Cloud and Virtualization Concepts

Lab 4: Virtual Machine Networking

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Contents

Introduction

In this lab, *Cloud and Virtualization Concepts Lab 4: Virtual Machine Networking,* we will look at the network capabilities of *Vmware Workstation*. We will explore how to use and set up network types similar to those found in many real-world scenarios. The network capabilities in *VMware Workstation* are beneficial for the development and testing of software and applications, such as limiting bandwidth or causing packet loss scenarios.

Objectives

- Identify different network types available in the Workstation environment
- Show how to set up a new VMNET
- Setup NAT rules and DHCP
- Show LAN segments and adapter settings (bandwidth and packet loss)

Lab Topology

Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

| Virtual Machine	IP Address	Account (if needed)	Password (if needed)
Workstation	172.16.29.128	sysadmin	Train1ng$

1 Explore Network Types

In this task, you will explore the types of networks that can be created for virtual machines to access as well as how to add and remove the networks.
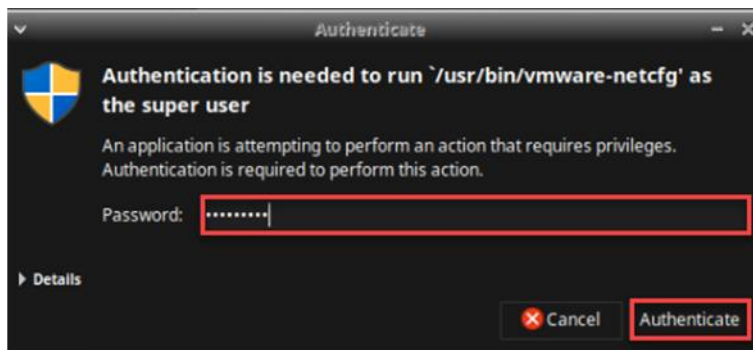
1. Open the *VMware Workstation* application. On the desktop, double-click the **VMware Workstation** icon.

2. Observe the network types available for the *Test Lubuntu* VM. In *VMware Workstation*, select **Edit > Virtual Network Editor**.
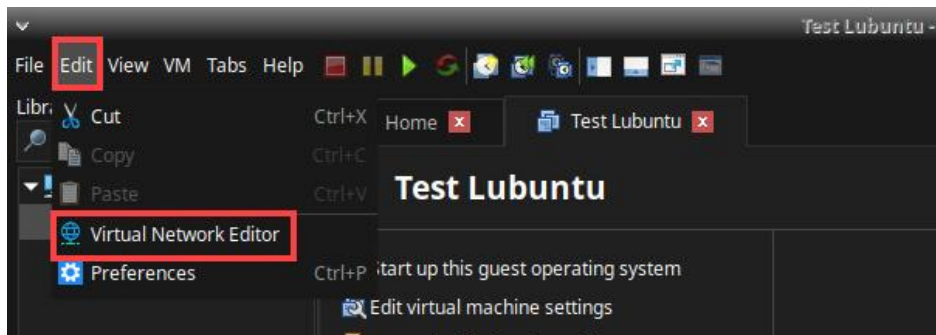
3. Type the password `Train1ng$` when prompted and click **Authenticate**.

4. In *the Virtual Network Editor* window, click the **vmnet0** network from the top pane to observe the network type settings. Notice that *Bridged* is configured as the network type. A bridged network allows the virtual machine to use physical network adapters on the host system to connect a network. Click the **Automatic Settings** button.
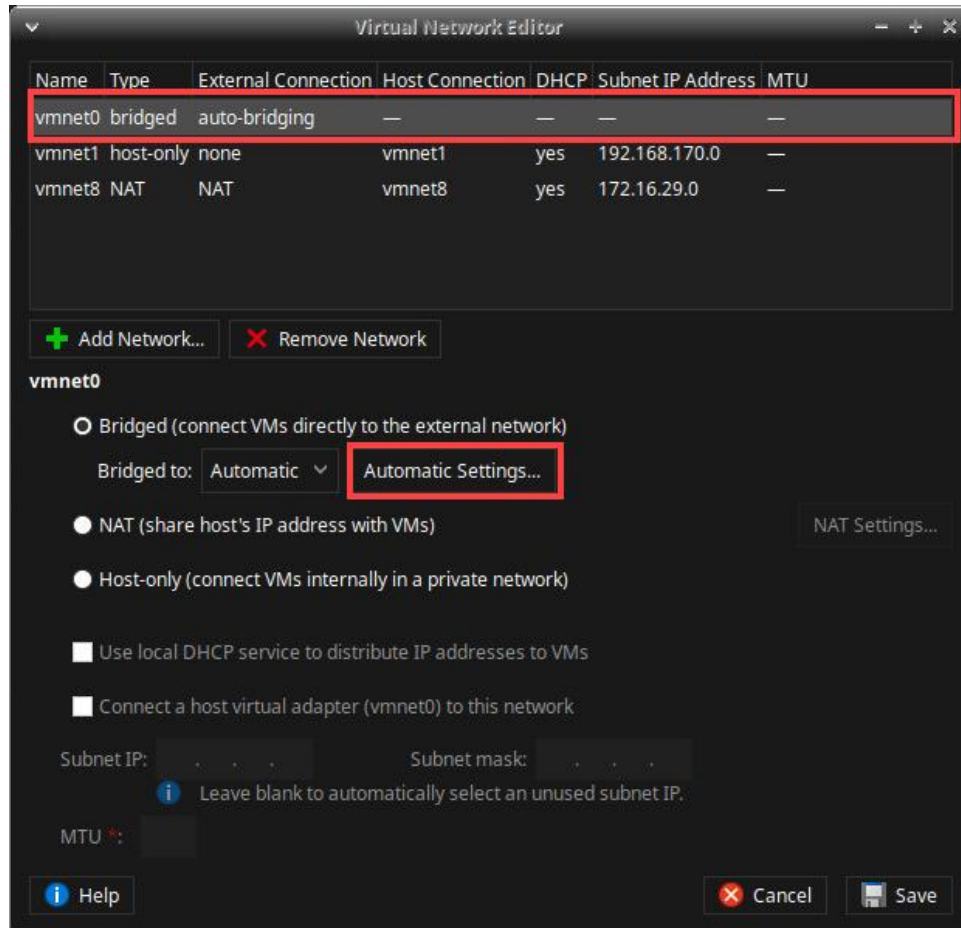

5. Notice the host network adapter *ens160*. This is the physical interface of the host system. *VMware Workstation* provides a bridge from the virtual network interface *vmnet0* to the interface of the host system *ens160*. Click **Close**.
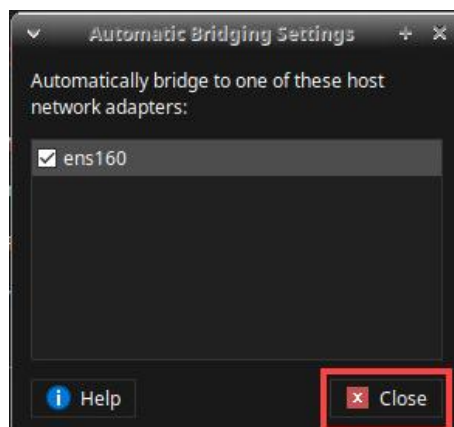
> The term network adapter and network interface card (NIC) are used interchangeably in Cloud and Virtualization Concepts.

