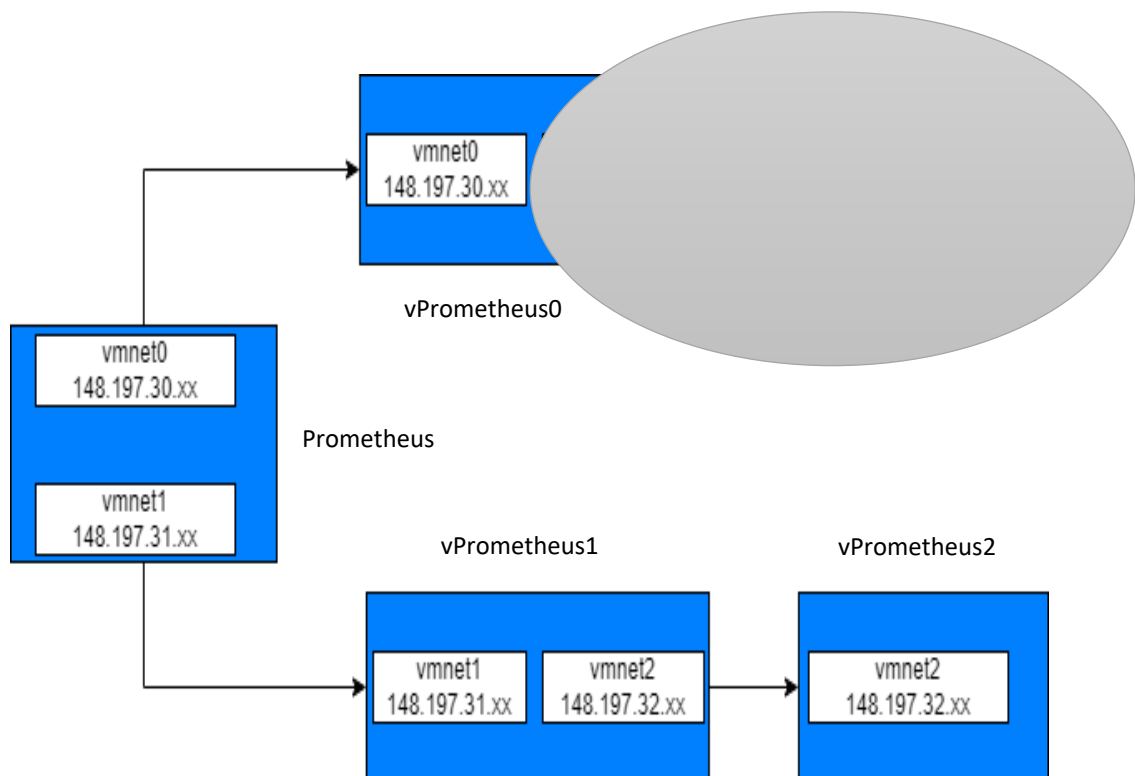


THE VIRTUAL NETWORK

INTRODUCTION

Virtual Machines have been with us for quite a few years now. There are lots of different ways to create a virtual network out there, in this lab sheet we will explore VMware Player. VMware is one of the oldest (if not the oldest) Virtualization Hypervisor around, their latest incarnation is the VMware Player which is free and simple enough to introduce you to the concept of Virtualization without the complexities that come with other software packages like ESXi Server. In this lab sheet we will build a small virtual network and see how we can connect VMs to each other.



METHODOLOGY

INSTALLING VMWARE PLAYER

As you will be working in a nested VM environment, you will need to build new virtual machines inside your host (Prometheus).

- Download VMWare player from:
- <https://www.techspot.com/downloads/1969-vmware-player.html>
(select the package for Linux).
- Extract the .bundle file from the .tar archive.
- Open a terminal inside the extracted bundle folder by right clicking in any space in the folder and select Open in Terminal.
- Make it executable by changing its permissions using the command:
- **chmod 777 VMware-Player-17.6.1-24319023.x86_64.bundle**

- Execute the file using: **`./VMware-Player-17.6.1-24319023.x86_64.bundle`**
- Launch VMplayer from the Applications menu or by typing **vmplayer** in a terminal. Once it launches, accept the license agreement.

