**Project-2**

**Title:** Implementing a 2-Tier Architecture (Web Server & App Server) with Private and Public Load Balancing.

Block Diagram:

VM-02

VM-02

VM-01

VM-01

APP Servers

Web Servers

Private Load balancer

Public Load balancer

Inbound rules

Source: Any

Destination: Web-VM

Destination port: 80 (HTTP)

Action: Allow

Inbound rules

Source: Web-VM

Destination: App-VM

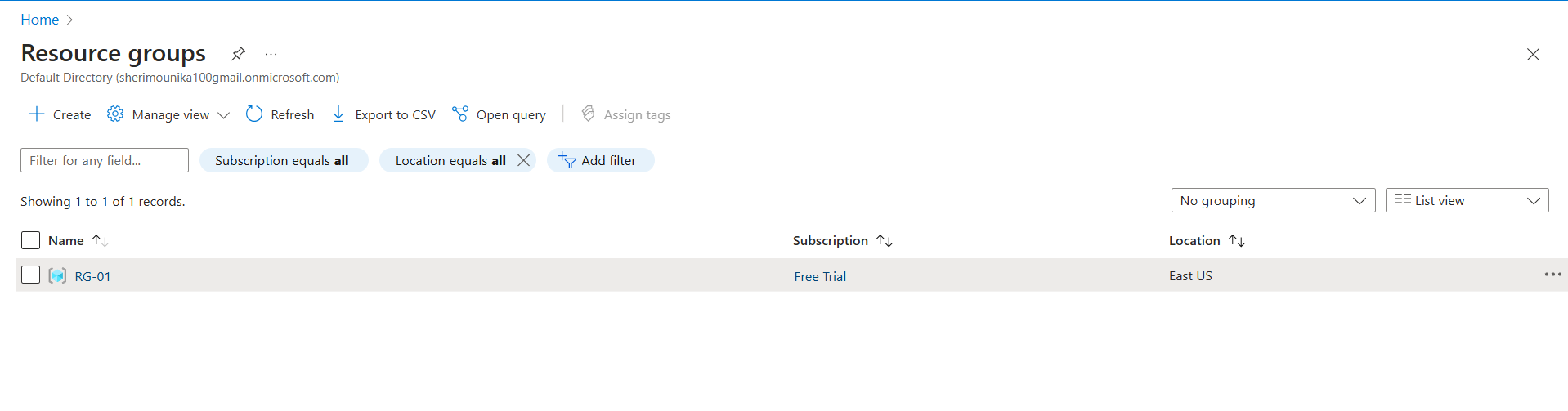
Destination port: 8080 (tomcat)

Action: Allow

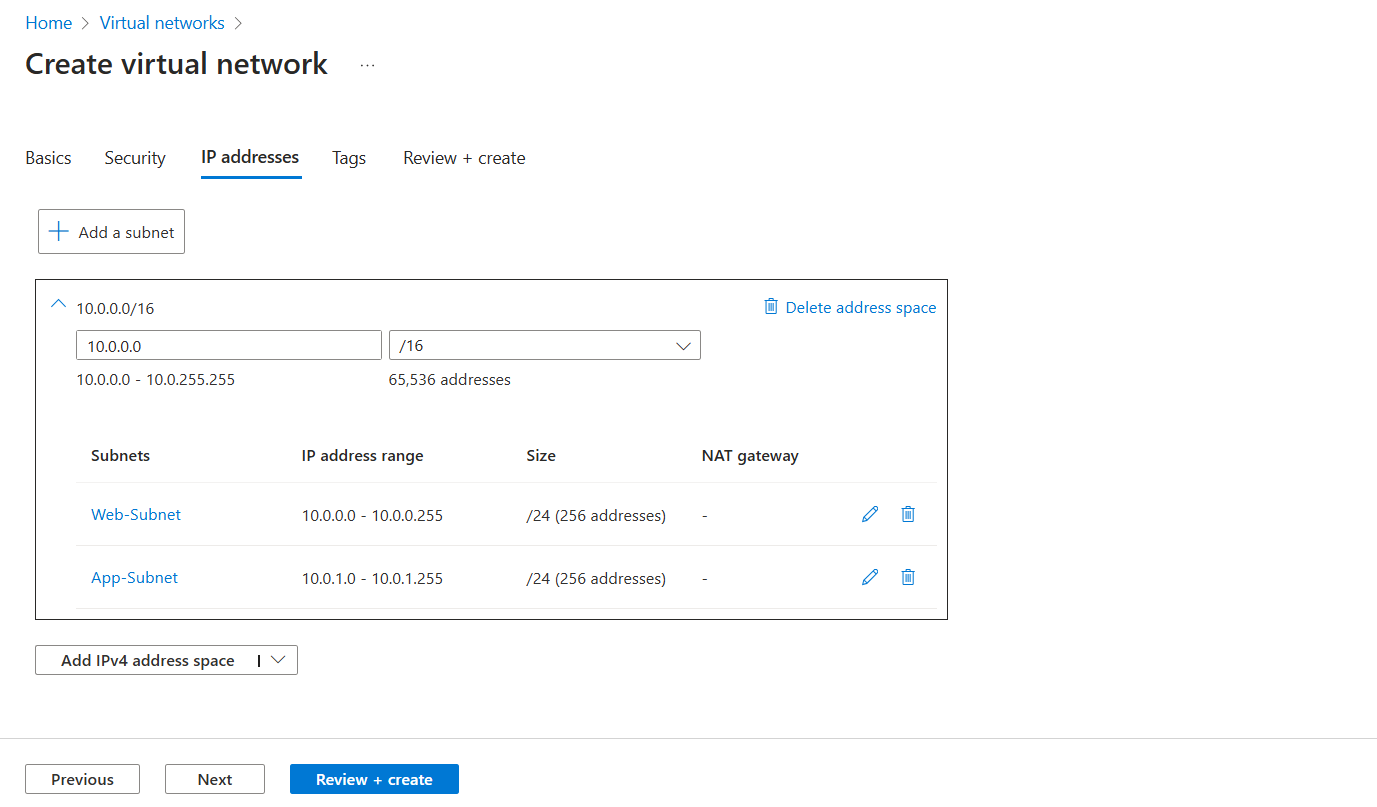
**Fig:** Two tier architecture with public and private load balancers.