6. Back on the *Virtual Network Editor* window, click the **vmnet1** network to observe the configured *Host-Only* network type settings. Take note of the option to use a DHCP device to distribute IP addresses to the VMs.
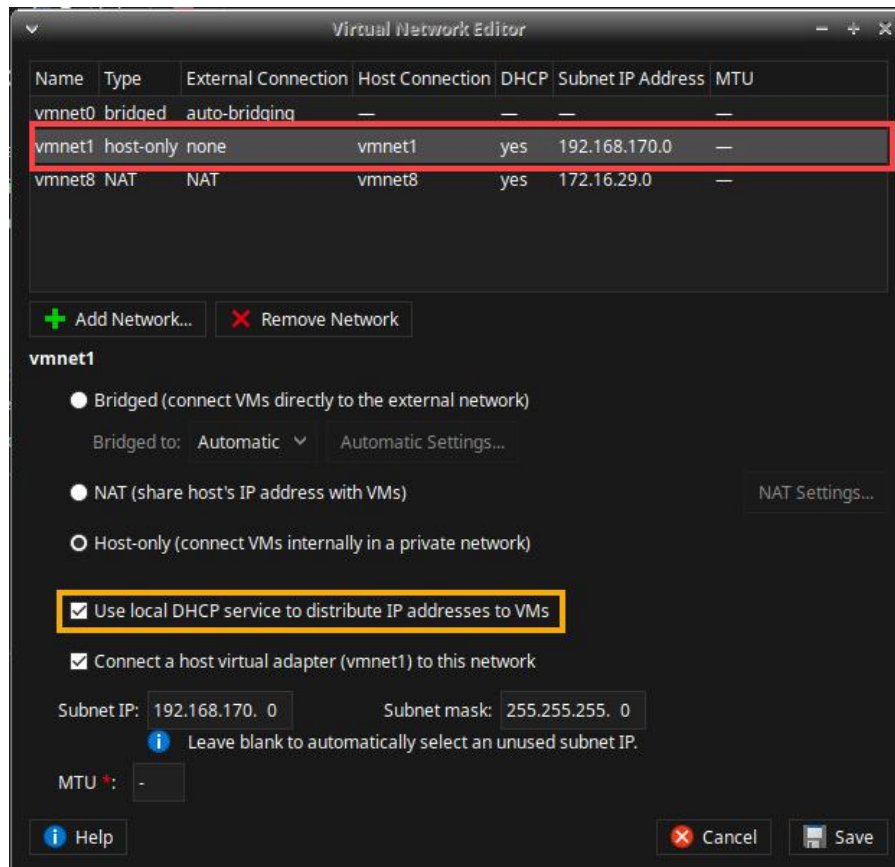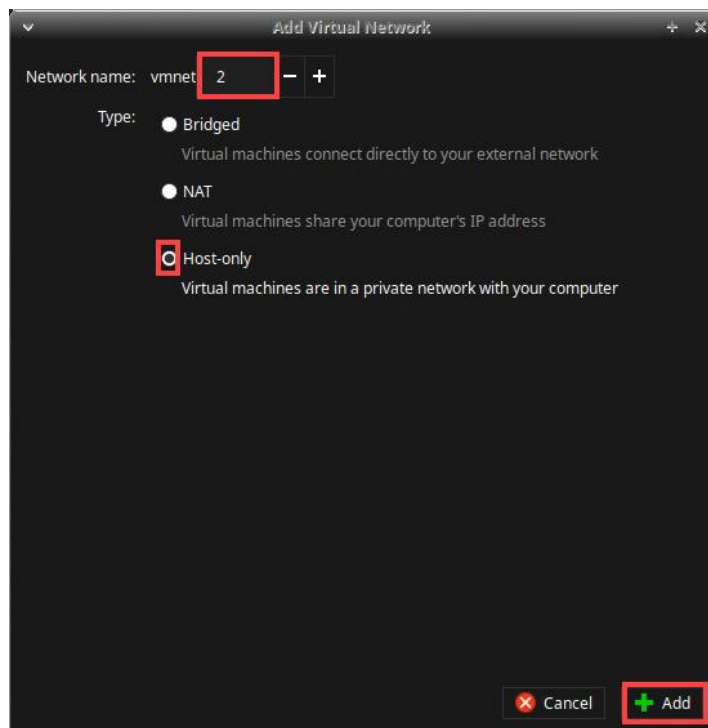
7. In the *Virtual Network Editor* window, click the **vmnet8** network to observe the configured *NAT* network type settings. The option to use a DHCP device to distribute IP addresses to the VMs is also selected for the NAT network. Take note of the IP address used for the VM *Subnet IP*.
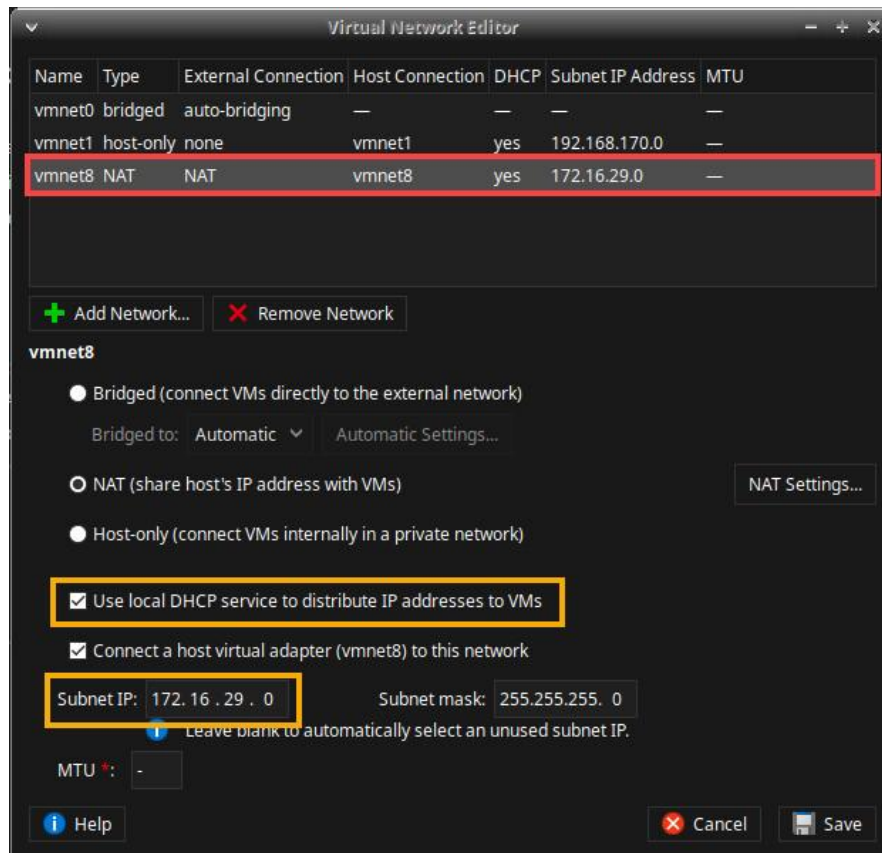
8. Add a new virtual machine network (*vmnet*). In the *Virtual Network Editor* window, click the **Add Network** button.
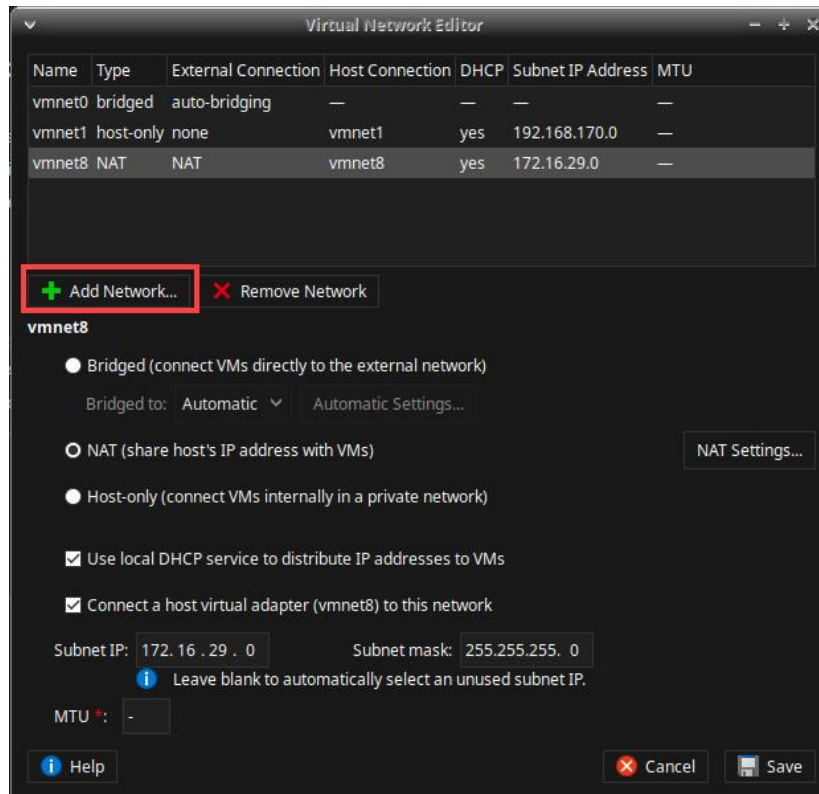