BUILDING A VM

- Power off the virtual machine (Prometheus). Go to the Start VMplayer and go to the setting of Prometheus. Go to Processors and under the Virtualization Engine section, tick the “Virtualize Intel VT-x/EPT or AMD-V/RVI. Boot Prometheus back up again.
- On your main host (still outside Prometheus) open a terminal in your Global folder and copy the Rocky Linux iso from your host machine using the scp command:
`scp Rocky * root@148.197.28.??:/root/Downloads/` (?? Is your Prometheus IP address)
- Once the file has finished copying go back inside Prometheus and create a new Virtual machine inside it as done in the last lab with the following parameters:
Name: UP??????-vP0
HDD Size: 20GB
Memory Size: 4GB
Processors: 1
Network Adapter: NAT
Disable 3D Acceleration
- Create a root password (localhost1) and create a user DoNotUseMe with any password of your choice.
- After the VM is built, login as root, enable the network card and make sure to check the “Connect Automatically” option in the Details of the Wired Network Card. Test by: ping google.com

VIRTUAL MACHINE CLONING

To complete the network as shown in the network diagram, we need 2 more VMs running inside Prometheus. We could start the process of installing new virtual machines but this is time-consuming. We can just clone vP0 above and rename to create our 2 new machines.

- Power Off vP0. In the /root/vmware folder on Prometheus, copy and paste the vP0 folder twice. This should create 2 copies; vP0(copy) & vP0(another copy).
- Rename both copies to vP1 and vP2 (**do not rename any of the contents of the folders!!!**)
- Open vmplayer again and click on “Open a Virtual Machine”. Navigate to the vP1 folder and open the file ending in .vmx (the name should still be vP0.vmx)
- When it opens, go to the Settings > Options tab and ensure the VM name is changed to vP1 (check the working directory to know which VM it is)
- Close the settings and power on the machine. Click “I copied it” when prompted.
- Once it boots, login as the root user and change the hostname by typing: gedit /etc/hostname . Reboot to effect changes.
- Repeat the process for vP2

CREATING THE VIRTUAL NETWORK

To get the desired network topology, we need to automatically create our own vmnets and make VMware Player use them. For this, we will be using a custom script called **vm_subnet**. This starts and configures vmnet0 and vmnet1 with ip addresses while starting vmnet2 and vmnet3 as processes, essentially acting as a virtual switch.

- Download the vm_subnet script from moodle.
- Change directory (cd) into the folder containing the downloaded script and set the permissions to make it executable: **`chmod u+x vm_subnet`**

- Power Off vP0, vP1 and vP2. Run the script: **./vm_subnet**
- When prompted, input the last octet of your network address. This should be assigned in the A2.Net subnets file on moodle e.g. for computer Irvine this would be 168 i.e. last octet from 148.197.30.168

Now you need to set up custom network adapters in your VMs that connect to the specific networks (vmnet0,1,2 or 3). To do this, we have created a custom script called fix-vmnet-dev on moodle.

- Download the fix-vmnet-dev script from moodle.
- Change directory (cd) into the folder containing the downloaded script and set the permissions to make it executable: **chmod u+x fix-vmnet-dev** (What is the difference between chmod u+x and chmod +x?).
- Copy the script into each of your VM folders located in /root/vmware (vP0, vP1 and vP2).
- Open a terminal in each of the folders and run the script: **./fix-vmnet-dev**. This should create 3 custom network adapters on each of the VMs.
- Go to the Virtual Machine settings on each VM and assign the custom adapters to the appropriate vmnet (see network diagram for vmnet assignments). Remove any extra network adapters as needed.
- Now login to each machine and configure the network settings.
- First of all you need to go to /etc/sysconfig/network-scripts and check the contents. There should be an ifcfg-ens34 in there (plus ifcfg-ens35 for vP1). If there isn't but there is an ifcfg-ens160 for example, then rename it and open and rename 2 more references to ens160 in there to say ens34 instead. For vP1 also please delete completely the UUID line. Reboot and go back and check that the files are correctly named.
- Now go to the network card settings on the top right corner of your screen and set the correct Networking information in there.

TESTING

Test your configurations by pinging neighbouring interfaces e.g. vP0 to Prometheus and vice versa. vP1 to Prometheus and vice versa and vP2 to vP1 and vice versa.

Now try pinging two or more hops away from each machine e.g vP0 to vP1 and vice versa, Prometheus to vP2 and vice versa and vP2 to vP0 and vice versa. Why isn't it working?