

DEVOPS with MULTI-CLOUD

Practice Tasks

Institute Name : V Cube software solutions
Course : DevOps with Multi-Cloud
Batch : 30
Trainer : Krishna reddy sir

Prepared by : G.Bhavish
(MCD-AZ30-024)

TASK-6 : 3-Tier Architecture (Basic).

Date : 28/01/26

Objective :-

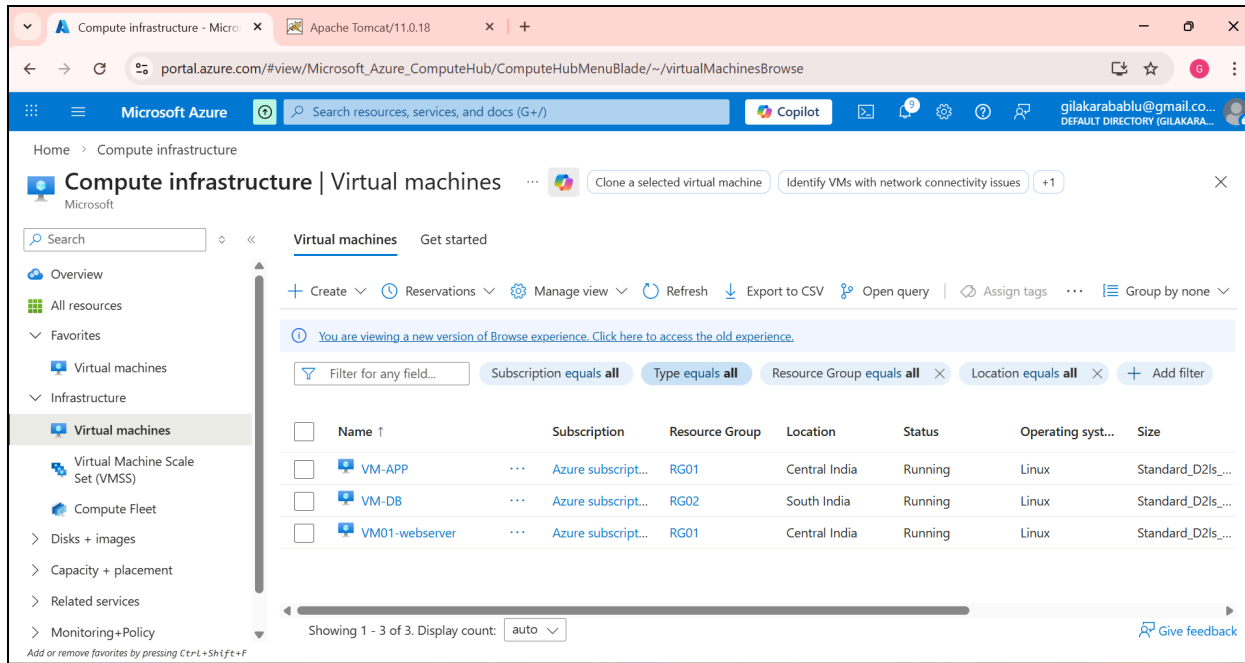
To design and implement a three-tier architecture in Azure that separates the web, application, and database layers, improving security, scalability, and availability by controlling traffic flow between each tier.

3 - Tier Architecture :-

- In the 3-tier Architecture we will have front end server ,backend server and business & logic server.
- A 3-tier Architecture divides the application into web server, app and database servers.each has its own role and this improves the security and maintenance.

Implementation of Three-Tier Architecture :-

- Create the virtual machines VM-WEB and VM-APP under the resource group RG01 and virtual network VN01 with two subnets SN-WEB & SN-APP.
- also create the virtual machine VM-DB under the resource group RG02 and virtual network VN02 with subnet SN-DB. (since we created db in different regions due to less cpu's, now we need to add vnet peering between both the virtual networks vn01 and vn02.)



fig(1) the three virtual machines are created.

→ Now login to the machine Vm-web and install nginx. And browse the vm web ip address for validation.

