Grades distribution	
MCQs	7 (1 point each)
Implementation screenshots	13 points (1 point each)
Total	20 points