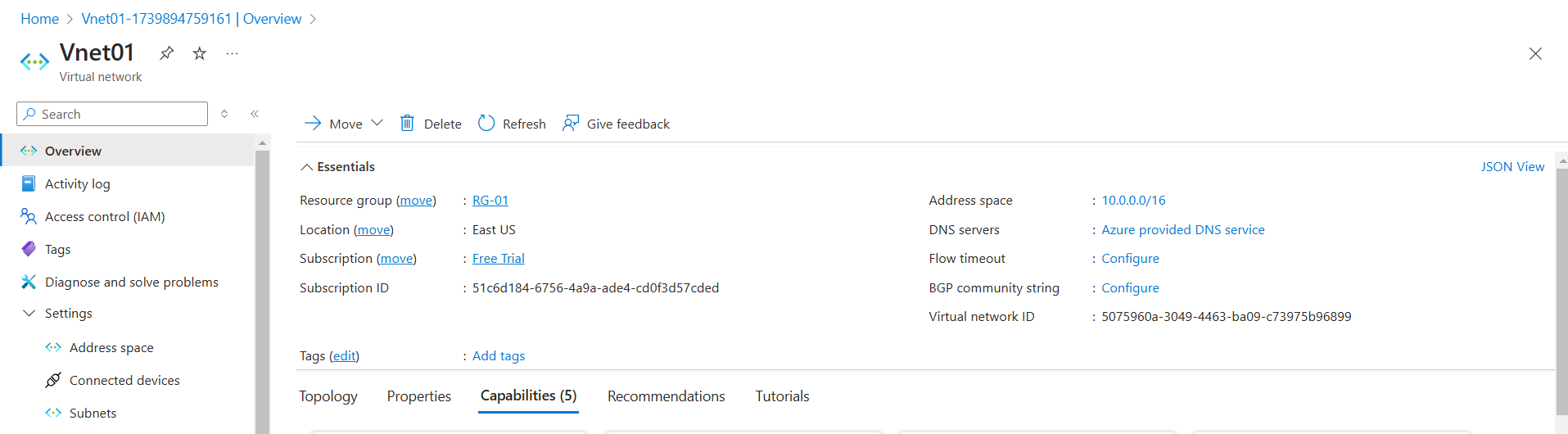
Now let’s perform it practically

**Step1:** Create a resource group (RG-01).



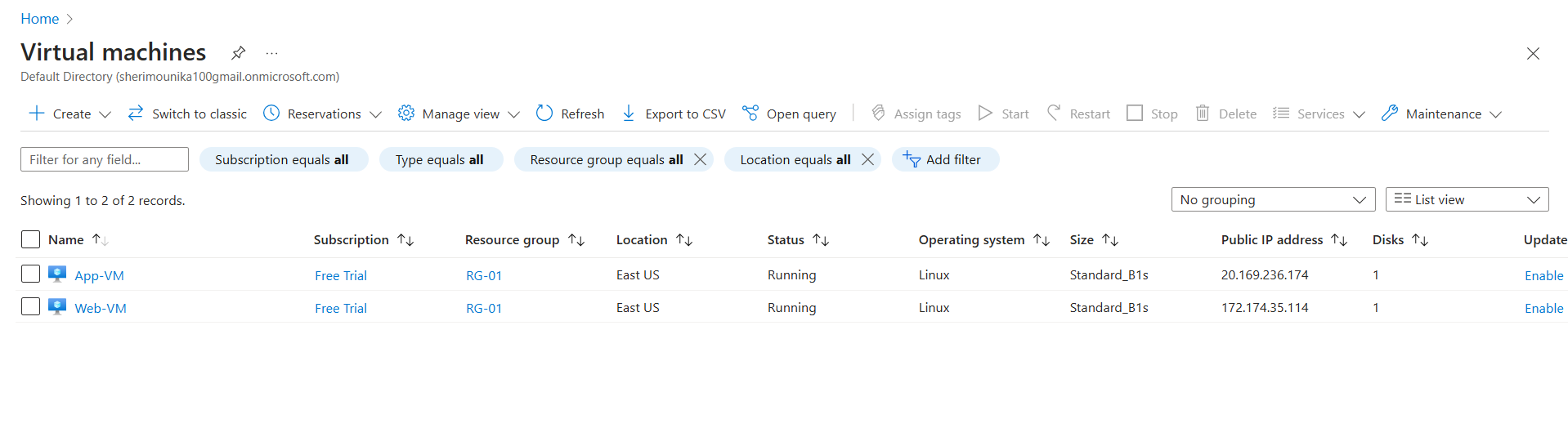
**Step2:** Create virtual network (Vnet01) with two Subnets (Web-Subnet & App-Subnet) in it.



