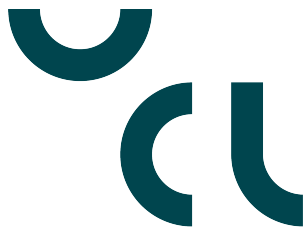


IT Technology  
21A ITT1 Networking  
Assignment 1



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University College

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# **1 Introduction**

This report will show how to set up two Raspberry Pi VMs on a network, check the connection and monitor the traffic between the two and inspect the ARP table.

# **2 Audience**

This document is intended for people who have not tried to set up a Raspberry Pi VM.

# **3 Inventory**

VMware Workstation is required.

## 4 Network Diagram

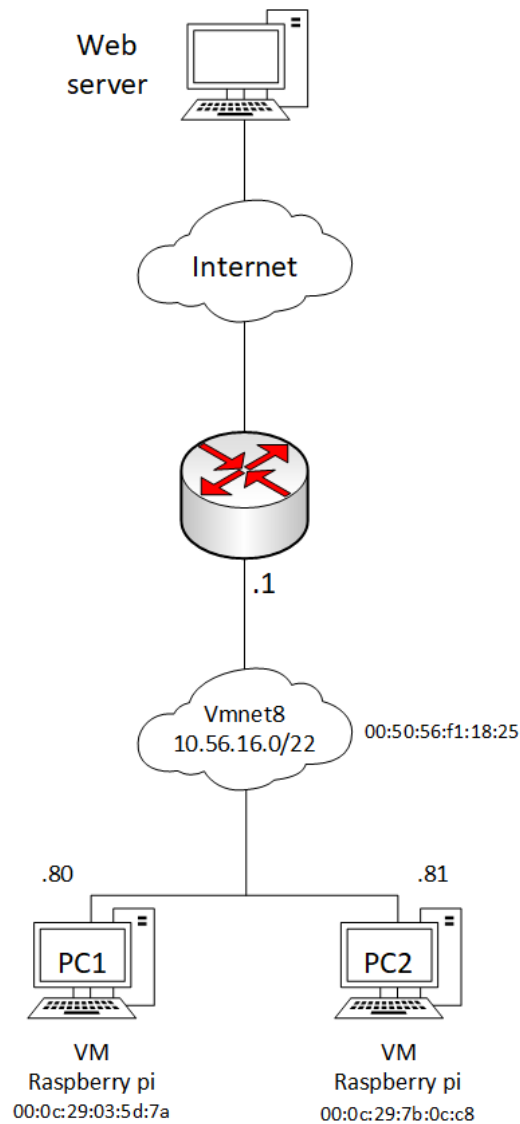


Figure 1: Network diagram

Figure 1 is the network that will be set up.

## 5 Install Raspberry Pi Buster OS on a VM

To install Raspberry Pi on VMware Workstation follow [this](https://gitlab.com/PerPer/networking/-/blob/master/Semester_Literature/2_semester_network_literature/Raspberry/Raspberry_Installation_on_VMW_Workstation_Pi_pda_V09_p_27-47.pdf) guide by Per Dahlstrøm.<sup>1</sup>

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<sup>1</sup>[https://gitlab.com/PerPer/networking/-/blob/master/Semester\\_Literature/2\\_semester\\_network\\_literature/Raspberry/Raspberry\\_Installation\\_on\\_VMW\\_Workstation\\_Pi\\_pda\\_V09\\_p\\_27-47.pdf](https://gitlab.com/PerPer/networking/-/blob/master/Semester_Literature/2_semester_network_literature/Raspberry/Raspberry_Installation_on_VMW_Workstation_Pi_pda_V09_p_27-47.pdf)

## 6 Installing networking software

Before installing software update (`sudo apt update`) and upgrade (`sudo apt upgrade`) Linux. To pull and install software use the command '`sudo apt install software`'.

Replace *software* with the name of the software.

Software to install:

- Wireshark
- tcpdump
- putty
- net-tool
- bridge-utils
- iproute2
- curl
- ufw

Raspberry Pi does not come with network manager so this has to be installed. To install it use the commands '`sudo apt-get install network-manager`' and then '`sudo apt install network-manager network-manager-gnome`'. It should now be able to run by opening the application menu then preferences then Advanced Network Configuration.