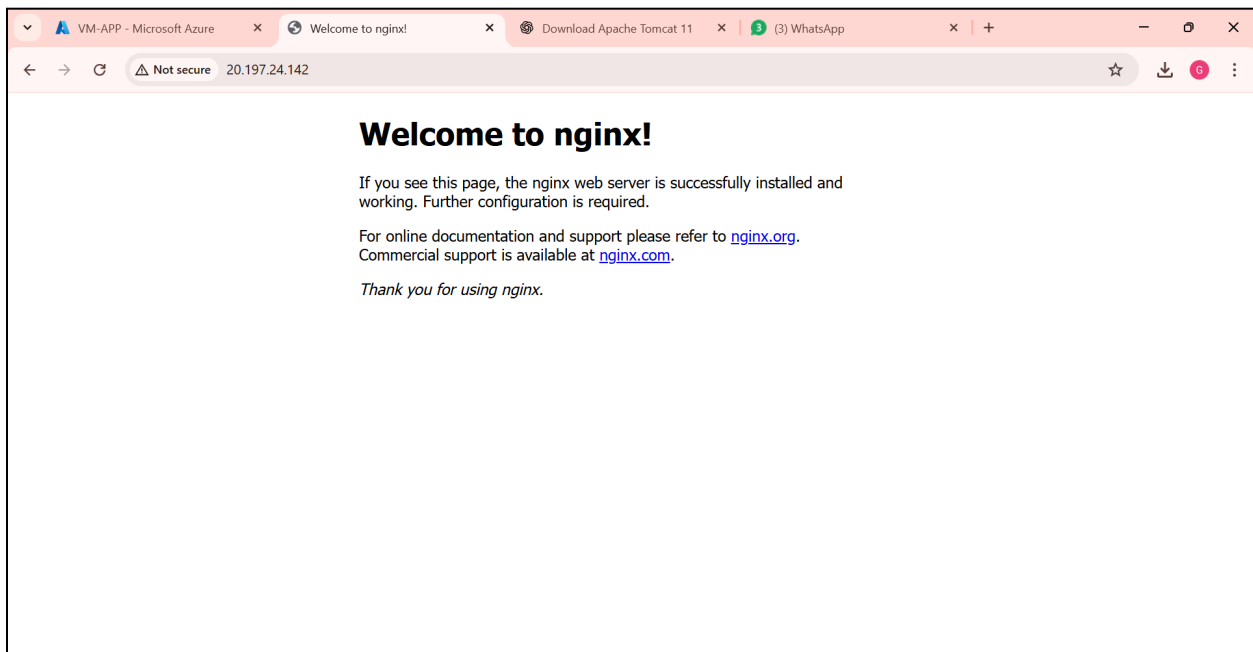


Fig (2) successfully installed nginx in vm-web.

