IT Technology

Assignment 1

Raspberry VM, IP and MAC addresses and ARP table.

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1. Introduction

In this assignment the user will learn how to install, setup and clone a Raspberry pi virtual machine and equip it with the necessary software to monitor internet traffic across its local network as well as how do find a devices IP and MAC addresses.

2. Tasks

- Draw a network diagram with IP addresses and MAC addresses listed. Please note that as MAC addresses will only be learned later in this assignment, these will have to be added to the drawing when they have been learned.

- Install a Raspberry Pi Buster Operating system on a Virtual Machine VM in VMWW. Connect it to VMnet8 set to NAT to give the Raspberry Pi Buster VM internet access.

- Name the VM in VMWW: Raspberry_Buster_Base

- Install the networking software:

    - Before installing software on Linux do:
        - Update (sudo apt update)
        - Upgrade (sudo apt upgrade)
    - Install networking software from Linux repositories:
        - Wireshark (Ethernet capturing and monitoring GUI software.)
        - Cpdump (app to capture live TCP/IP packets on a network interface)
        - Putty (Terminal program.)
        - Net-tools (arp, hostname, ifconfig, netstat, route).
        - Bridge-utils (Utility to create and manage bridge devices.)
        - Iproute2 (ip commands like: ip route)
        - Curl (curl is a command line tool to transfer data to or from a server.)
        - Ufw (Uncomplicated Firewall is a program for managing a netfilter firewall)

- Install Network manager

- Clone Raspberry Pi Buster VM

- Use ping to verify connectivity between network devices PC1 and PC2.

  (Run Wireshark on PC1. Ping PC2 and the router in turn. Use the filter icmp as Wireshark Display filter. Find the source and destination IP addresses in the request packets and find the corresponding source and destination MAC addresses. Find the source and destination IP addresses in the reply packets and find the corresponding source and destination MAC addresses.)

- Compare the IP and MAC addresses found in Wireshark with the IP and MAC addresses found by the command

- Draw up manually he ARP table from the findings in the items above. The ARP table maps IP addresses to MAC addresses, i.e. ARP resolves IPs to MAC addresses on a networking device. Here on the Raspberry Pi as a networking device.

- Use the ip neigh Linux command to inspect the ARP table on the Linux box PC1 and then on PC2.

3. Learning goals

- Install a Raspberry Pi Buster Operating system on a Virtual Machine VM in VMWW.
- Use ping to verify connectivity between network devices.
- Inspect the ARP table on a Linux box, here a Raspberry.
- Use Wireshark to confirm IP and MAC addresses.

