Network management

Introduction

The goal of this lab is to introduce you to the management of a LAN network composed of machines running Linux. You will learn to manipulate the configuration of network interfaces, static routing and the management of virtual machines

I. Virtual Machines installation

To manage your own LAN without disturbing the physical network, you will install a virtualization platform called **virtualbox**. The goal is to create the virtual machines that will compose your LAN. To do so, you will find below the installation guide

1. Import the key that allows direct installation from "VirtualBox repository": (enter this command in one line)

```
wget -q https://www.virtualbox.org/download/oracle_vbox_2016.asc -O-
| sudo apt-key add -wget -q


https://www.virtualbox.org/download/oracle_vbox.asc -O- |sudo apt-key
add -
```

2. Both commands lines should return the result "OK".
3. Add this line to tour repository with : `add-apt-repository`

```
sudo add-apt-repository "deb [arch=amd64]
http://download.virtualbox.org/virtualbox/debian $(lsb_release -cs)
contrib"
```

4. Update your repository and install virtualbox:

```
sudo apt update

sudo apt install virtualbox-6.0
```

II. How to create the virtual machines

To create a virtual machine, you will need an operating system. In your case, you are using Ubuntu 18.0. You need to download an Ubuntu ISO.

Then launch your platform with the command: virtualbox

- Create your machine by choosing the parameters: disk space of 15GB, RAM 2G, the network card will be NAT.

- in the system menu : click on processor -> check both items to activate virtualization

- In the storage section add a drive that will display the location of your Ubuntu ISO

- Once the parameters are validated, start the installation.

As we want to administrate a LAN, you must clone your machine:

- From file menu, Search for the cloning entire tab

- Choose different MAC addresses to avoid addressing conflicts. We will need three machines named respectively Client1, client1 and Gateway which will have two network interfaces.

- To better simulate a private network, the two internal machines will use "private network" interfaces if not use bridge inetrface.

- Gateway will play the role of a router and will have two interfaces; "NAT networks" and "private networks" or bridge depending on the client machines.

Start your machines.

III. Network Interface Configuration

Depending on your operating system version. Configure or update the existing file in /etc/netplan/01-netcfg.yaml to configure your network interfaces.

a second method (the old one) requires the installation of the "net-tools" package

it's up to you to choose the method that suits you

First method:

Example :

To set your network interface `enp0s3` to static IP address `192.168.1.222` with gateway `192.168.1.1` and DNS server as `8.8.8.8` and `8.8.4.4` replace the above configuration with the one below.

```
# This file describes the network interfaces available on your system
# For more information, see netplan(5).
network:
  version: 2
  renderer: networkd
  ethernets:
    enp0s3:
     dhcp4: no
     addresses: [x.x.x.x/24]
     gateway4:   x.x.x.1              (#IP address of your gateway )
     nameservers:
       addresses:
```

to update the network interface parameters:

```
sudo netplan apply
```

- Test your configuration :

```
ip a ou bien ip link show
ip route show ou bien ip route list
```

Now, all VM (Virtual machines) are configured

- Test via ping command : from a given VM ping the other VMs
- Until all VMs communicate only in your LAN. If you want to go out the internet, you update the Gateway VM to support the routing mechanism.

```
echo 1 > /proc/sys/net/ipv4/ip_froward
```

- In the client VM be sur that the gateway IP address is correctely configured if not, add it with this command.

```
ip route add default via @IPgw dev eth0
```

- List your routing table: **`ip route list ou bien ip route show`**
- Test to ping your Gateway VM
- Test to ping teh google DNS : ping 8.8.8.8
- If no reponse, add a NAT translation to your Gateway VM.

```
iptables -t nat -A POSTROUTING -o XXX -j MASQUERADE
```

XXX ; represents the outside interface, means your NAT interface. This interface has a dynamic address

- Teste again the google DNS
- Until now, you can use ony IP address to communicate. To use a domain name or a resource, like « ww.google.com », you need to add a clien DNS agent.
  Update your « /etc/resolv.conf » file and add : namesever 8.8.8.8 instead the local configuration. To update for the rest of the VMs
- Test pinf www.google.com
- With your browser you can navigate on the inetrnet