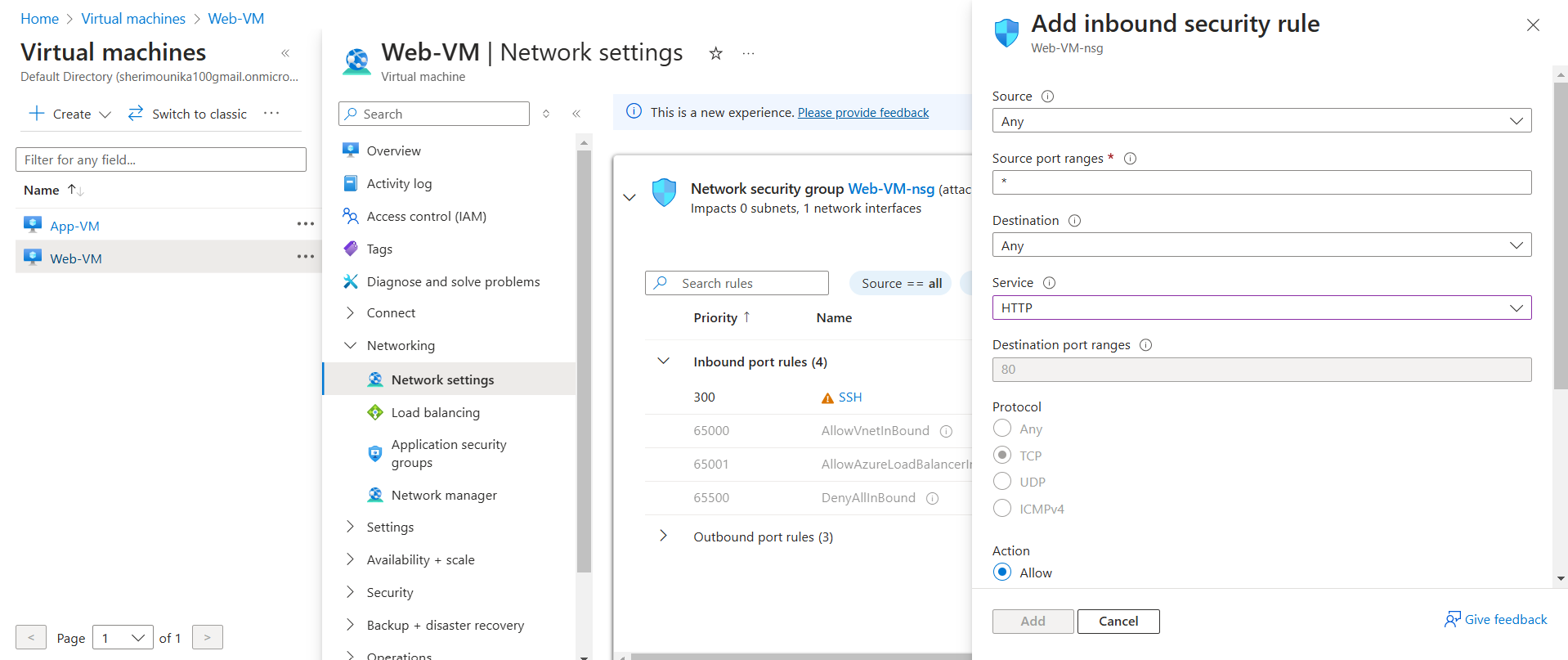


**Fig:** Virtual Network is created with two subnets

**Step3:** Create two Linux virtual machines (Web-VM & App-VM) in corresponded subnets. (Web-VM in Web-Subnet & App-VM in App- Subnet).

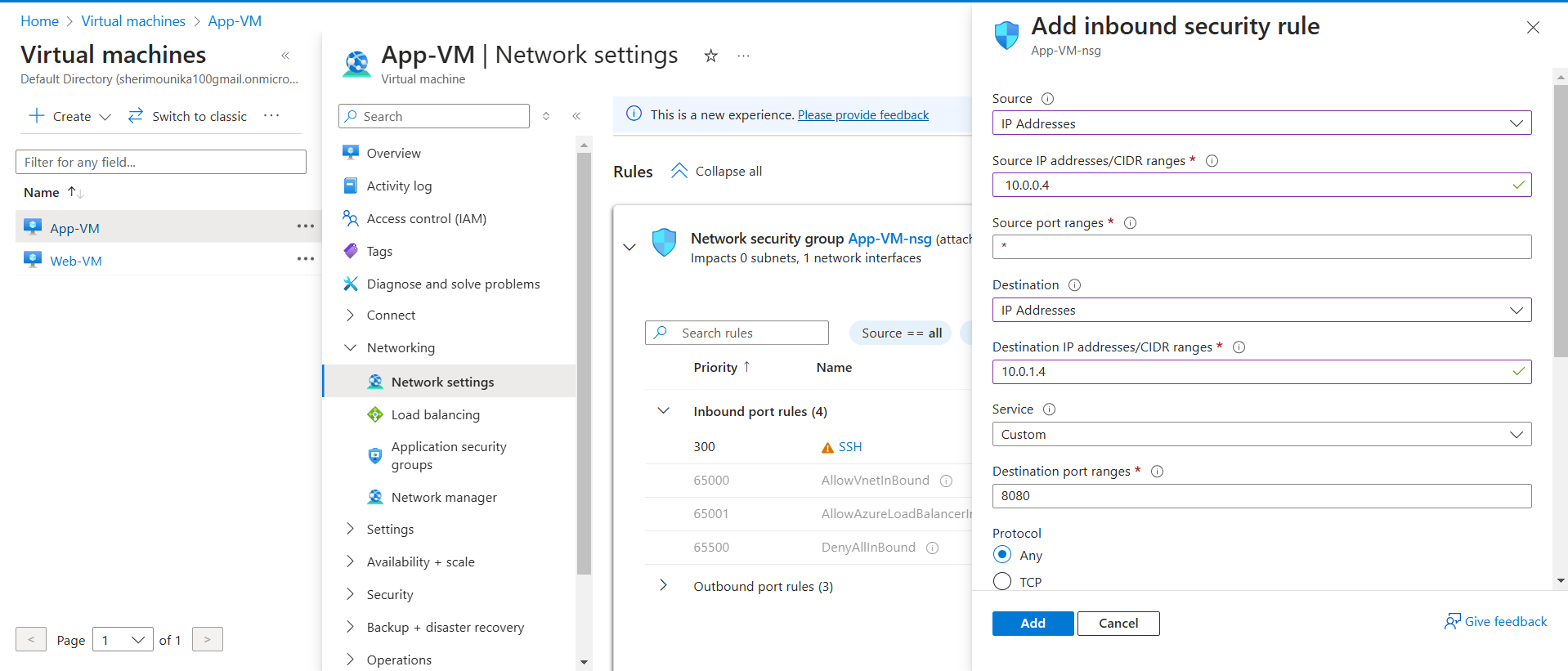


**Step4:** Now write the NSG rules for each VM individually.



**Fig:** Adding NSG rules to the Web-VM.

The above NSG rule is describes that source=any mean everyone in world can access the Web-VM using 80 port (HTTP). So that we can easily browse our website from anywhere.