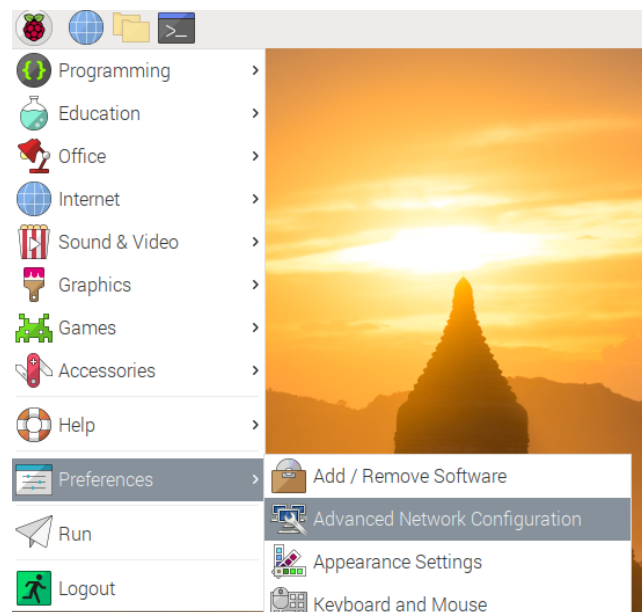


Figure 2: Run Network Manager

## 7 Clone the VM

To clone a VM right click the VM that needs to be cloned then 'manage' then 'clone'.

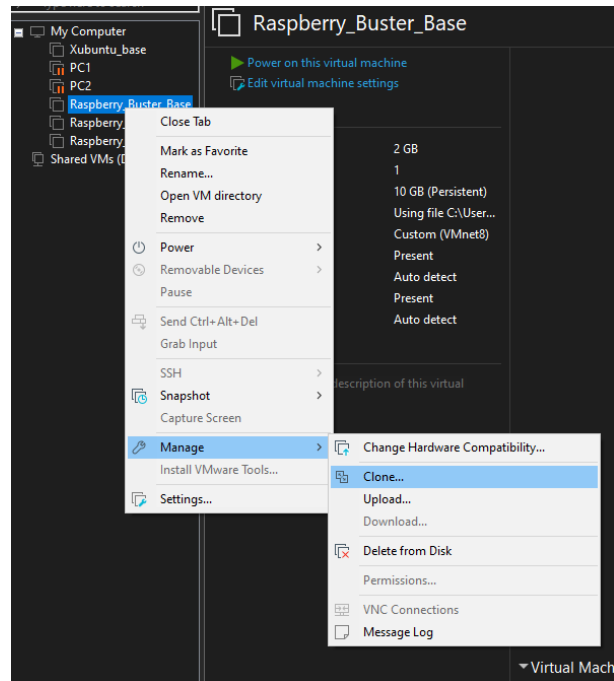


Figure 3: Clone a VM

Under clone type select 'Create a full clone'.

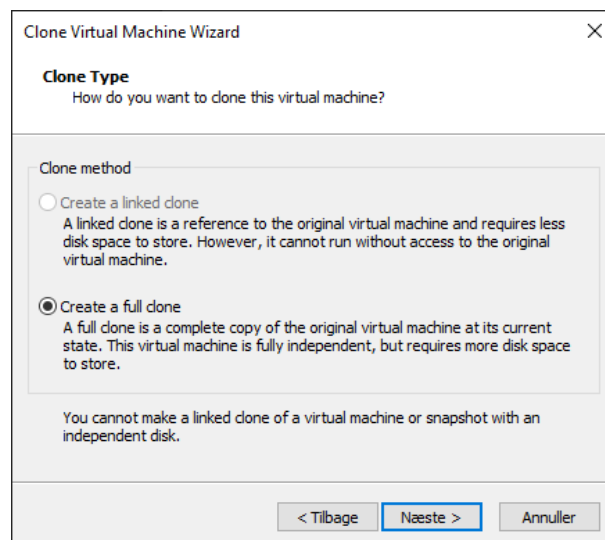


Figure 4: Select clone type

## 8 Setting a static ip

To set up a static IP address for the VM. First disable networking and run Network Manager. In the Network Connections window press "Add a new connection" in the bottom left corner. In the new window select Ethernet and press "Create...".