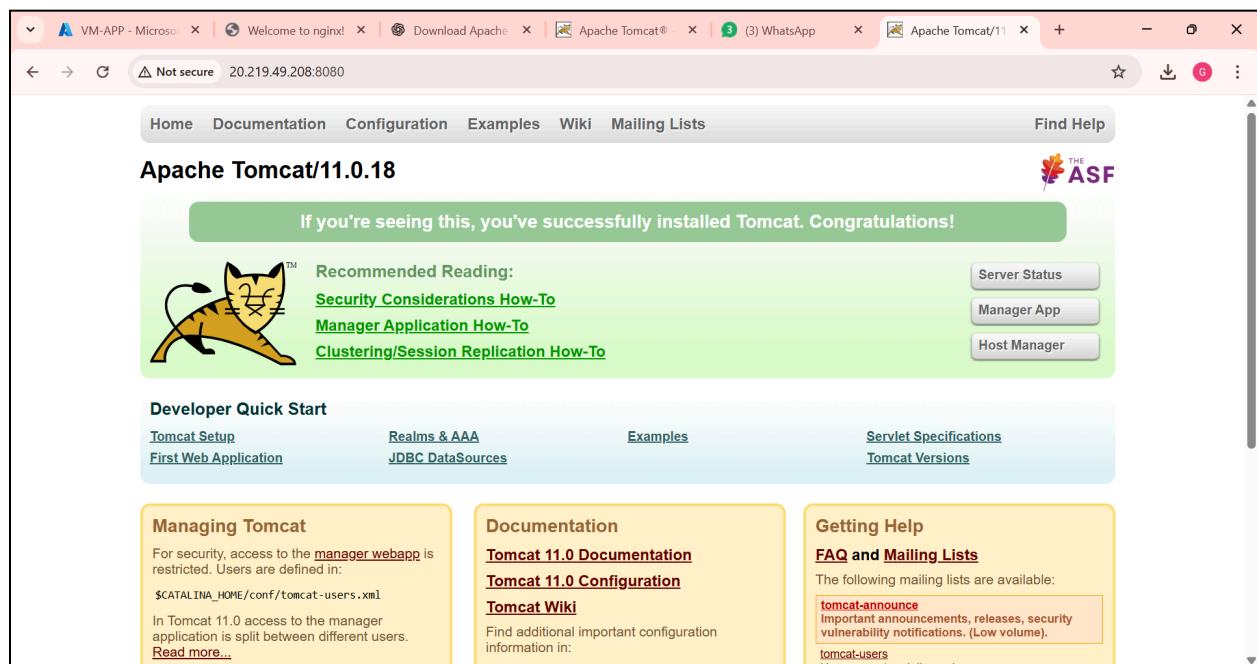
→ Now login to the vm-app and install Apache Tomcat.

- To run Tomcat we need java, so first download java:-
 - apt install default-jdk -y
 - java -version
- To install Tomcat :-
 - Go to the Apache Tomcat official website and get the latest version.

- wget

<https://dlcdn.apache.org/tomcat/tomcat-10/v10.1.18/bin/apache-tomcat-10.1.18.tar.gz>

- tar -xvzf [apache-tomcat-10.1.18.tar.gz](https://dlcdn.apache.org/tomcat/tomcat-10/v10.1.18/bin/apache-tomcat-10.1.18.tar.gz)
- mv apache-tomcat-10.1.18 tomcat
- cd tomcat/bin
- ./startup.sh



fig(3) successfully Tomcat installed in vm-app.

→ Now login to the vm-db and install MYSQL.

- apt install mysql-server -y
- mysql_secure_installation
- nano /etc/mysql/mysql.conf.d/mysqld.cnf
- bind-address = 0.0.0.0
- Save and exit (CTRL + X, then Y, then Enter).
- systemctl restart mysql
- systemctl status mysql

→ Now we have installed and configured in all the 3 tiers, since we have already created nsg for login to vm's.

→ Now we will add some new rules.