**Fig:** Adding of NSG rules to the App-VM.

The above NSG rules describes that source=10.0.0.4 (Web-VM private IP) Web-VM can only access (connect) the destination=10.0.1.4 (App-VM private IP) App-VM, over the 8080 port (Tomcat runs on this port number), on other sources are allowed to access (connect) the App-VM.

**Step5:** Install the tomcat in APP-VM.

In order to install the tomcat in the App-VM we have to follow some steps.

Step-1🡺login to the Web-VM.

Step-2🡺check whether we are connecting to App-VM from Web-VM using “ping <IP>” command.

Step-3🡺if we connected to the App-VM from Web-VM, then login into the APP-VM using SSH and install tomcat in it.

Installing of Tomcat and adding manger role to the normal user:

1. Login into App-VM

ssh username@public IP

1. **Set up the environment for tomcat:** install the JDK (java development kit).You need the Java Development Kit (JDK) to install and run Tomcat because Tomcat is a Java-based application.

**[**Sudo install default-jdk].

1. Check whether jdk installed or not:

[java -version]

1. Install tomcat:

Sudo wget https://dlcdn.apache.org/tomcat/tomcat-11/v11.0.2/bin/apache-tomcat-11.0.2.tar.gz

1. Extract the tomcat tar file:

[sudo tar -xzf < apache-tomcat-10.1.33.tar.gz>]

1. Create the tomcat directory inside “opt” folder.

Cd /opt/ 🡺press enter

Mkdir tomcat 🡺press enter

1. Move the extracted folder of tomcat into the path of /opt/tomcat:

Cd ..

[Mv apache-tomcat-10.1.33/\* /opt/tomcat/].

1. Running tomcat as root is not recommended due to security risk so add the normal user:

[sudo useradd -m -d /opt/tomcat -U -s /bin/false tomcat] it adds user called tomcat.

1. Create the manager for tomcat in order access tomcat server:

Cd /opt/tomcat/conf/ 🡺press enter

Vi tomcat-users.xml 🡺press enter

<role rolename="manager-gui"/>

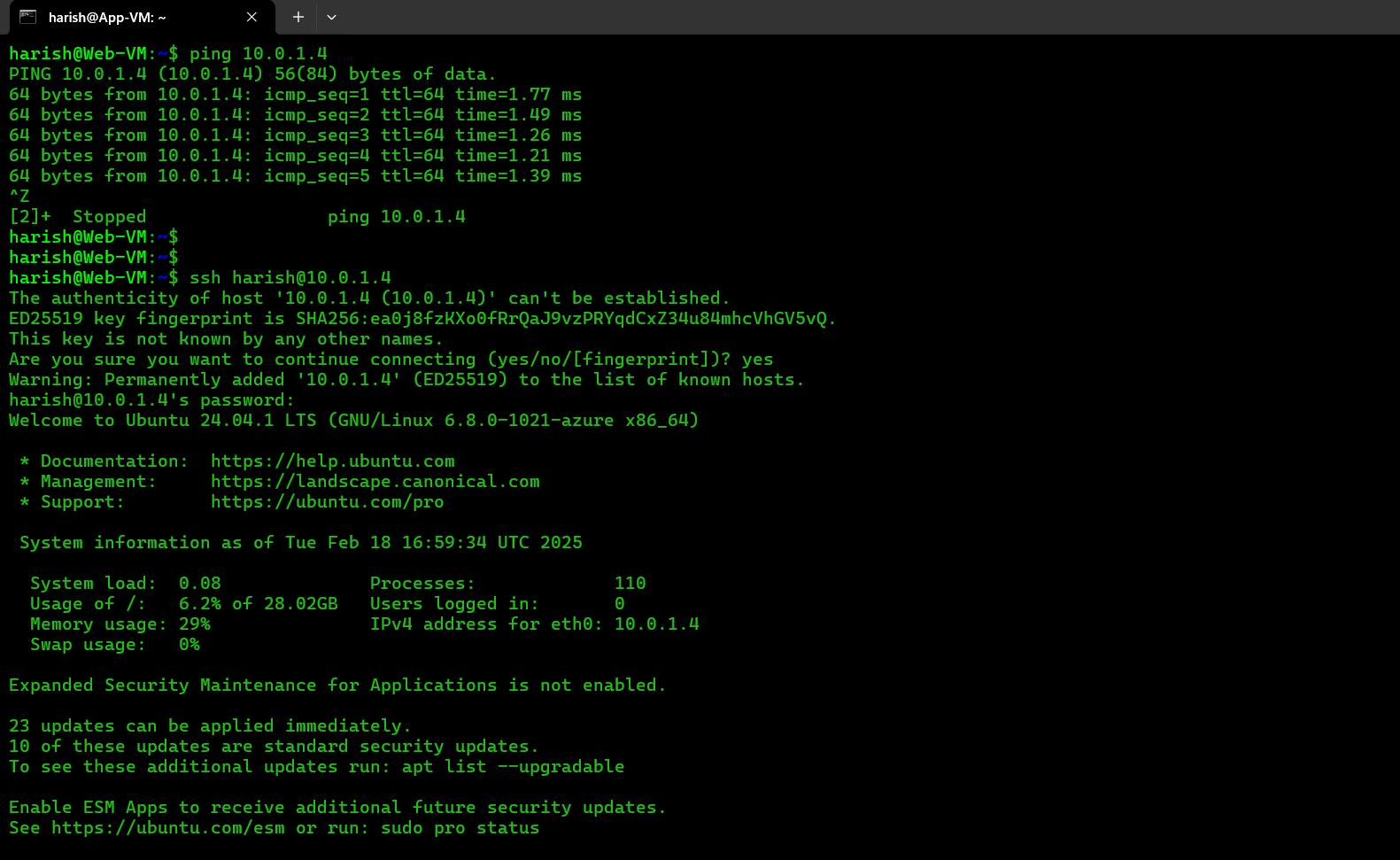
<user username="harish" password="Harish@12345" roles="manager-gui"/>

Then exit from the “vi” editor.

