CS3530 Networking Hans-on:
VM Hosts, Linux Bridge, and Static Networking

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Objective and Contents

- Objective
  - Getting used to the hands-on using VM hots and Linux Bridge
  - Practically understanding the basic network configuration on Linux

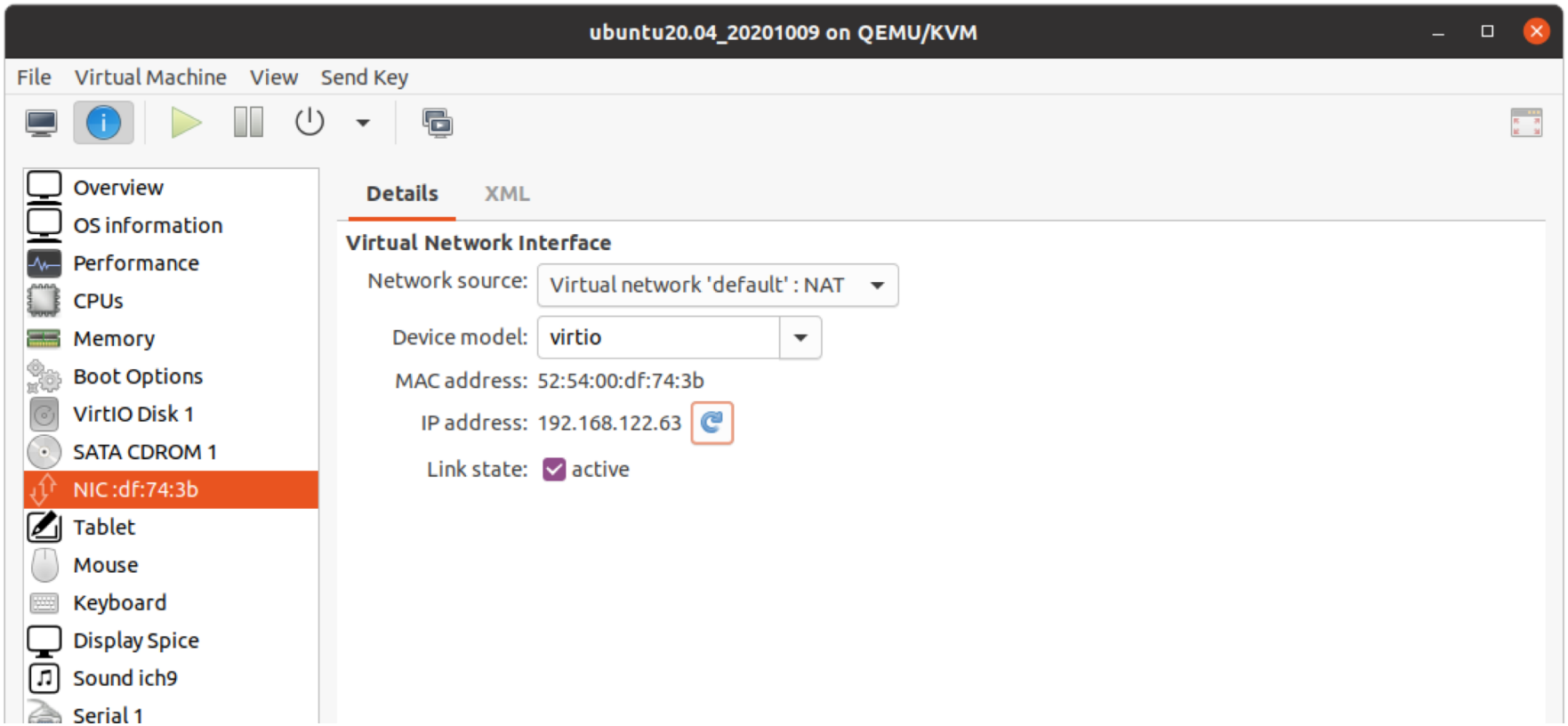
- Contents
  - Configuring network on and between the 2 VM instances
  - Checking connectivity between the 2 VM instances

Useful Links

- Network Configuration
  - https://ubuntu.com/server/docs/network-configuration

Checking the network configuration of a VM (1/2)