9. Name the network **vmnet2** by clicking the arrows in the *Network name* field and selecting the number **2**. Configure the network type as host-only by selecting the **Host-only** radio button. Click **Add**.
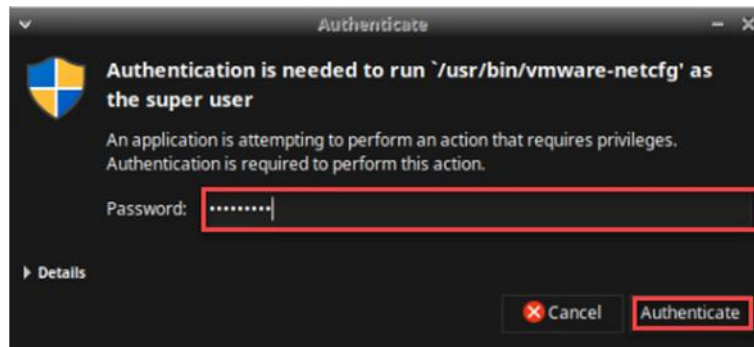
10. In the *Virtual Network Editor*, select the newly created **vmnet2** network to highlight it and then select the radio button for **NAT (share host's IP address with VMs)**. Click **Save**.
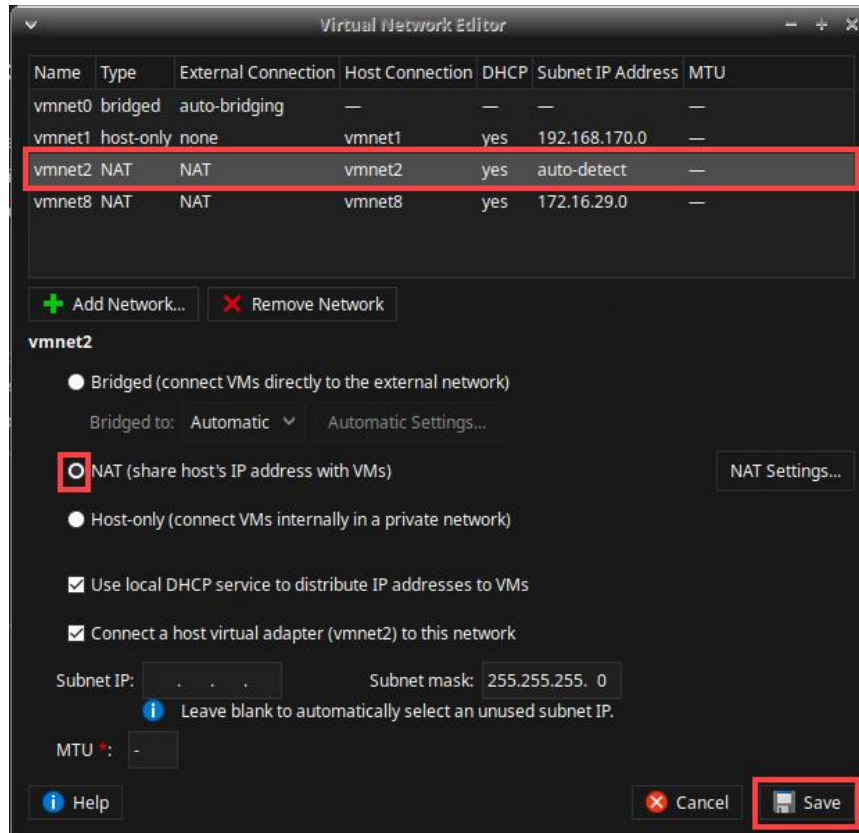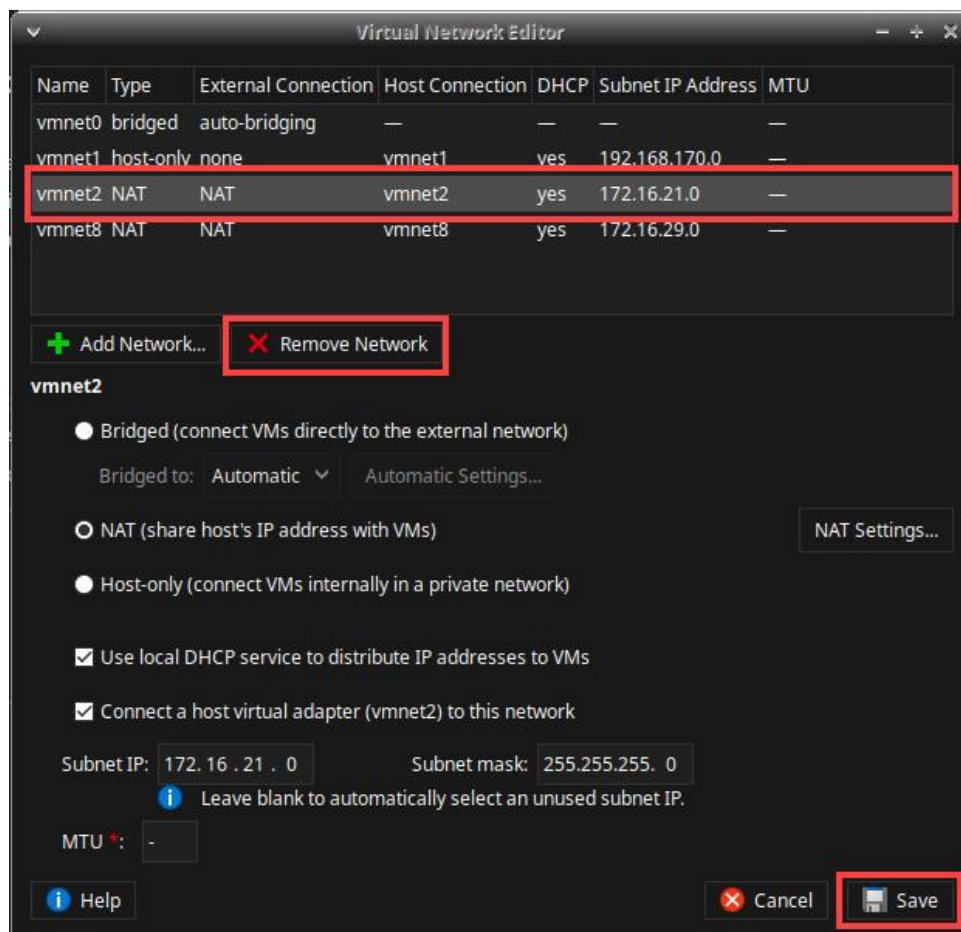

11. Navigate to **Edit > Virtual Network Editor** to verify the new settings.
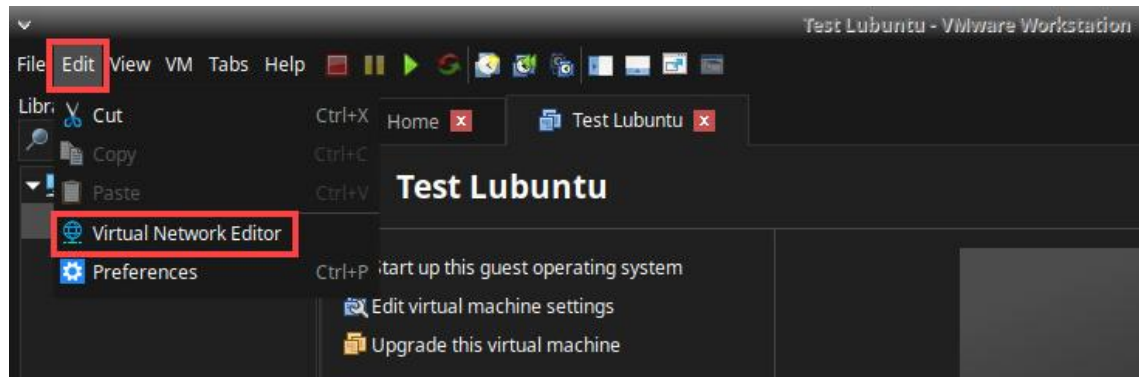
12. Type the password `Train1ng$` when prompted and click **Authenticate**.

13. In the *Virtual Network Editor*, remove the new virtual network. Select the **vmnet2** network and click **Remove Network**. Once removed, click **Save**.