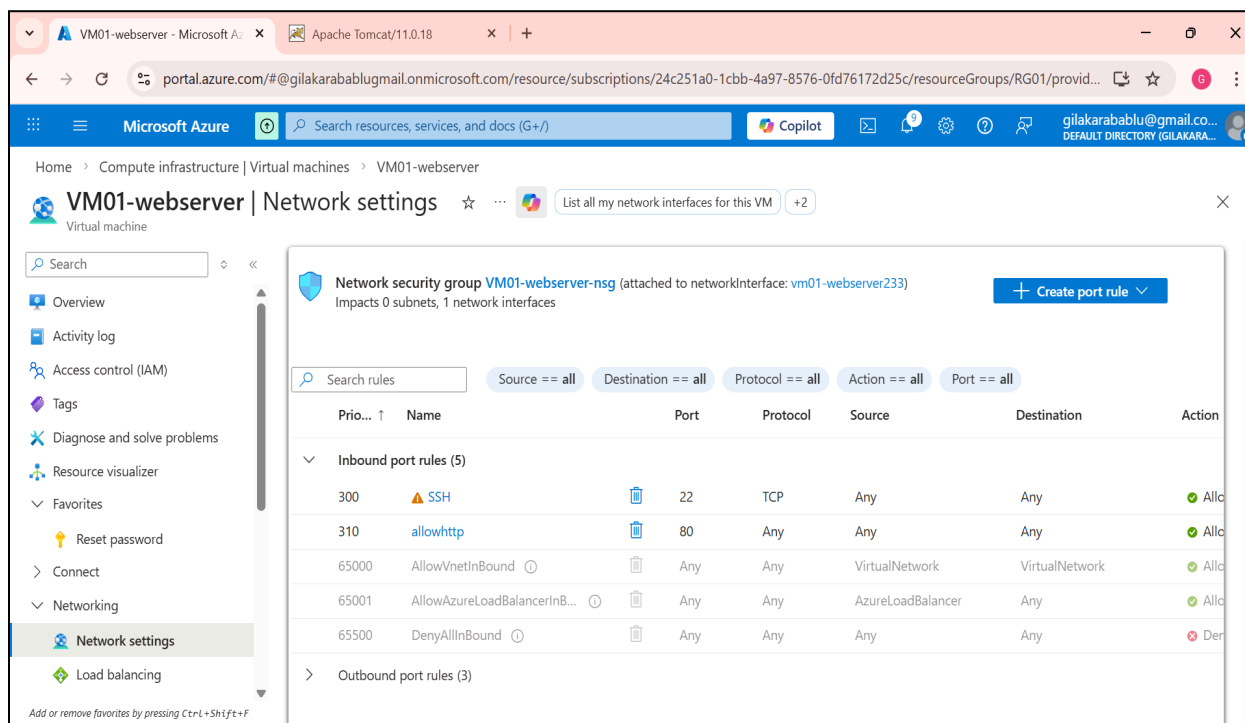


Fig (4) nsg rules for vm-web.

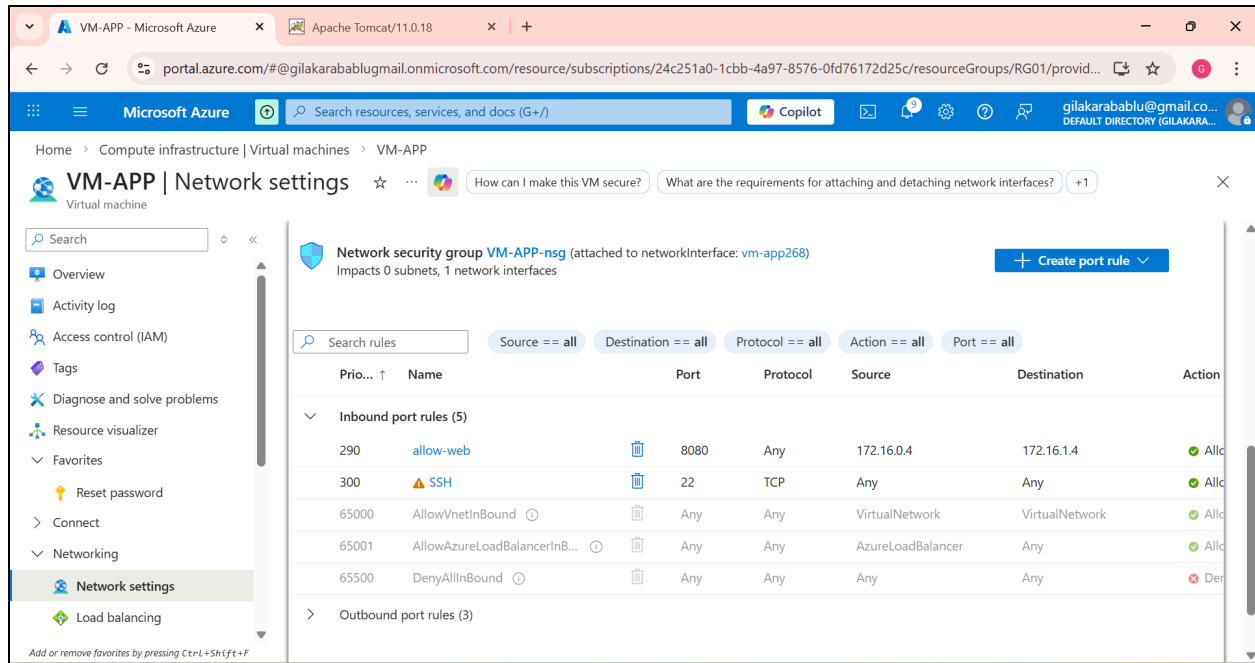


Fig (5) nsg rules for vm-app.