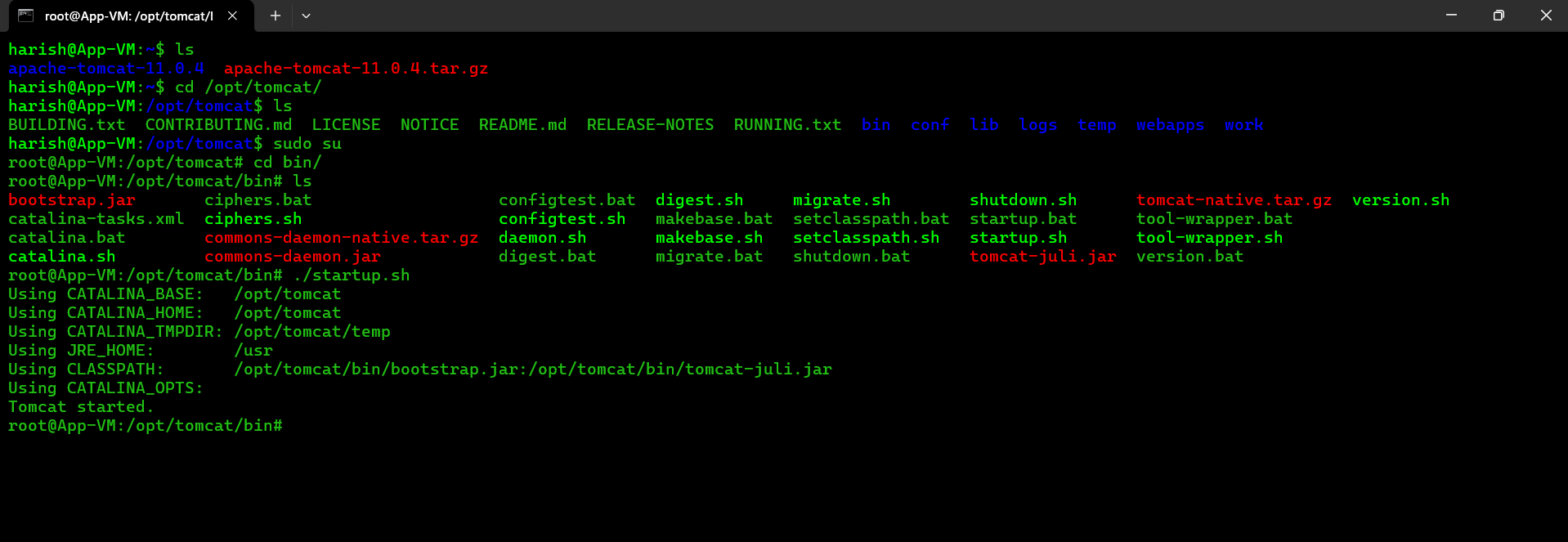
1. Now start the tomcat:

Cd /opt/tomcat/bin/ 🡺press enter

./startup.sh 🡺press enter.