14. Leave the *VMware Workstation* application window open to continue with the next task.

2   Setting up NAT Rules

In this task, you will set up rules for a *Network Address Translation*. A virtual network configured with NAT can be useful for testing and development purposes. For example, NAT might be required by a web developer who is using a virtual machine as a test server on Workstation. With NAT, the developer can access the web site that he or she has been building on a virtual machine from within Workstation.
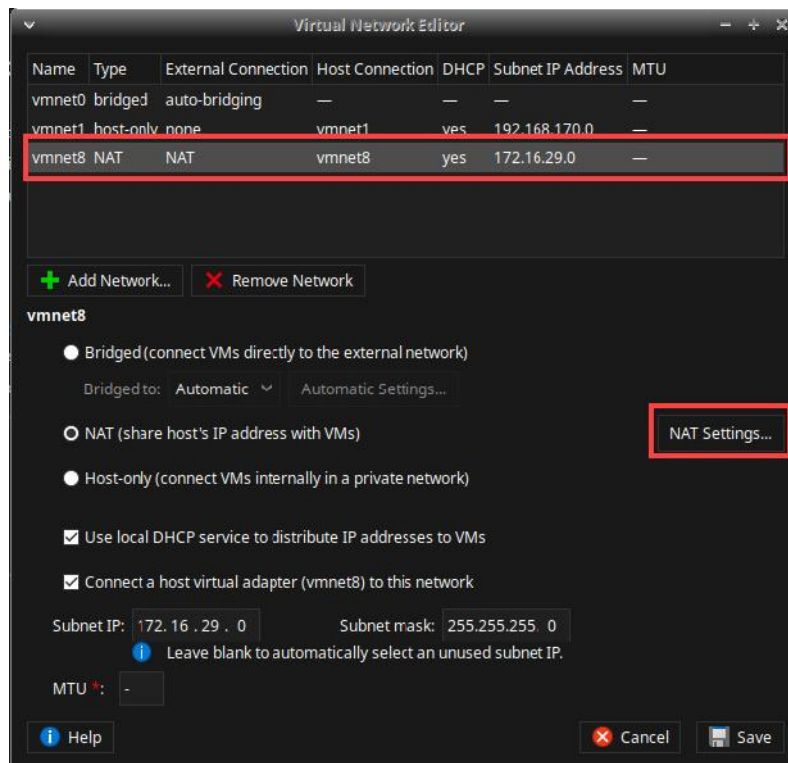
1. On the *VMware Workstation* application window, navigate to **Edit > Virtual Network Editor**.
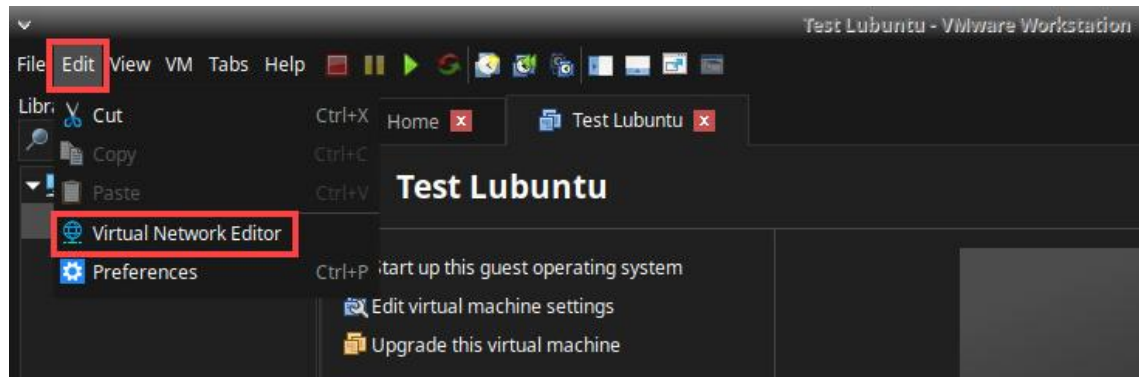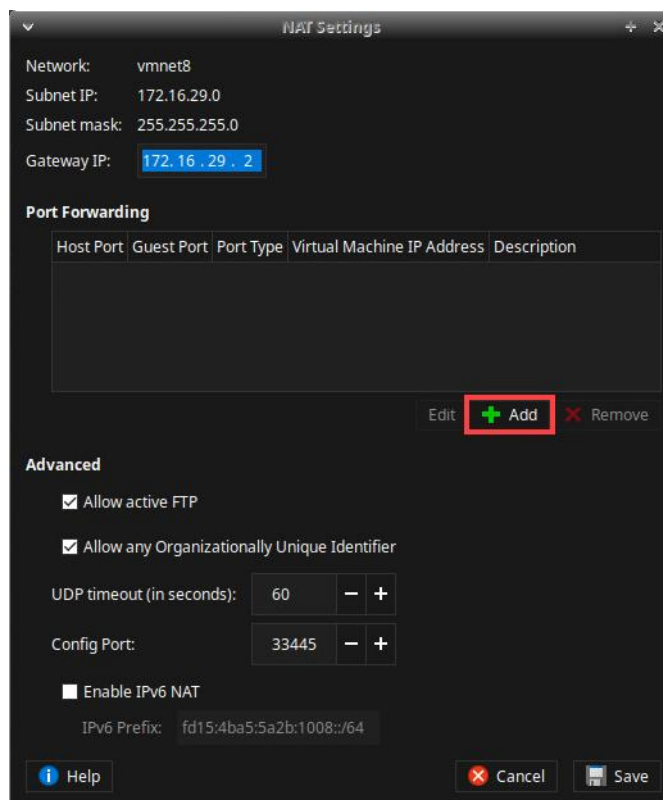

2. Type the password `Train1ng$` when prompted and click **Authenticate**.
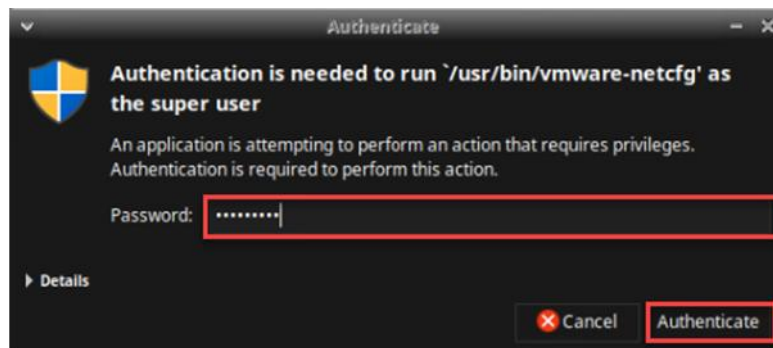
3. In the *Virtual Network Editor* window, select the **vmnet8** network and then click the **NAT Settings** button.
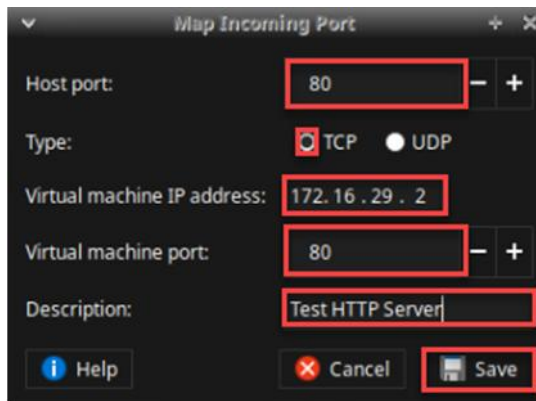

4. Enable port forwarding in order to correctly set up *NAT*. In the *NAT Settings* window, under *Port Forwarding*, click **Add**.
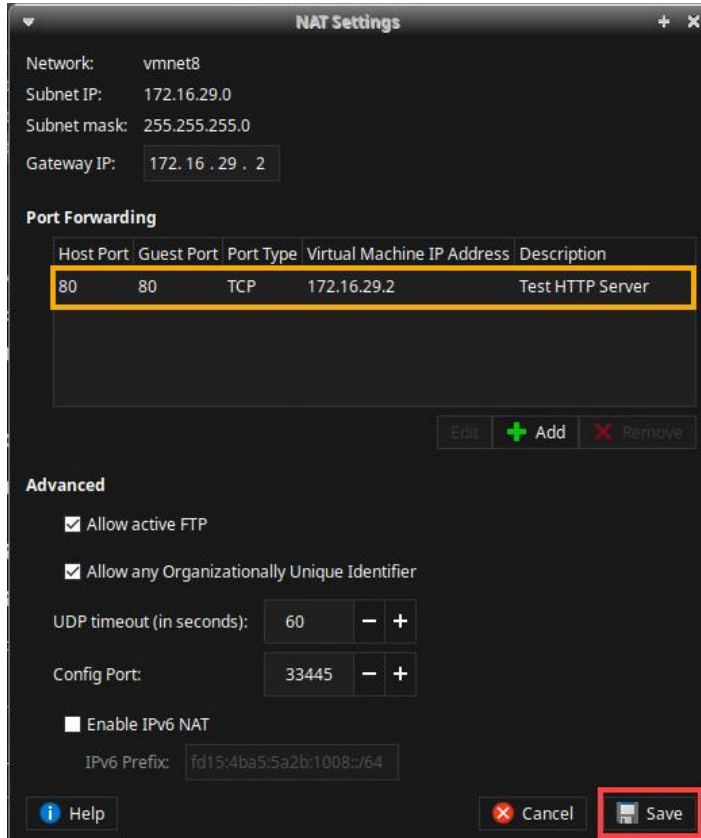
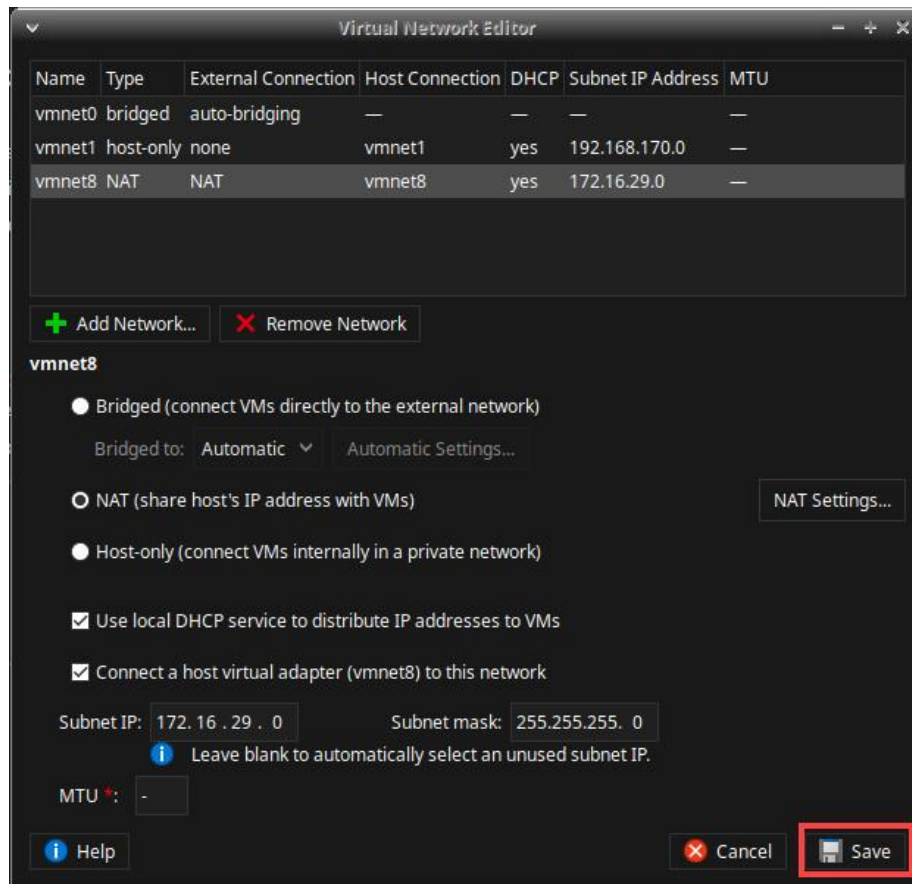5.   Use the following information to map the incoming port 80. Click **Save**.