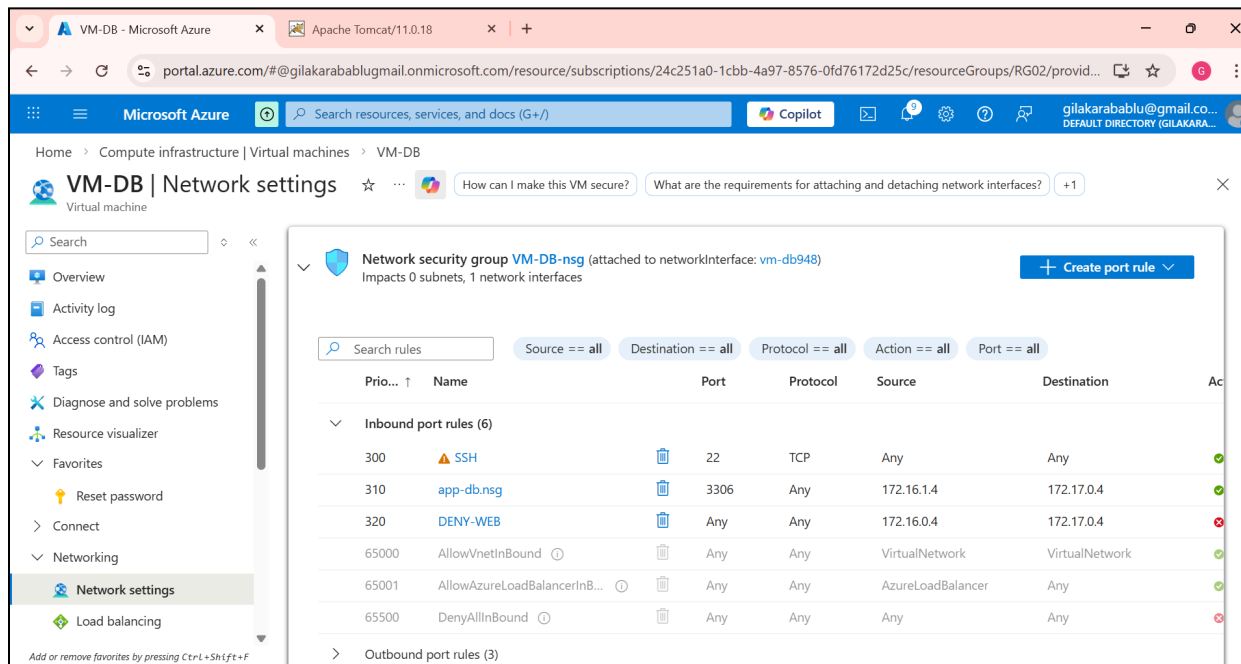


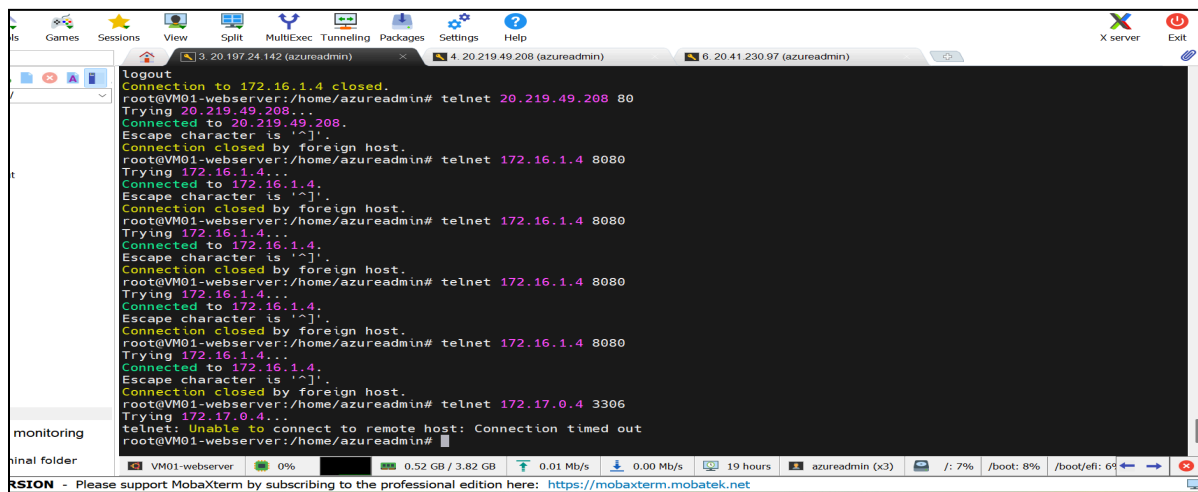
Fig (6) nsg rules for vm-db.

→ now we have configured and installed everything, we need to just connect the 3 tiers.