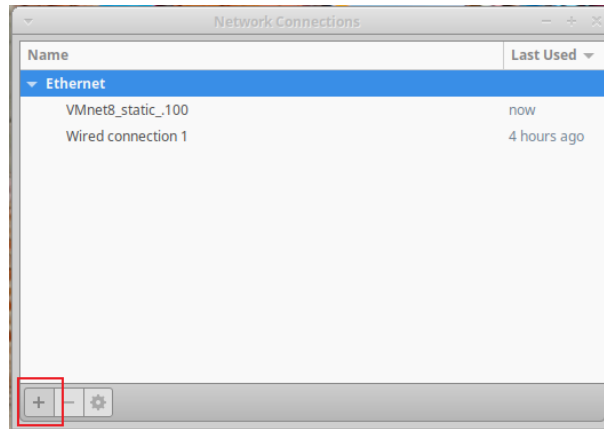


Figure 5: Network Connection window

In the Edit Network window change the settings highlighted so they correspond with the network diagram in figure 1.

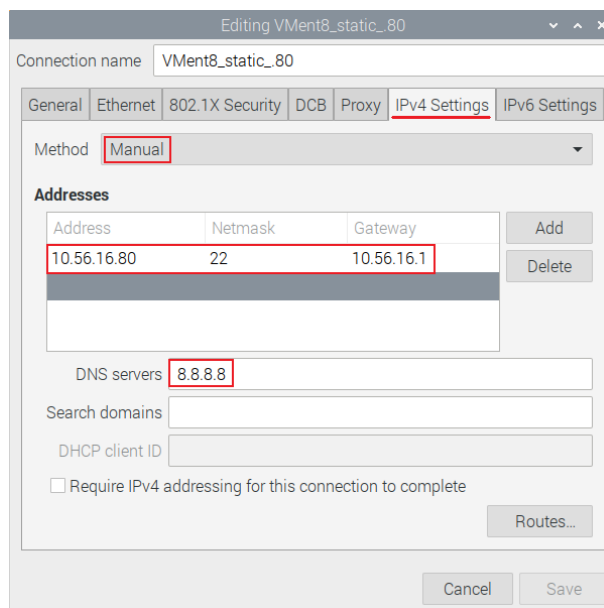
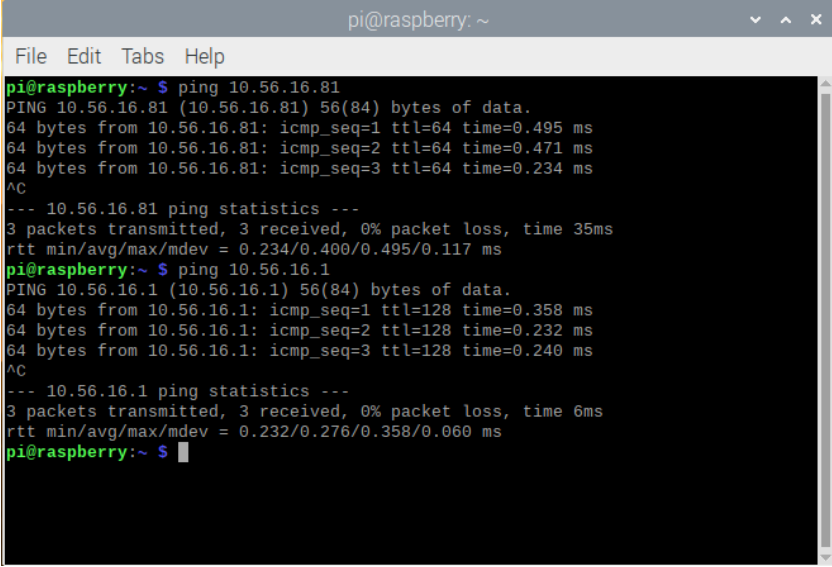


Figure 6: Edit Network window for PC1

Now the same has to be done on the other PC. Make sure the IP address is set corresponding with the network diagram in figure 1.

## 9 Verify connectivity

To check if there is a connection between the two hosts the ping command in the terminal can be used. To do this open the terminal and type "ping" followed by the IP address you want to ping. On figure 7 PC 1 with the IP address 10.56.16.80 is pinging PC2 with the IP address of 10.56.16.81.



```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~$ ping 10.56.16.81  
PING 10.56.16.81 (10.56.16.81) 56(84) bytes of data.  
64 bytes from 10.56.16.81: icmp_seq=1 ttl=64 time=0.495 ms  
64 bytes from 10.56.16.81: icmp_seq=2 ttl=64 time=0.471 ms  
64 bytes from 10.56.16.81: icmp_seq=3 ttl=64 time=0.234 ms  
^C  
--- 10.56.16.81 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 35ms  
rtt min/avg/max/mdev = 0.234/0.400/0.495/0.117 ms  
pi@raspberrypi:~$ ping 10.56.16.1  
PING 10.56.16.1 (10.56.16.1) 56(84) bytes of data.  
64 bytes from 10.56.16.1: icmp_seq=1 ttl=128 time=0.358 ms  
64 bytes from 10.56.16.1: icmp_seq=2 ttl=128 time=0.232 ms  
64 bytes from 10.56.16.1: icmp_seq=3 ttl=128 time=0.240 ms  
^C  
--- 10.56.16.1 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 6ms  
rtt min/avg/max/mdev = 0.232/0.276/0.358/0.060 ms  
pi@raspberrypi:~$
```