Field	Setting
Host Port	**80**
Type	**TCP**
IP Address	**172.16.29.2**
Virtual machine port	**80**
Description	**Test HTTP Server**

6.   Verify that the port forwarding settings have been saved. Click **Save** to close *NAT Settings*.

7. On the *Virtual Network Editor* window, click **Save**.

8. Leave the *VMware Workstation* application window open to continue with the next task.

3   Set up a LAN Segment

LAN segments are beneficial when testing or building out virtual machine systems (groups of VMs) that have complex internal network configurations. A LAN segment is a private network that is shared by other virtual machines. A LAN segment can be useful for testing, network performance analysis, and situations where virtual machine isolation is important.

In this task, you will set up a LAN segment called *internal* by adding a new virtual network adapter to the *Test Lubuntu* VM.
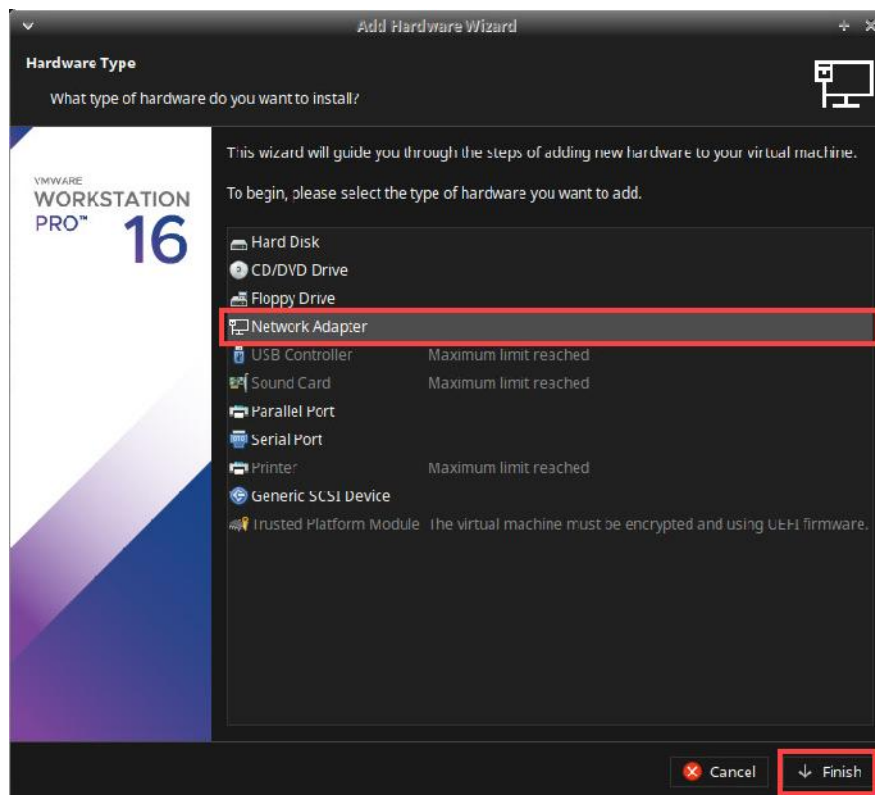
1. In the *VMware Workstation* application window, right-click the **Test Lubuntu** entry in the inventory pane and select **Settings**.
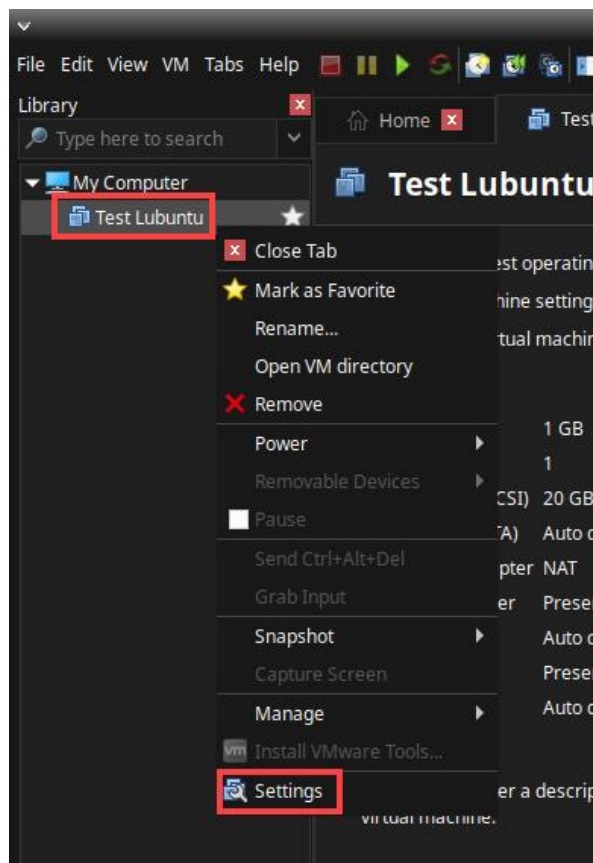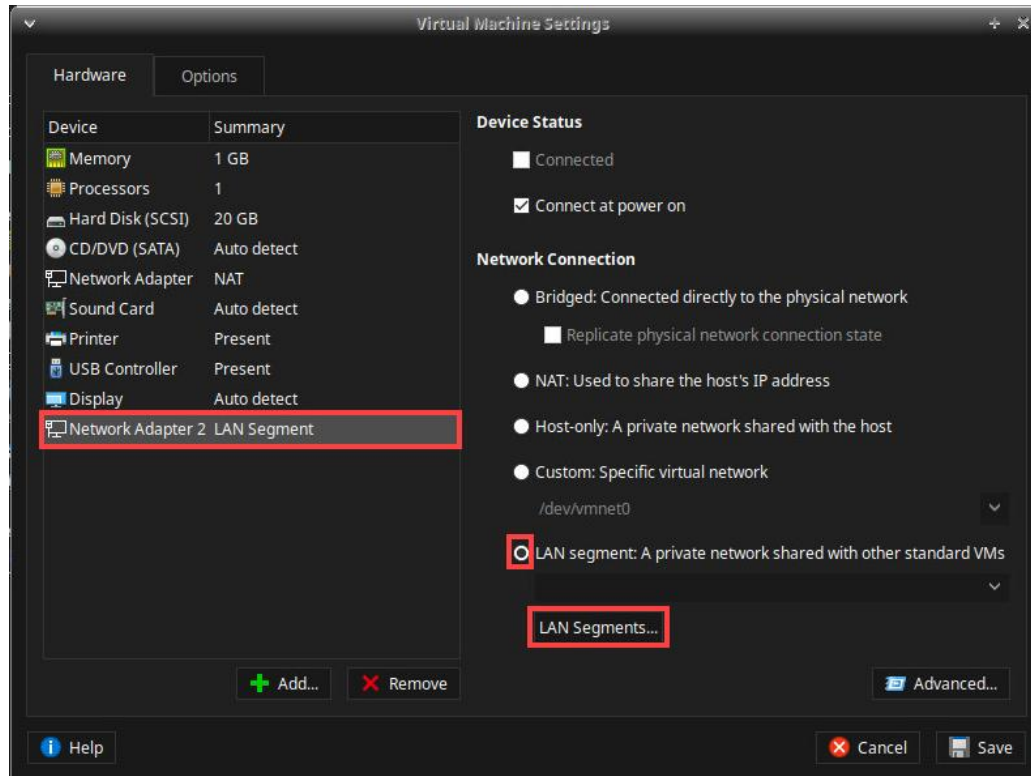
2. Add a hardware device by clicking the **Add** button.
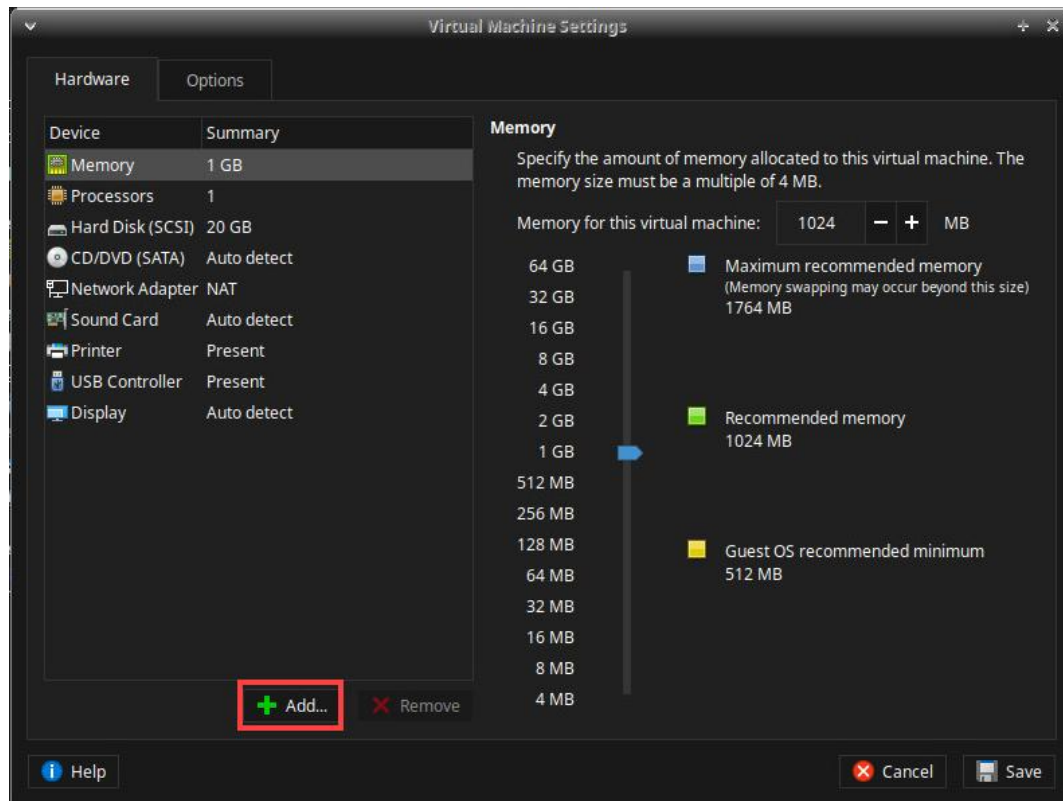
3. In the *Add Hardware Wizard* window, select **Network Adapter** from the list and click **Finish**.

