

DEVOPS with MULTI-CLOUD

Practice Tasks

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TASK-9 : 2-Tier with 2 Load Balancers.

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Objective :-

To design and implement a two-tier architecture in Azure using a public load balancer for the web tier and a private load balancer for the application tier, ensuring secure traffic flow, high availability, and scalable communication between the tiers.

2-Tier with 2 Load Balancers :-

- In the two tier we have a webserver and an application server.
- We will create two Load Balancers i.e one public load balancer and one private load balancer.
- we will attach the public load balancer to the web server and the private load balancer to the application server.

To Implement the 2-Tier :-

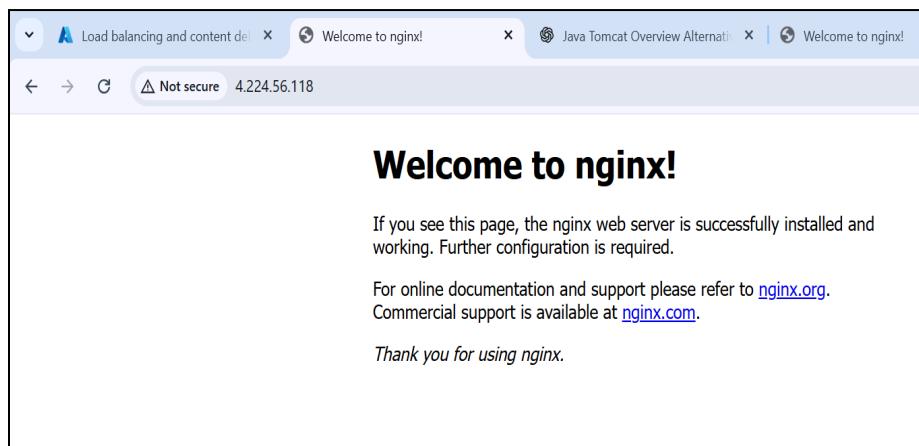
- Create two virtual machines VM01 & VM02 under the resource group RG01 and virtual network VN01 with subnets SN01 & SN02. while creating vm's allow the ports 22 & 80 also install nginx in vm01 and tomcat in vm02.

The screenshot shows the Microsoft Azure portal interface. The left sidebar is titled 'Compute infrastructure' and includes sections for Overview, All resources, Favorites (Virtual machines), Infrastructure, and Virtual machines. The main content area is titled 'Virtual machines' and shows a table with two rows of data. The columns are Name, Subscription, Resource Group, Location, Status, Operating syst..., and Size. The data rows are:

Name	Subscription	Resource Group	Location	Status	Operating syst...	Size
VM01	Azure subscript...	RG01	Central India	Running	Linux	Standard_D2s_v3
VM02	Azure subscript...	RG01	Central India	Running	Linux	Standard_D2s_v3

fig(1) successfully created two virtual machines.

- After installing the nginx in vm01, validate by browsing with the vm's ip addresses (same for tomcat also).
- Now create two load balancers, one public and one private.
- Give the frontend port no as 80 and backend port no 80 for the public load balancer & frontend port as 8080 and backend as 8080 for the private load balancer.



fig(2) nginx is successfully installed.

```

Using CATALINA_TMPDIR: /home/azureadmin/tomcat/temp
Using JRE_HOME:          /usr
Using CLASSPATH:         /home/azureadmin/tomcat/bin/bootstrap.jar:/home/azureadmin/tomcat/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
root@VM02:/home/azureadmin/tomcat# telnet 172.16.0.6 8080
Trying 172.16.0.6...
telnet: Unable to connect to remote host: Connection timed out
root@VM02:/home/azureadmin/tomcat# java -version
openjdk version '21.0.9' 2025-10-21
OpenJDK Runtime Environment (build 21.0.9+10-Ubuntu-124.04)
OpenJDK 64-Bit Server VM (build 21.0.9+10-Ubuntu-124.04, mixed mode, sharing)
root@VM02:/home/azureadmin/tomcat# tomcat -version
Command 'tomcat' not found, did you mean:
  command 'topcat' from deb topcat (4.9-1)
Try: apt install <deb name>
root@VM02:/home/azureadmin/tomcat# ls
bootstrap.jar      ciphers.sh      daemon.sh     migrate.bat   shutdown.sh    tool-wrapper.bat
catalina-tasks.xml commons-daemon-native.tar.gz digest.sh     migrate.sh    startup.bat   tool-wrapper.sh
catalina.bat        commons-daemon.jar digest.sh     setclasspath.bat startup.sh    version.bat
catalina.sh         configtest.bat  makebase.bat  setclasspath.sh tomcat-juli.jar version.sh
ciphers.bat        configtest.sh   makebase.sh   shutdown.bat   tomcat-native.tar.gz
root@VM02:/home/azureadmin/tomcat# ./startup.sh
Using CATALINA_BASE:  /home/azureadmin/tomcat
Using CATALINA_HOME:  /home/azureadmin/tomcat
Using CATALINA_TMPDIR: /home/azureadmin/tomcat/temp
Using JRE_HOME:          /usr
Using CLASSPATH:         /home/azureadmin/tomcat/bin/bootstrap.jar:/home/azureadmin/tomcat/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
root@VM02:/home/azureadmin/tomcat#

```

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Fig (3) tomcat is successfully installed.