Figure 7: Pinging PC 2 in terminal

Then using the icmp filter in Wireshark only these pings can be seen as requests and replies.

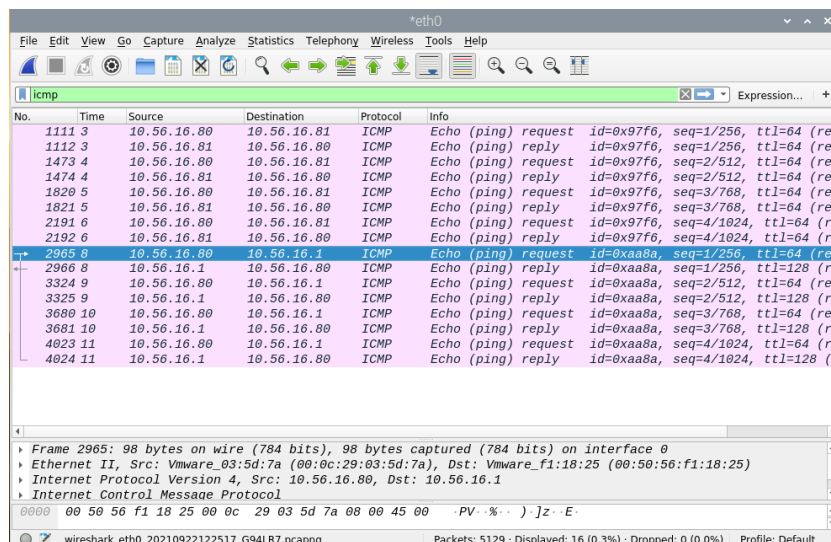


Figure 8: Wireshark



## 10 Compare ip and mac address

To find the mac addresses in Wireshark double-click a packet. The MAC addresses can be seen under Ethernet II.

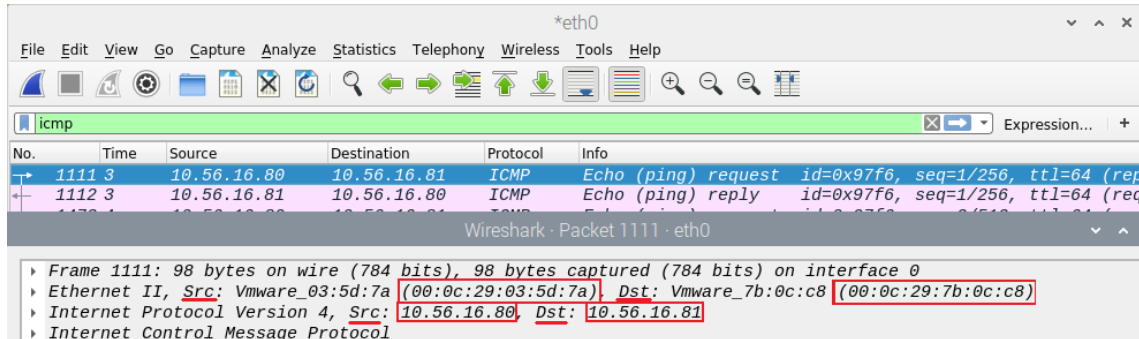


Figure 9: Wireshark packet

These addresses are the same the using the `$ ip addr` command.