4. On the *Virtual Machine Settings* window, while **Network Adapter 2** is selected in the left pane, select the radio button for **LAN segment: A private network shared with other standard VMs** and then click **the LAN Segments** button.

5. Add a LAN segment called *internal.* Click the **Add** button. Type `internal` in the *name* field, followed by pressing the **Enter** key. Click the **Close** button.
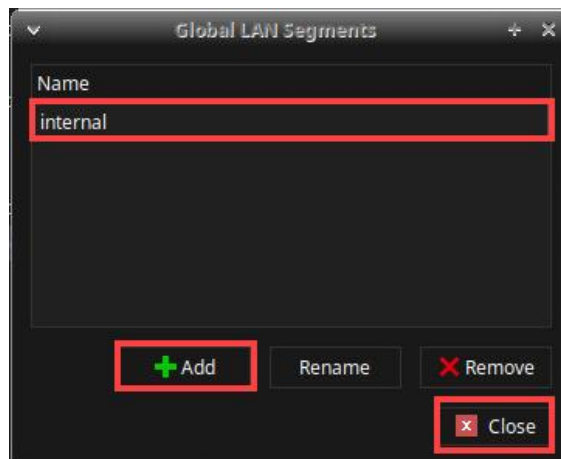
6. Select the **internal** from the LAN segment dropdown and click **Save**.
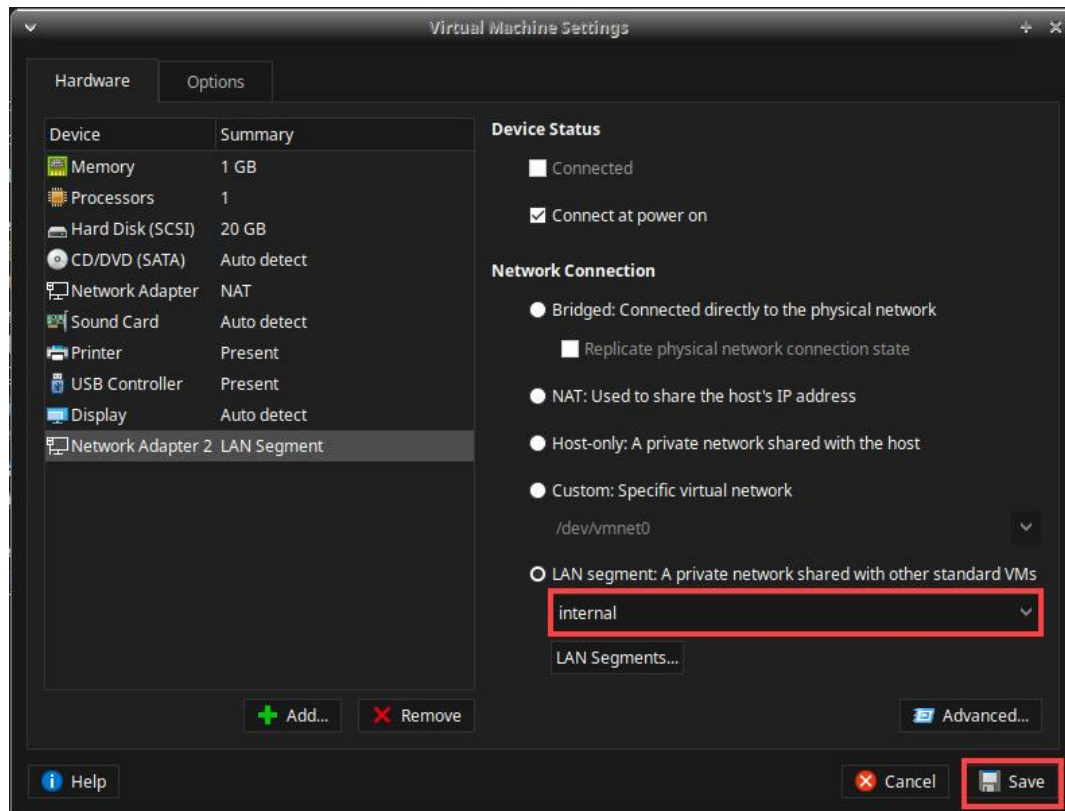
7. Leave the *VMware Workstation* window open to continue with the next task.

4 Bandwidth and Packet Loss on a VM Network

In *VMware Workstation*, you can use advanced virtual network adapter settings to limit the bandwidth and specify the acceptable packet loss percentage for incoming and outgoing data transfers for a virtual machine.

Testing bandwidth and packet loss is useful when testing an application's ability to handle traffic in low bandwidth or a high packet loss situation. It allows developers or administrators to test and identify issues without taking the risk of breaking a physical network.

In this section, you will edit the bandwidth and configure packet loss of incoming traffic on the *vmnet8* network and then test the configurations.