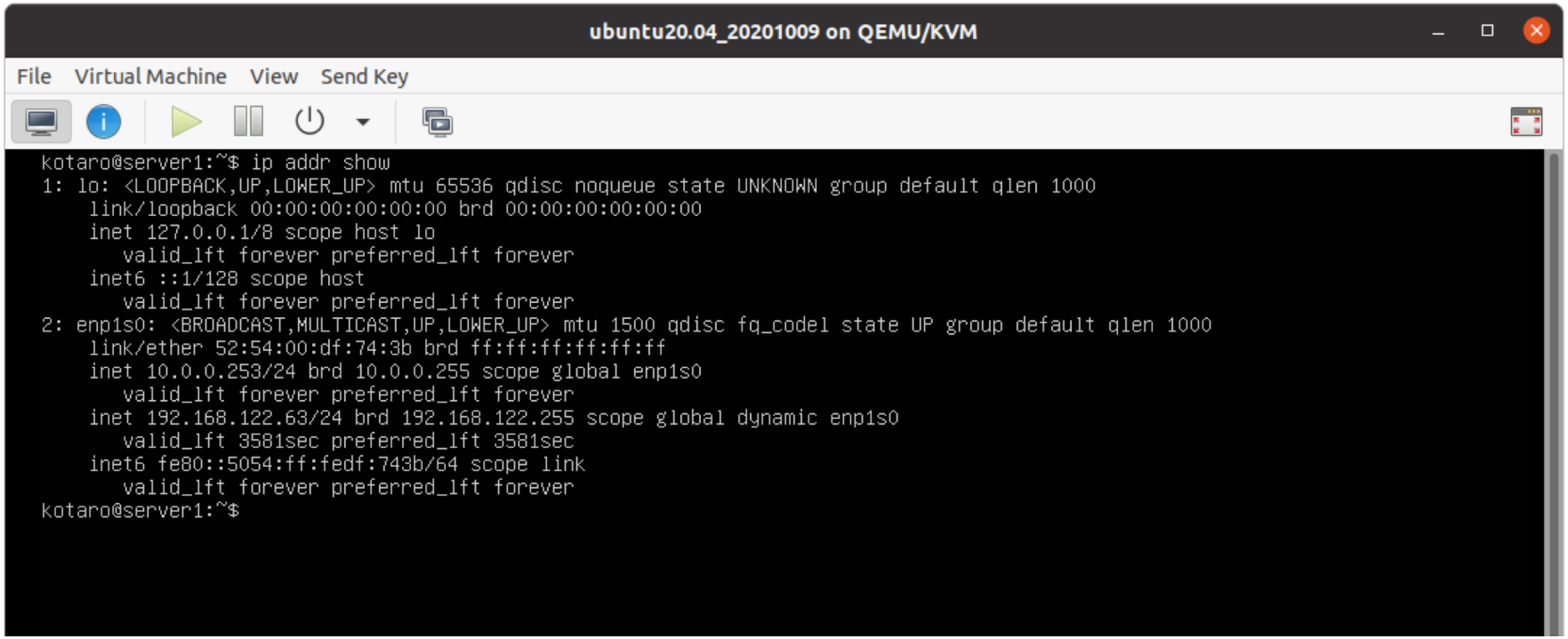
- GUI based information on virt-manager



Checking the network configuration of a VM (2/2)