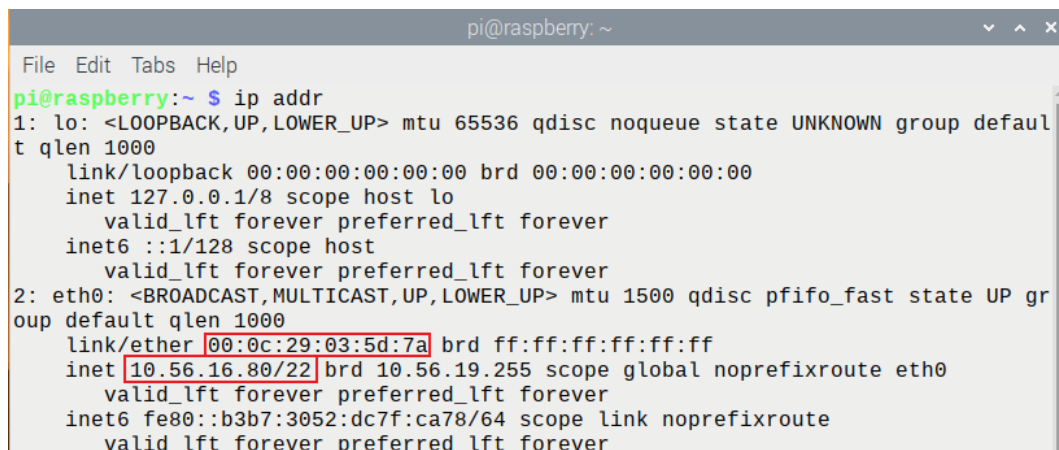


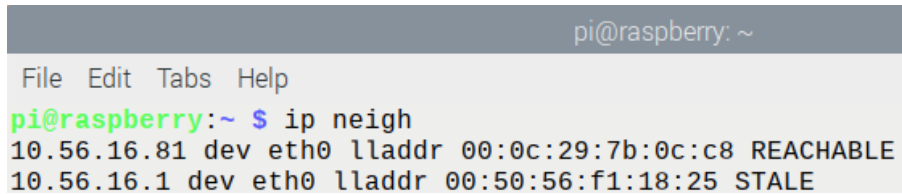
Figure 10: ip addr command on PC1

## 11 ARP table

The addresses found in the previous sections is used to draw an ARP table.

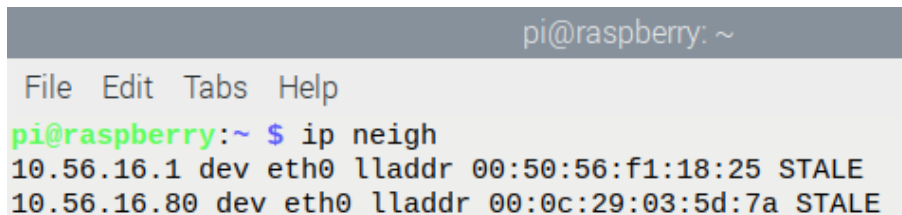
ARP table		
Device name	IP address	MAC address
Router	10.56.16.1	00:50:56:f1:18:25
PC1	10.56.16.80	00:0c:29:03:5d:7a
PC2	10.56.16.81	00:0c:29:7b:0c:c8

## 12 ip neigh command

A terminal window titled 'pi@raspberrypi: ~' with a menu bar 'File Edit Tabs Help'. The prompt is 'pi@raspberrypi:~ \$'. The command 'ip neigh' has been executed, showing two entries in the ARP table: '10.56.16.81 dev eth0 lladdr 00:0c:29:7b:0c:c8 REACHABLE' and '10.56.16.1 dev eth0 lladdr 00:50:56:f1:18:25 STALE'.

```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~ $ ip neigh  
10.56.16.81 dev eth0 lladdr 00:0c:29:7b:0c:c8 REACHABLE  
10.56.16.1 dev eth0 lladdr 00:50:56:f1:18:25 STALE
```

Figure 11: ip neigh command from PC1

A terminal window titled 'pi@raspberrypi: ~' with a menu bar 'File Edit Tabs Help'. The prompt is 'pi@raspberrypi:~ \$'. The command 'ip neigh' has been executed, showing two entries in the ARP table: '10.56.16.1 dev eth0 lladdr 00:50:56:f1:18:25 STALE' and '10.56.16.80 dev eth0 lladdr 00:0c:29:03:5d:7a STALE'.

```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~ $ ip neigh  
10.56.16.1 dev eth0 lladdr 00:50:56:f1:18:25 STALE  
10.56.16.80 dev eth0 lladdr 00:0c:29:03:5d:7a STALE
```

Figure 12: ip neigh command from PC2

Using the 'ip neigh' command it shows that the ARP table from section 11 was created correctly.

## 13 Conclusion

It should now be possible to install the Raspberry Pi OS on a VM in VMWW, use ping to verify the connectivity between two hosts, inspect the ARP table and use Wireshark to confirm IP and MAC addresses. All in accordance to the learning goals