→ To connect them all first we need to add peering in the virtual network vn01 and vn02, since they are in different regions.

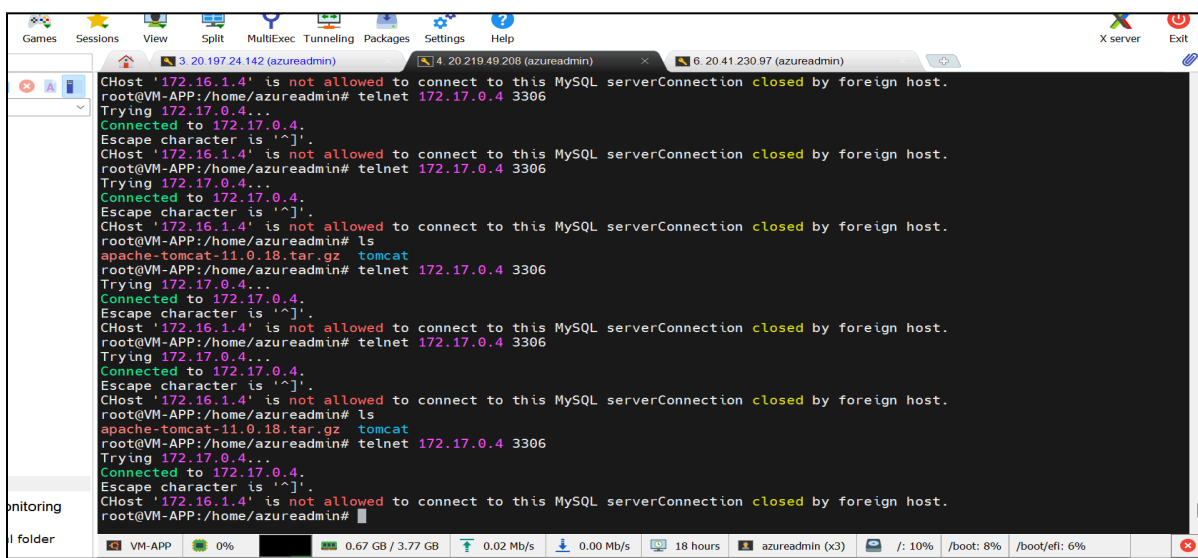
→ Finally to connect them all from one tier to another we will use the telnet command.