- A Linux command on the VM itself

`ip addr show`

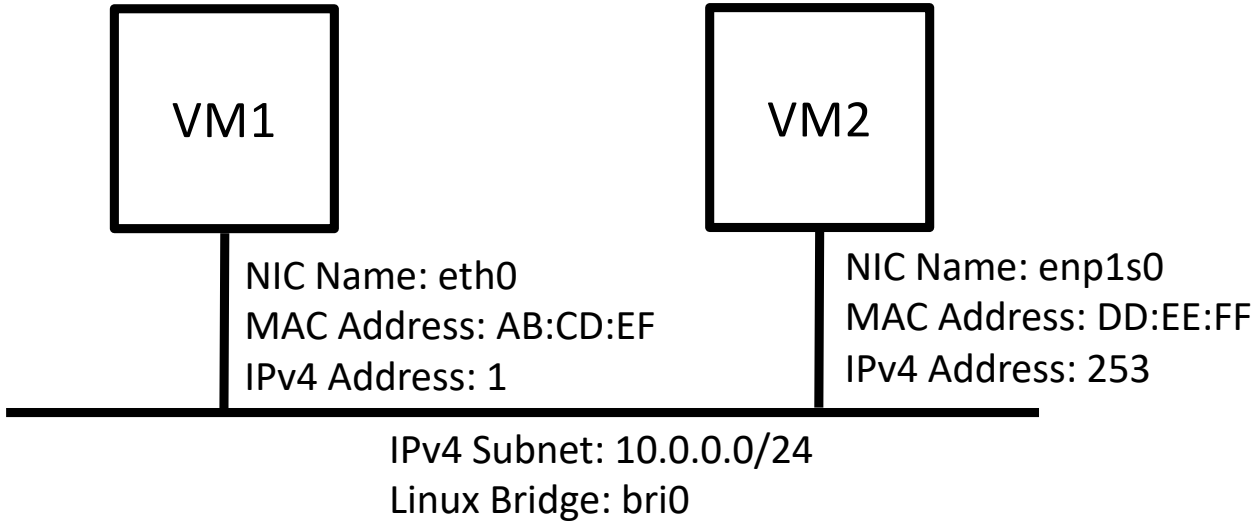


Steps

- Configuring Linux Bridge on your Ubuntu Desktop
- Configuring network on virt-manager and Ubuntu Servers
- Checking and benchmarking network connectivity between Ubuntu Servers

The Network Diagram

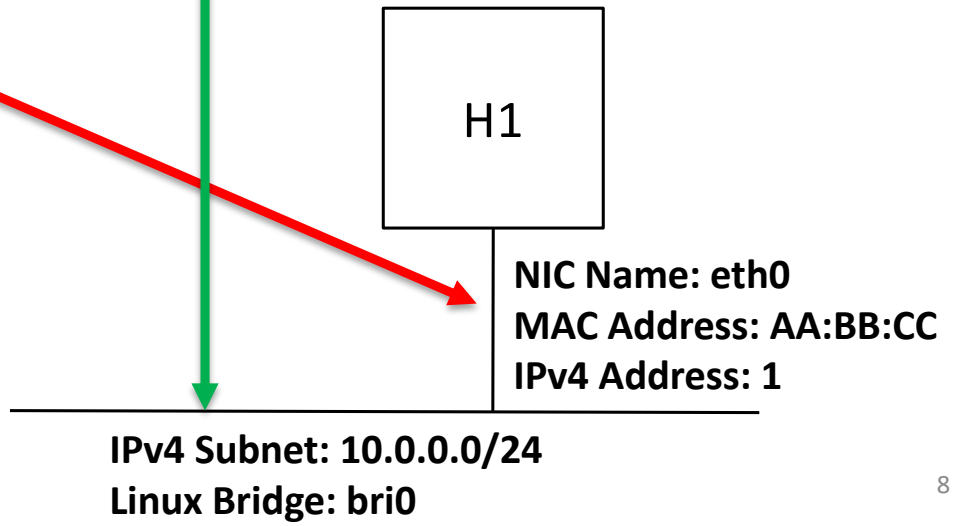
- Connect Two VMs, S1 and S2, using Linux Bridge
  - VMs are implemented using Ubuntu Server LTS 20.04
  - Networking between S1 and S2 is done in a step-by-step manner



How to read a network diagram?

- NIC Name
  - Name of NIC recognized by OS
  - Can be “eth0”, “enp1s0”, etc.
  - “eth0” may be widely known.
- MAC Address
  - MAC (Ethernet) Address of NIC
  - Last 6 HEX Characters are recommended to note down for consistency with virt-manager
- IPv4 Address
  - IPv4 address given to NIC
  - Together with Subnet IP address, IPv4 Address for eth0 should be 10.0.0.1
  - Can be the static number given by you, or the dynamic number assigned using DHCP
  - In case of “static”, the host part should be enough expecting that IPv4 Subnet is mentioned properly. Otherwise, should be “DHCP”

- IPv4 Subnet
  - The network address with subnet mask which will be operated using a Linux Bridge
- Linux Bridge
  - The name of linux bridge that each NIC of the VMs should attach through KVM setting
  - **Linux Bridge itself does not take a subnet configuration**



Creating a Virtual Network for VM-to-VM Communication using Linux Bridge

- Creating a Linux bridge interface on Host Ubuntu

```
sudo brctl addbr bri0
```