1. In the *VMware Workstation* application window, right-click the **Test Lubuntu** entry in the inventory pane and select **Settings**.
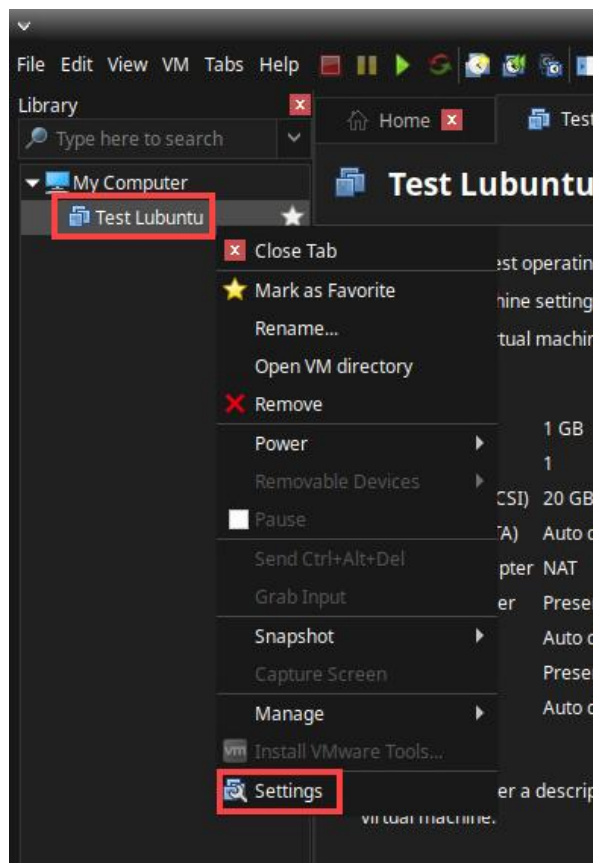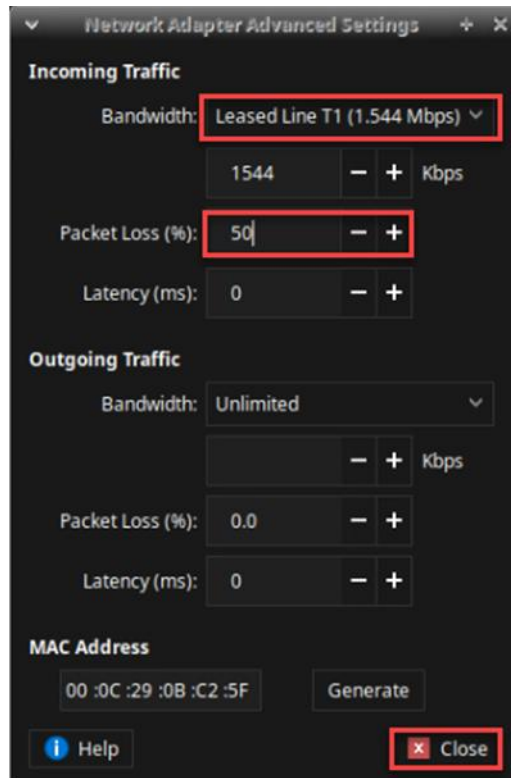
2. Select **Network Adapter** from the left pane. On the right, under *Network Connection*, select the **Custom: Specific virtual network** radio button. Choose the **/dev/vmnet8** network from the dropdown menu. Click **Advanced**.
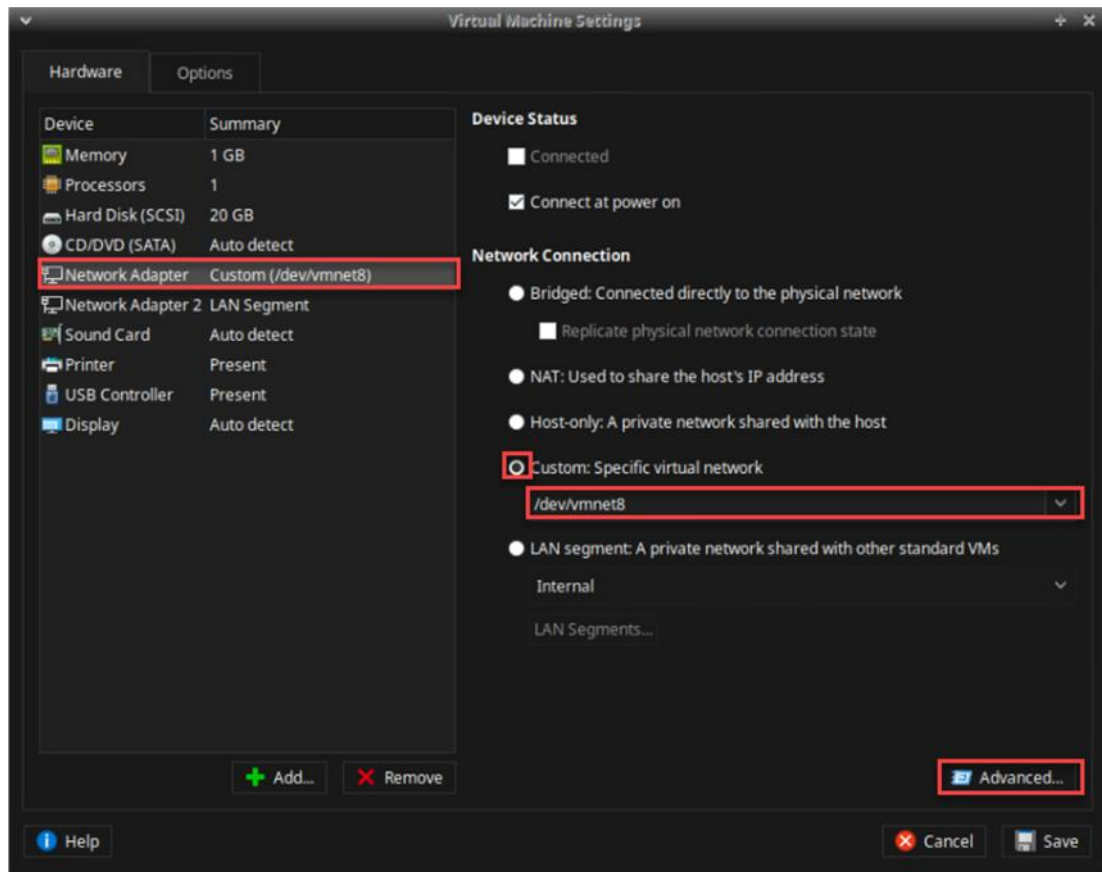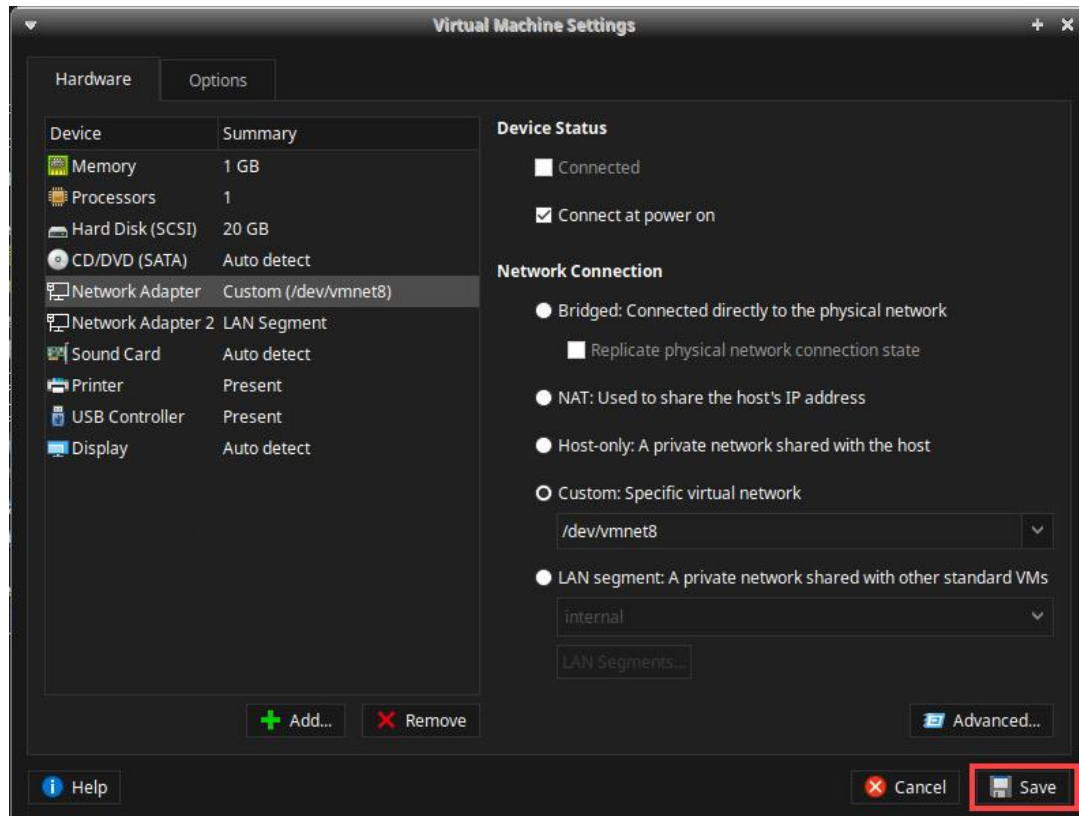
3. Use the following configuration to edit *Incoming Traffic.* Click the **Close** button.

| Field	Setting
Bandwidth	Leased Line T1 (1.544 Mbps)
Packet Loss (%)	50.0

In the *Bandwidth* field, 1.544 Mbps (megabits per second) is the data transfer rate, 1544 in kilobits per second.