- Telnet<pvt-ip address>d port no. (for pvt connection).
- Telnet<pub-ip address>d port no. (for pub connection)



```
logout
Connection to 172.16.1.4 closed.
root@VM01-webserver:/home/azureadmin# telnet 20.219.49.208 80
Trying 20.219.49.208...
Connected to 20.219.49.208.
Escape character is '^]'.
Connection closed by foreign host.
root@VM01-webserver:/home/azureadmin# telnet 172.16.1.4 8080
Trying 172.16.1.4...
Connected to 172.16.1.4.
Escape character is '^]'.
Connection closed by foreign host.
root@VM01-webserver:/home/azureadmin# telnet 172.16.1.4 8080
Trying 172.16.1.4...
Connected to 172.16.1.4.
Escape character is '^]'.
Connection closed by foreign host.
root@VM01-webserver:/home/azureadmin# telnet 172.16.1.4 8080
Trying 172.16.1.4...
Connected to 172.16.1.4.
Escape character is '^]'.
Connection closed by foreign host.
root@VM01-webserver:/home/azureadmin# telnet 172.16.1.4 8080
Trying 172.16.1.4...
Connected to 172.16.1.4.
Escape character is '^]'.
Connection closed by foreign host.
root@VM01-webserver:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
telnet: Unable to connect to remote host: Connection timed out
root@VM01-webserver:/home/azureadmin#
```

Fig (7) successfully connected from web to app.



```
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
Connected to 172.17.0.4.
Escape character is '^]'.
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
Connected to 172.17.0.4.
Escape character is '^]'.
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin# ls
apache-tomcat-11.0.18.tar.gz  tomcat
root@VM-APP:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
Connected to 172.17.0.4.
Escape character is '^]'.
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
Connected to 172.17.0.4.
Escape character is '^]'.
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin# ls
apache-tomcat-11.0.18.tar.gz  tomcat
root@VM-APP:/home/azureadmin# telnet 172.17.0.4 3306
Trying 172.17.0.4...
Connected to 172.17.0.4.
Escape character is '^]'.
CHost '172.16.1.4' is not allowed to connect to this MySQL serverConnection closed by foreign host.
root@VM-APP:/home/azureadmin#
```

Fig (8) successfully connected from app to db.

The screenshot shows a MobaXterm terminal window with the title "20.41.230.97 (azureadmin)". The terminal displays the following commands and output:

```
64 bytes from 172.16.1.4: icmp_seq=22 ttl=64 time=16.2 ms
64 bytes from 172.16.1.4: icmp_seq=23 ttl=64 time=18.1 ms
64 bytes from 172.16.1.4: icmp_seq=24 ttl=64 time=16.3 ms
^C
--- 172.16.1.4 ping statistics ---
24 packets transmitted, 24 received, 0% packet loss, time 23031ms
rtt min/avg/max/mdev = 15.990/17.085/19.957/1.400 ms
root@VM-DB:/home/azureadmin# apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
mysql-server is already the newest version (8.0.44-0ubuntu0.24.04.2).
0 upgraded, 0 newly installed, 0 to remove and 5 not upgraded.
root@VM-DB:/home/azureadmin# nano /etc/mysql/mysql.conf.d/mysqld.cnf
root@VM-DB:/home/azureadmin# systemctl restart mysql
root@VM-DB:/home/azureadmin# systemctl status mysql
● mysql.service - MySQL Community Server
   Loaded: loaded (/usr/lib/systemd/system/mysql.service; enabled; preset: enabled)
   Active: active (running) since Wed 2026-01-28 07:29:01 UTC; 25s ago
 Process: 33427 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, status=0/SUCCESS)
 Main PID: 33437 (mysqld)
   Status: "Server is operational"
    Tasks: 38 (limit: 4675)
  Memory: 365.5M (peak: 380.8M)
     CPU: 610ms
    CGroup: /system.slice/mysql.service
            └─33437 /usr/sbin/mysqld

Jan 28 07:29:00 VM-DB systemd[1]: Starting mysql.service - MySQL Community Server...
Jan 28 07:29:01 VM-DB systemd[1]: Started mysql.service - MySQL Community Server.
root@VM-DB:/home/azureadmin#
```

The terminal window also shows a file explorer on the left with the path "/home/azureadmin/" and a status bar at the bottom indicating system resources and a notice about the unregistered version of MobaXterm.

Fig (9) successfully installed mysql.

→ Therefore the 3-Tier Architecture is successfully implemented.