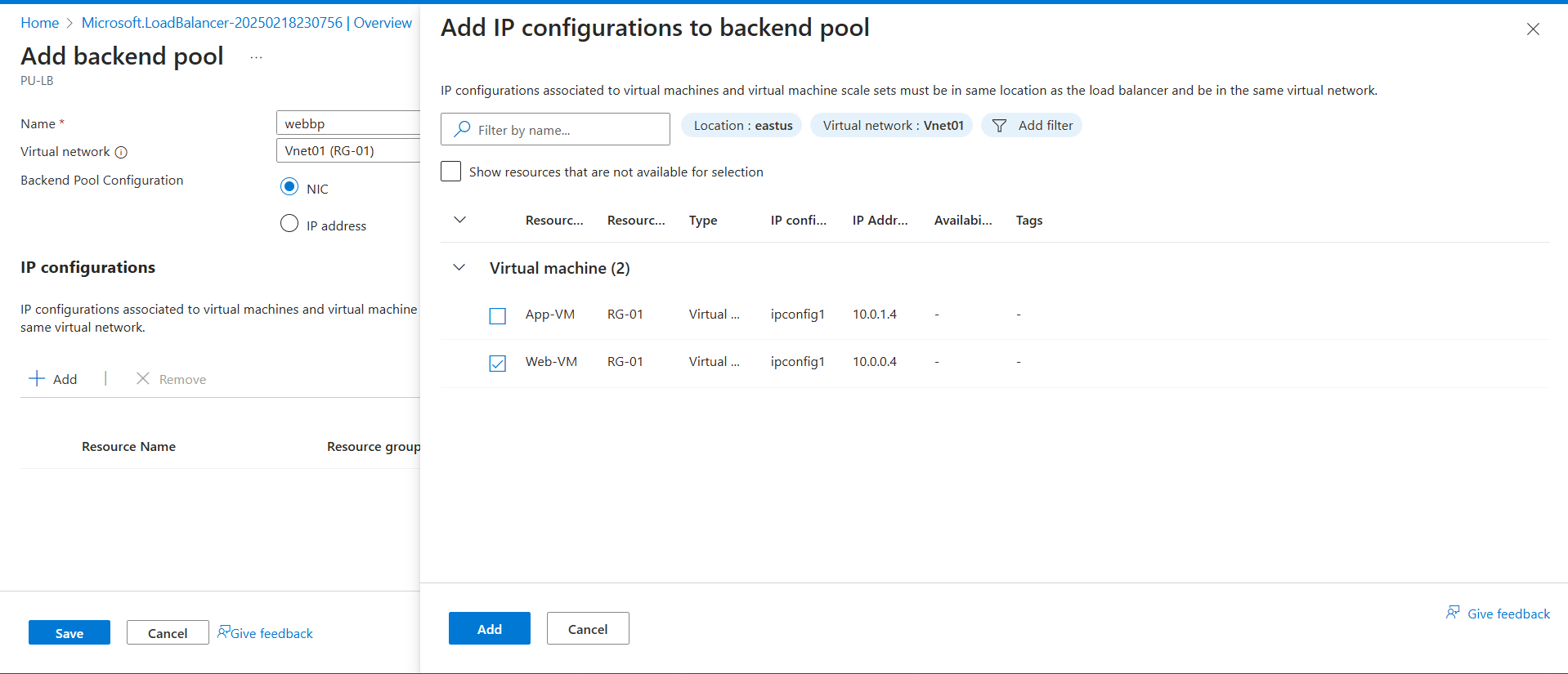
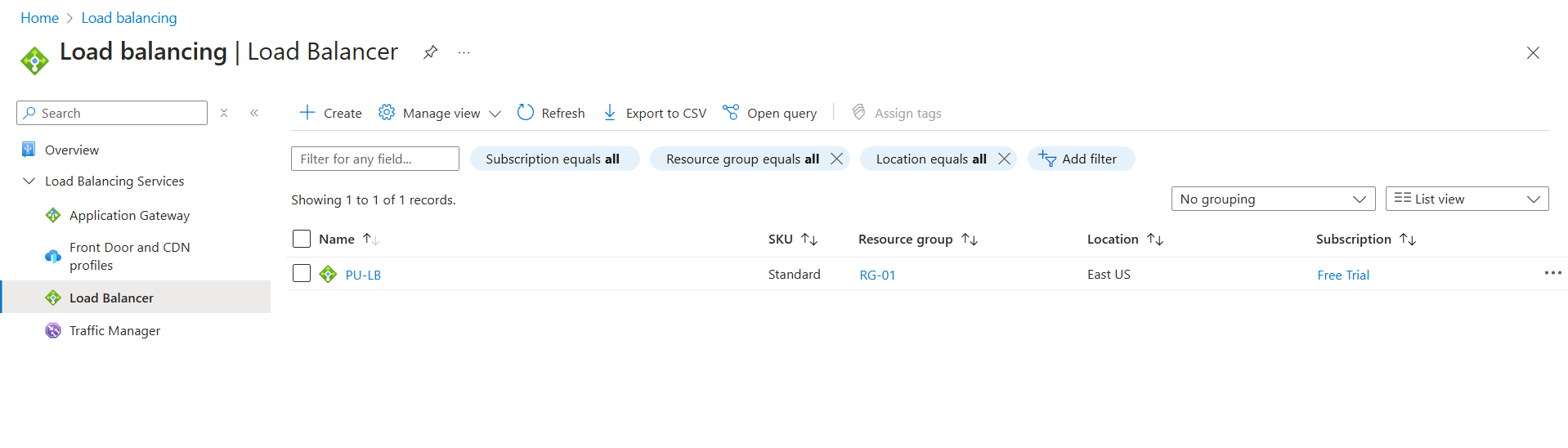