4. Back on the *Virtual Machine Settings* window, click **Save** to save the configuration and to close the window.
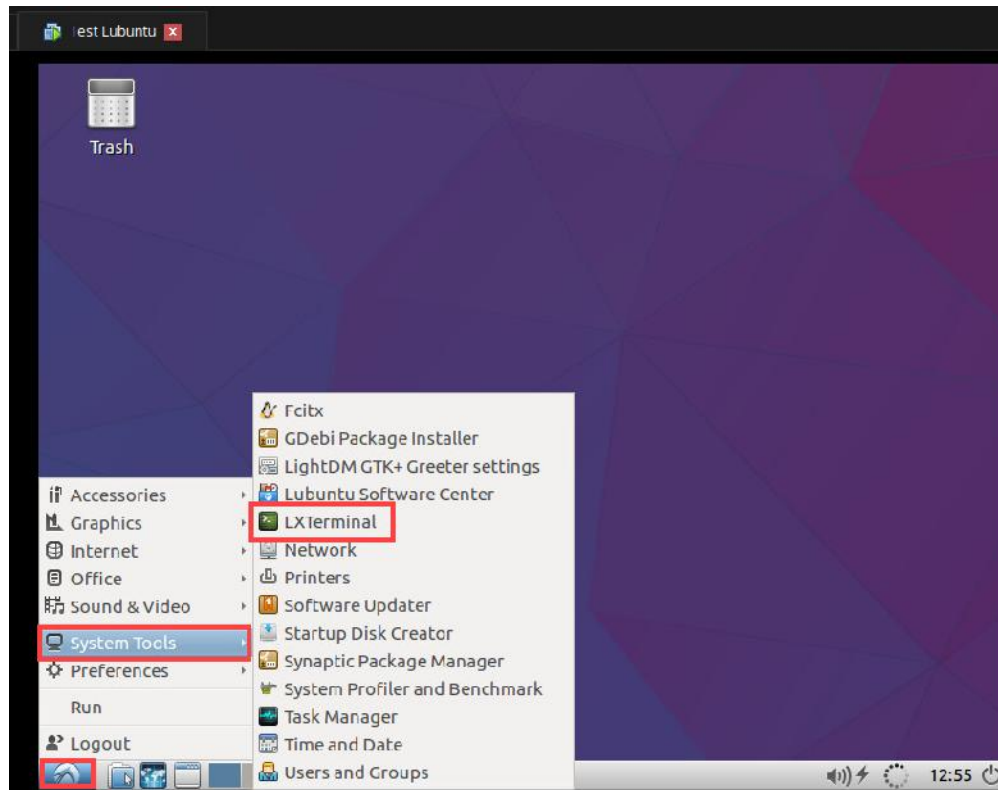

5. Boot the *Test Lubuntu* virtual machine. Click **Start up this guest operating system**. If a warning appears, click **OK**.
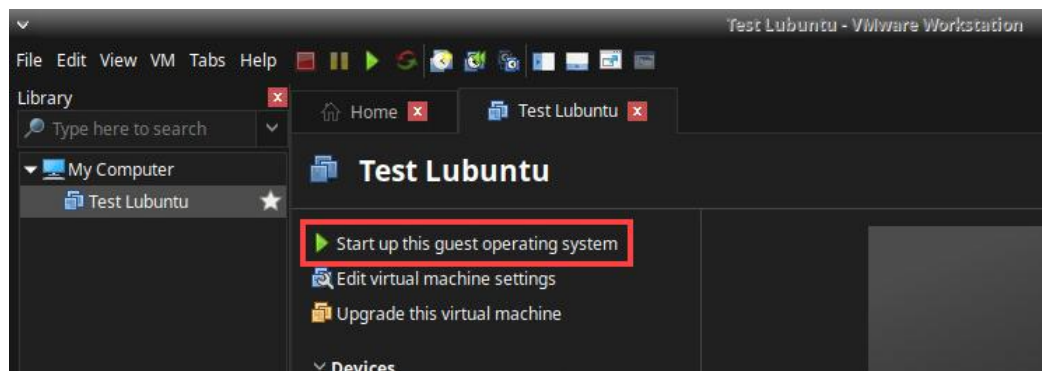
> **Please Note** If prompted, click **I Moved it**. Wait a few seconds for the machine to boot.

6. In the virtual machine console viewer, navigate to **Start > System Tools > LXTerminal**.

7. In the terminal, type the command below, followed by pressing the **Enter** key to output the virtual machine's network information.

```
sysadmin@sysadmin-virtual-machine:~$ ip addr
```
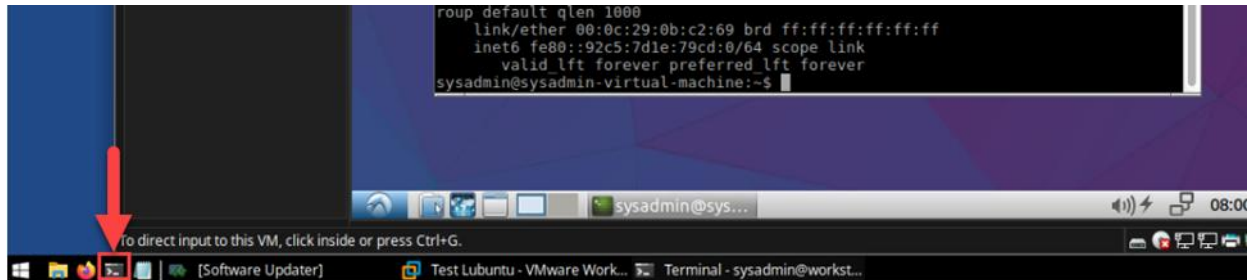
> Note the IP settings for *ens33*, the IP address used shows as *172.16.29.128*. Do note that your IP address may slightly be different from this example, but it should be in the same subnet.

8. On the host machine, click on the **terminal** icon at the bottom to open a new terminal.

9. At the prompt, enter the command below (substitute the IP address if yours is different). The *ping* command will check the connectivity to the VM's network address.

```
sysadmin@workstation:~$ ping -c4 172.16.29.128
```
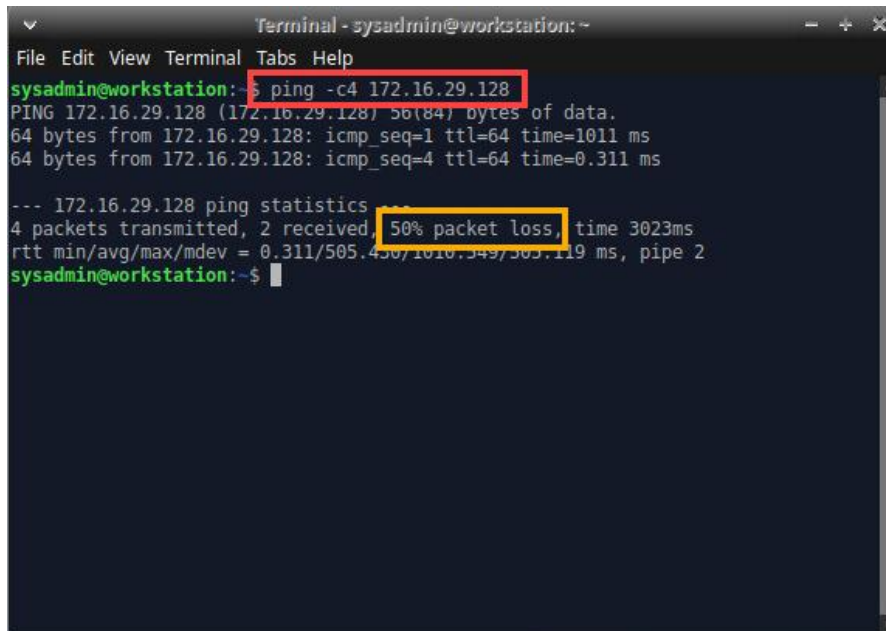

> Notice the percentage of packet loss should be around 50% (you may experience a <50% loss) as configured earlier in this task for incoming traffic.

10. The lab is now complete; you may end the reservation.