- Making the interface up and running

```
sudo ip link set bri0 up
```

- Linux Bridge can be operated as a NIC

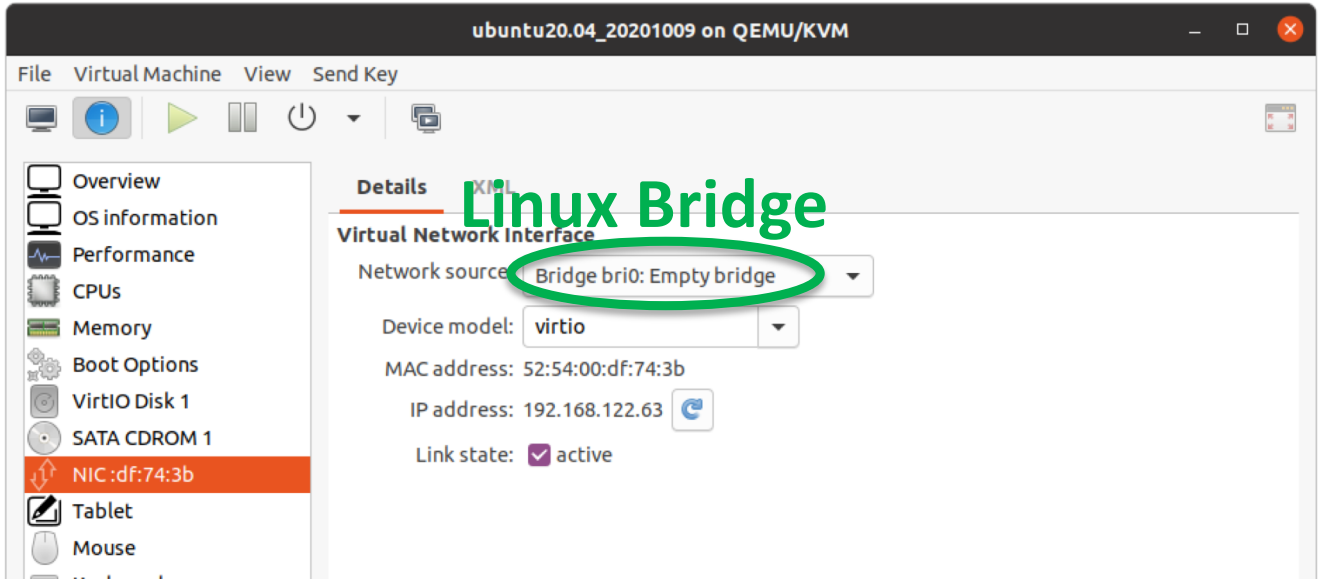
```
ip addr show bri0
```

- Analogy: You unpacked a switching hub and switched it on. However, your VM is not connected to the switch.

- Very important points
  - Don't configure DHCP or a static IP address to a Linux bridge if not needed
  - If an IP address is configured, Ubuntu host (your laptop) will use the IP address
  - Sometimes your laptop may get a trouble

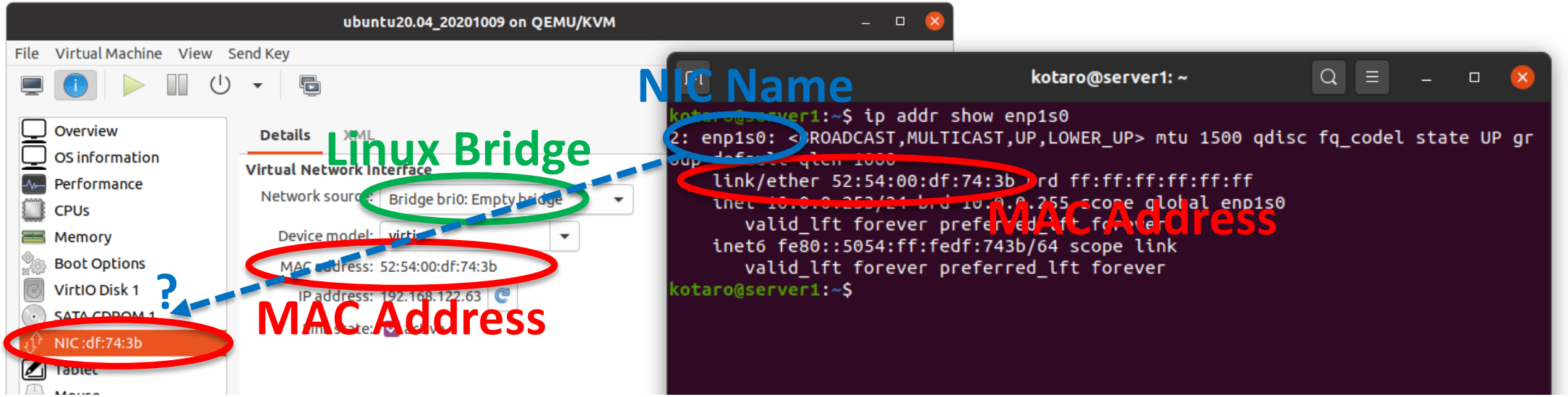
Attaching a NIC of a VM to the Linux bridge on virt-manager

- Analogy: attaching a LAN cable between VM and a switching hub.