→ now create two load balancers, one public and one private.

Name	SKU	Resource Group	Location	Subscription
azlb-pub	Standard	RG01	Central India	Azure subscription 1
azlb-pvt	Standard	RG01	Central India	Azure subscription 1

Fig (4) Two load balancers are created.

→ also add the vm's in the backend of the load balancers.

The screenshot shows the Microsoft Azure portal interface for VM01. The left sidebar has 'Load balancing' selected under 'Networking'. The main content area displays a table for a Network interface / IP configuration named 'vm01566 (primary) / ipconfig1 (primary)'. The table shows one entry: 'azlb-pub' of type 'Load balancer' with a 'Frontend IP address' of '98.70.246.65'. The table has columns for Name, Type, Frontend IP address, and Frontend DNS address.

Name	Type	Frontend IP address	Frontend DNS address
azlb-pub	Load balancer	98.70.246.65	-

Fig (5) vm added for public load balancers.

The screenshot shows the Microsoft Azure portal interface for VM02. The left sidebar has 'Load balancing' selected under 'Networking'. The main content area displays a table for a Network interface / IP configuration named 'vm02891 (primary) / ipconfig1 (primary)'. The table shows one entry: 'azlb-pvt' of type 'Load balancer' with a 'Frontend IP address' of '172.16.0.6'. The table has columns for Name, Type, Frontend IP address, and Frontend DNS address.

Name	Type	Frontend IP address	Frontend DNS address
azlb-pvt	Load balancer	172.16.0.6	-

Fig (6) vm is added for the private load balancer.

→ Now let us configure the nsg rules and connections.

→ These are from another 2-tier :

The screenshot shows the Microsoft Azure portal interface for a virtual machine named VM01. The left sidebar navigation includes options like Diagnose and solve problems, Monitor, Resource visualizer, Favorites (with Reset password), Connect, Networking (selected), Network settings (selected), Load balancing, Application security groups, Network manager, and Settings. The main content area is titled "VM01 | Network settings" and shows the "vm01964 (primary) / ipconfig1 (primary)" interface. Under the "Essentials" section, it lists the Network interface (vm01964), Virtual network / subnet (VN01 / SNO1), Public IP address (20.197.24.234), Private IP address (172.16.0.4), and Admin security rules (0). It also shows Load balancers (1), Application security groups (0), Network security group (VM01-nsg), Accelerated networking (Enabled), and Effective security rules (0).

The screenshot continues from the previous one, showing the "Network security group VM01-nsg" attached to the network interface vm01964. The interface impacts 0 subnets and 1 network interface. The "Inbound port rules (5)" table is displayed, listing the following rules:

Prio...	Name	Port	Protocol	Source	Destination	Action
300	SSH	22	TCP	Any	Any	Allow
310	allow-http	80	Any	Any	172.16.0.4	Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow
65001	AllowAzureLoadBalancerInB...	Any	Any	AzureLoadBalancer	Any	Allow
65500	DenyAllInBound	Any	Any	Any	Any	Deny

→ These are the nsg rules for web
Source : any , destination : web private ip. ,port : 80
And 22 is for login to the machine.

→ these are the nsg rules for the app.

Source : web pvt-ip, destination : pvt-lb ip, port : 8080.

And 22 is for login to the machine.

→ Now we need to connect from the web to the app using the telnet command.

```

4.224.56.118 (azureadmin)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect... 2.4.224.56.118 (azureadmin) 3.4.224.56.77 (azureadmin)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
root@VM01:/home/azureadmin# apt install nginx
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nginx is already the newest version (1.24.0-0ubuntu7.5).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
root@VM01:/home/azureadmin# telnet 172.16.0.6 80
Trying 172.16.0.6...
Connected to 172.16.0.6.
Escape character is ']'.
Connection closed by foreign host.
root@VM01:/home/azureadmin# telnet 172.16.0.6 8080
Trying 172.16.0.6...
telnet: Unable to connect to remote host: Connection timed out
root@VM01:/home/azureadmin# telnet 172.16.0.6 8080
Trying 172.16.0.6...
telnet: Unable to connect to remote host: Connection timed out
root@VM01:/home/azureadmin# telnet 172.16.0.6 8080
Trying 172.16.0.6...
Connected to 172.16.0.6.
Escape character is ']'.
Connection closed by foreign host.
root@VM01:/home/azureadmin# telnet 172.16.0.6 8080
Trying 172.16.0.6...
Connected to 172.16.0.6.
Escape character is ']'.

```

Remote monitoring Follow terminal folder

VM01 0% 0.51 GB / 7.75 GB 0.02 Mb/s 0.00 Mb/s 182 min azureadmin (x2) /: 7% /boot: 8% /boot/efi: 6% /mnt: 1

fig(11) successfully connected to the app from the web using telnet command.

→ Now the connection is successfully established and the traffic is flowing from the web to the private load balancer and next to the app.

◆ Successfully completed the 2 tier Architecture.