**Fig:** Connecting to the App-VM by login to the Web-VM is done successfully.

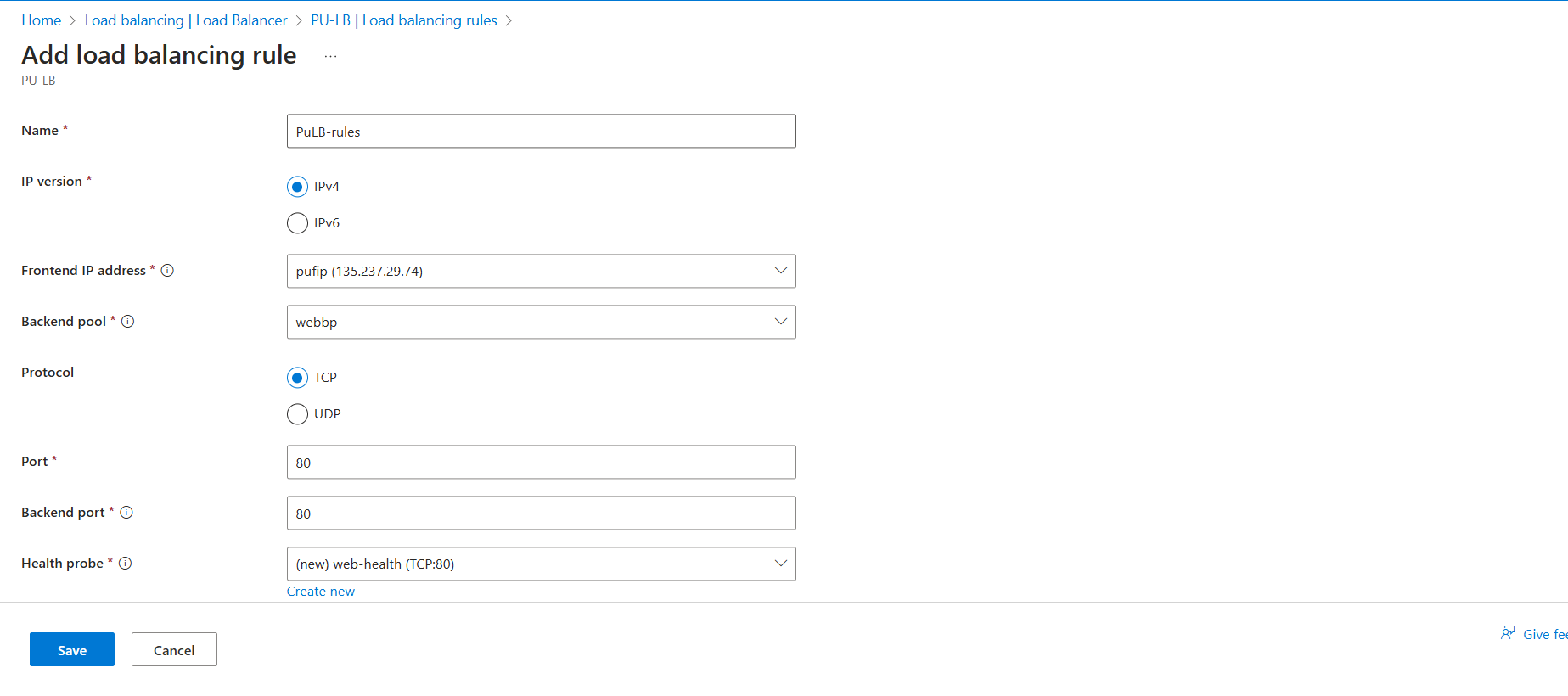


**Fig:** Tomcat is installed in the App-VM.

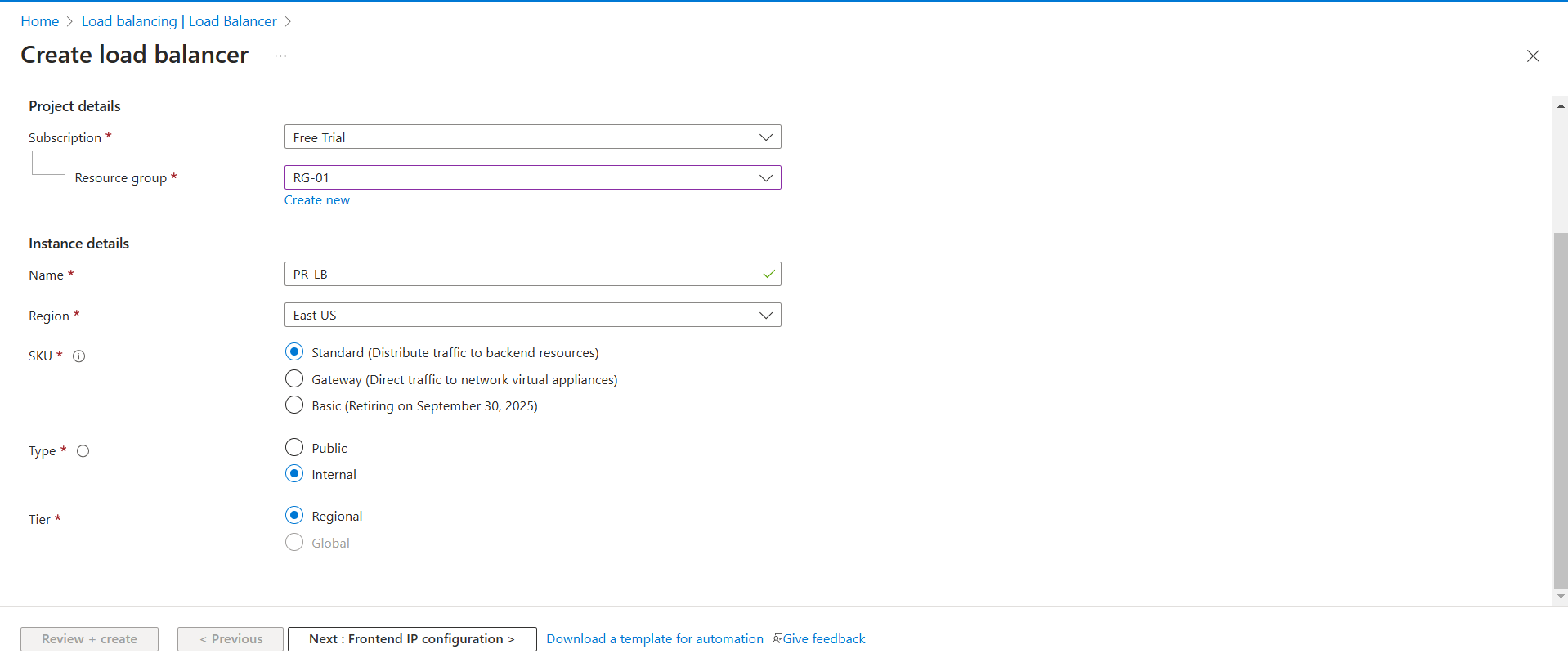
**Step6:** Create a public Load Balancer (PU-LB) and add Web-VM in its backend pool.