Important tips to avoid confusion

- The mapping among “NIC Name”, “MAC Address” and “Linux Bridge” is important to avoid confusion of which NIC to join which network on “virt-manager”
- ”virt-manager” does not recognize “NIC Name”. You need to specify which “MAC address” connects which “Linux Bridge”.



Manual (Static) IP Address Configuration on Ubuntu Server 20.04 LTS

- Temporary Configuration (Ex: Configure 10.0.0.1/24 to eth0)

```
sudo ip addr add 10.0.0.254/24 dev eth0
```

- Give the IP address to
- Checking the

Manual (Static) IP Address Configuration on Ubuntu Server 20.04 LTS

- Permanent Configuration
  - Create and edit a script

```
sudo vi /etc/netplan/99_config.yaml
```

  - Execute the script

```
sudo netplan apply
```

```
network:
    version: 2
    renderer: networkd
    ethernets:
        enp1s0:
            addresses:
                - 10.0.0.253/24
            gateway4: 10.0.0.254
            nameservers:
                search: [mydomain]
                addresses: [8.8.8.8]
```

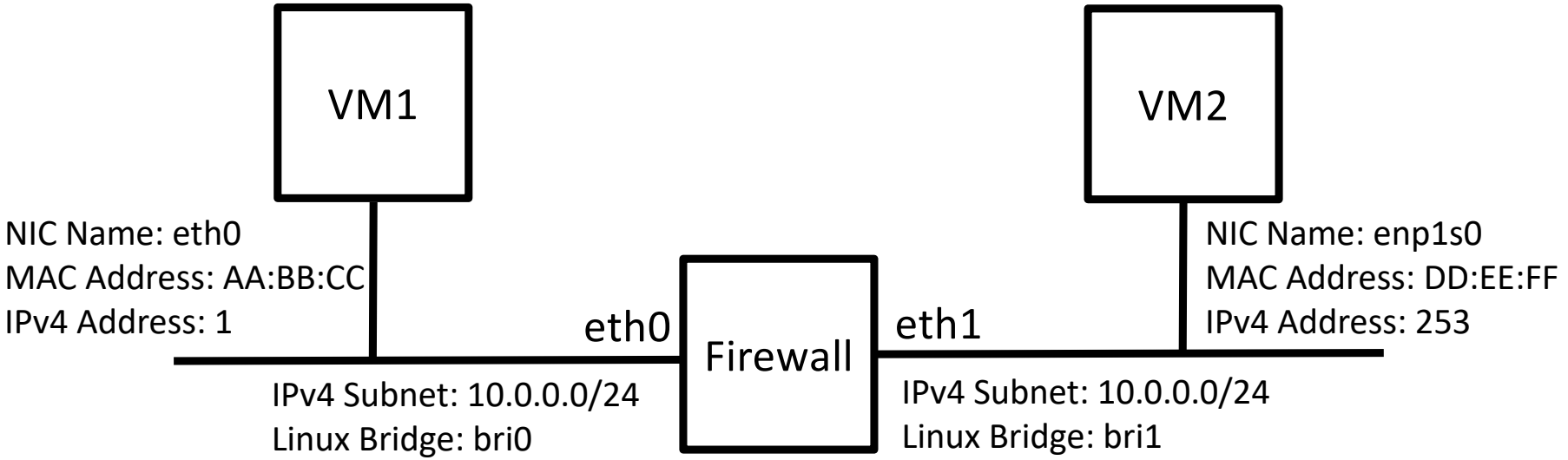
Once you give an IP address to the VMs

- Let’s Check the connectivity and performance
- Run ping and iperf on VMs.
- If you do not know the usage of ping and iperf, use ”man” command to figure it out, and study what these commands do.
- To be announced as an assignment!!

How do you conduct Firewall Assignment?

The Network Diagram for Firewall Assignment

- Put Firewall (Ubuntu Server VM) in between VM1 and 2 using multiple Linux Bridges
- Unlike the previous previous network diagram, VM1 and VM2 does not ping with each other immediately (Why?)



Your code is needed

- Ubuntu Server does not work as a router by default
- In this assignment, you an assume that VM1 and VM2 are visible hosts in the same LAN
- Firewall shall work as a bridging device (Layer 2) which does not communicate with any active host
  - (It's job is to decide forward or drop the incoming packet)

Done!!