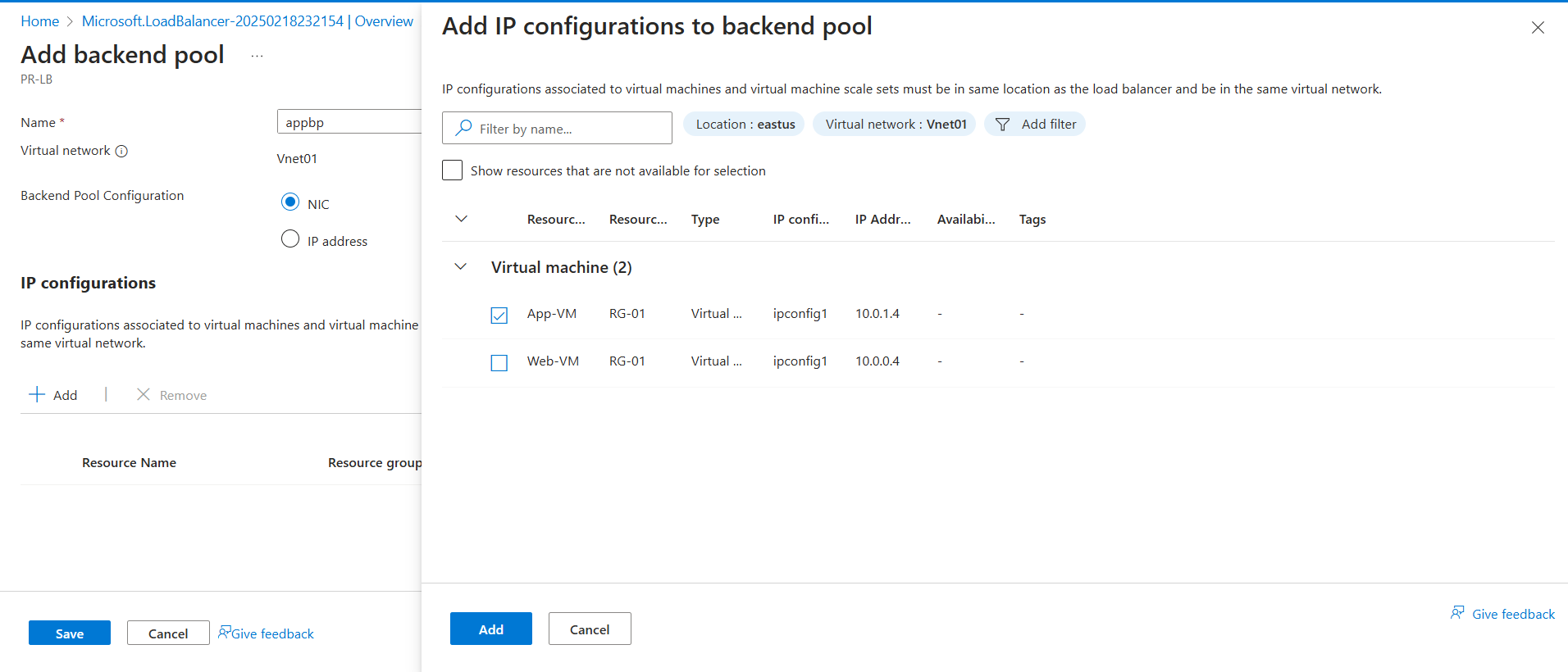
******Fig:** Public Load Balancer

**Fig:** Adding of Web-VM to the backend pool of public Load balancer (PU-LB).

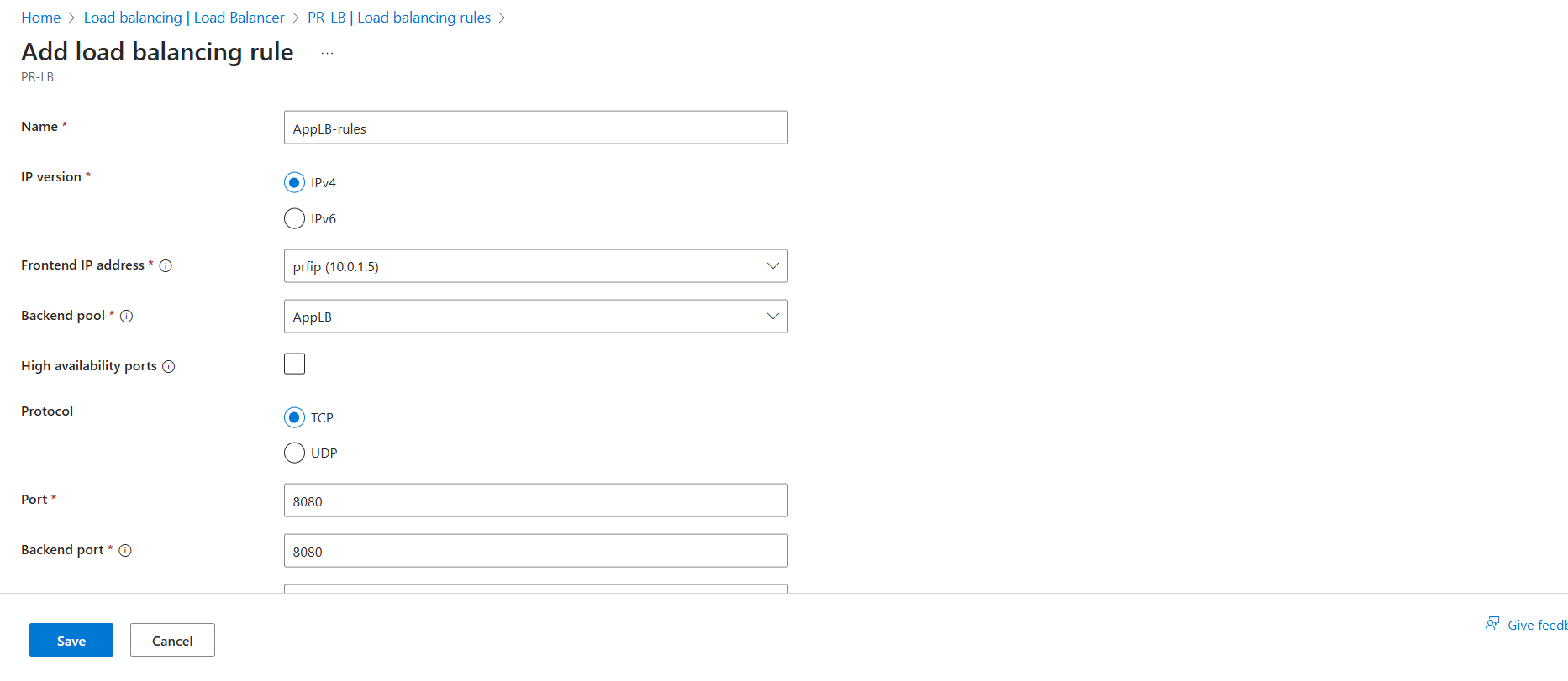


**Fig:** Adding the public load balancer rules.

**Step7:** Create a private Load balancer and add App-VM in its backend pool.

**Fig:** Adding App-VM in the backend pool of private Load balancer.

**Fig:** Adding of APP-VM to the backend pool of private load balancer.



**Fig:** Adding the private load balancer rules.

The block diagram of above performed task is given as below.

App-VM

Web-VM

App-Subnet

Web-Subnet

Vnet01

Private

Load balancer

Public

Load balancer

**Fig:** 2-Tier Architecture with private and public load balancer.