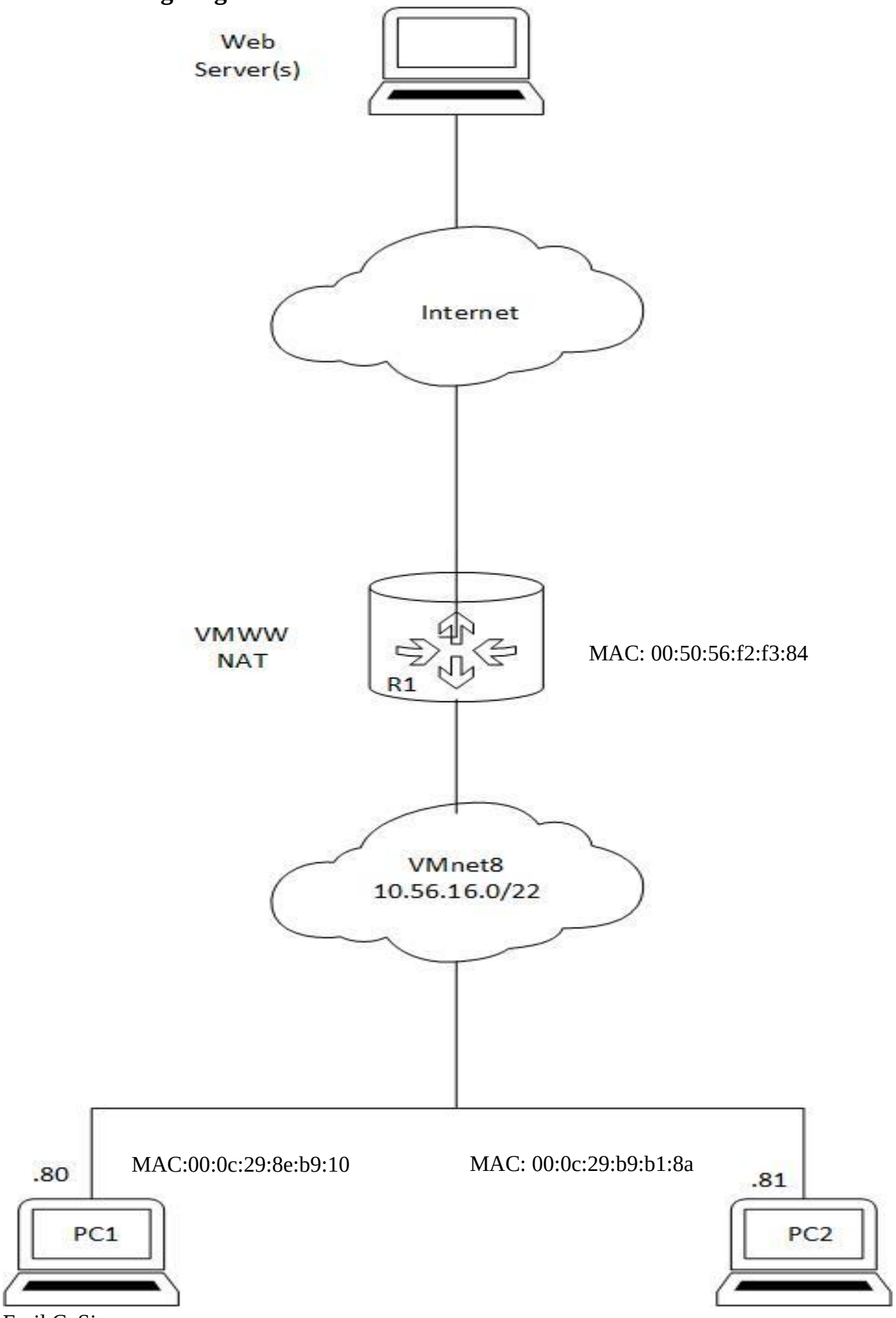
4. Audience

- Anybody wanting to learn how to setup a virtual machine network environment using Raspberry Pi buster as a base. And checking the ip's and mac addresses of the Vm's

5. Inventory

- PC
- WMWW
- Raspberry Pi buster OS

6. Networking diagram



7. Install Raspberry Pi Buster OS on Virtual machine in VMWW

For installing and setting up the Raspberry Pi Buster OS on a virtual machine in VMWW
Please follow this guide by Per Dahlstorem

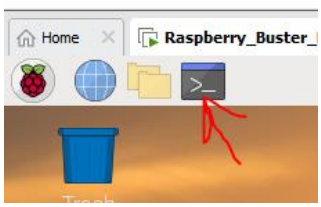
https://gitlab.com/PerPer/networking/-/blob/master/Semester_Literature/2_semester_network_literature/Raspberry/Raspberry_Installation_on_VMW_Workstation_Pi_pda_V09_p_27-47.pdf

If followed correctly it should look like this:

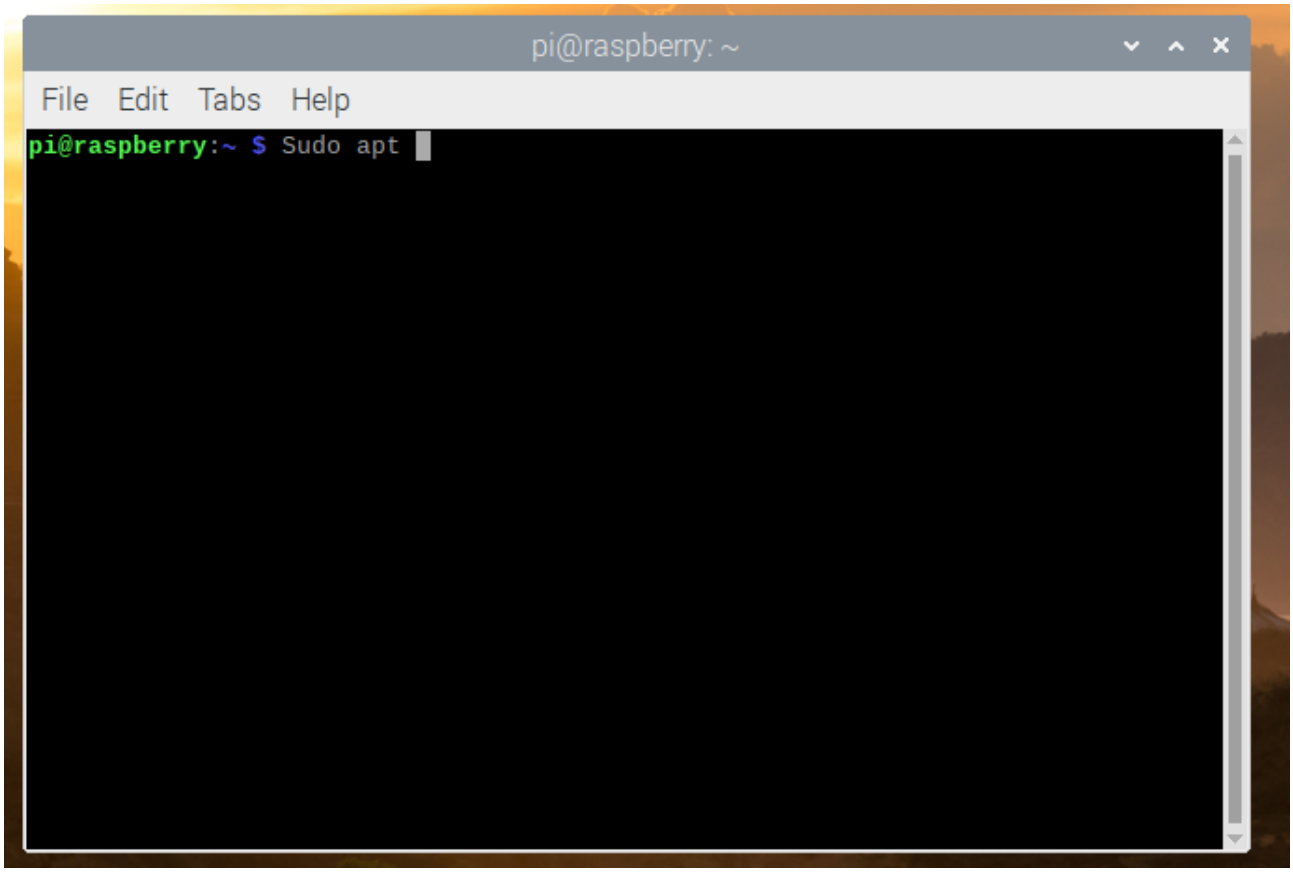
8. Install networking software

The software that needs to be installed on the Raspberry Pi Buster base is

- Wireshark (Ethernet capturing and monitoring GUI software.)
- Cpdump (app to capture live TCP/IP packets on a network interface)
- Putty (Terminal program.)
- Net-tools (arp, hostname, ifconfig, netstat, route).
- Bridge-utils (Utility to create and manage bridge devices.)
- Iproute2 (ip commands like: ip route)
- Curl (curl is a command line tool to transfer data to or from a server.)
- Ufw (Uncomplicated Firewall is a program for managing a netfilter firewall)
- Network-manager (type “sudo apt-get network-manager” for this software)
- Network manager gnome (type “sudo apt network-manager network-manager gnome)



To install this software open terminal



In the terminal the base command we are going to be using is “sudo apt (software name in lowercase)”

Start by typing “sudo apt update” followed by “sudo apt upgrade” to update and upgrade the system.

Now type in “sudo apt (software name in lowercase)” for each of the software on the list

Lastly remove dhcpcd with this command “sudo apt remove dhcpcd

9. Cloning Raspberry Pi Buster in VMWW

For a detailed guide on cloning, you base machine please follow the guide in the paper for “Assignment 2 VMnet8, Network diagrams, Linux software, static IPs and traffic monitoring” The guide in the paper is for Xubunto machines but the procedure is the same

Quick guide.

- Right click the Raspberry base in the library.
- Select manage
- Press clone
- Check “Clone current state of the virtual machine”, hit next
- Check “Create full clone”, hit next
- Name it and pick a location for the clone on your computer.
  Repeat for pc 2

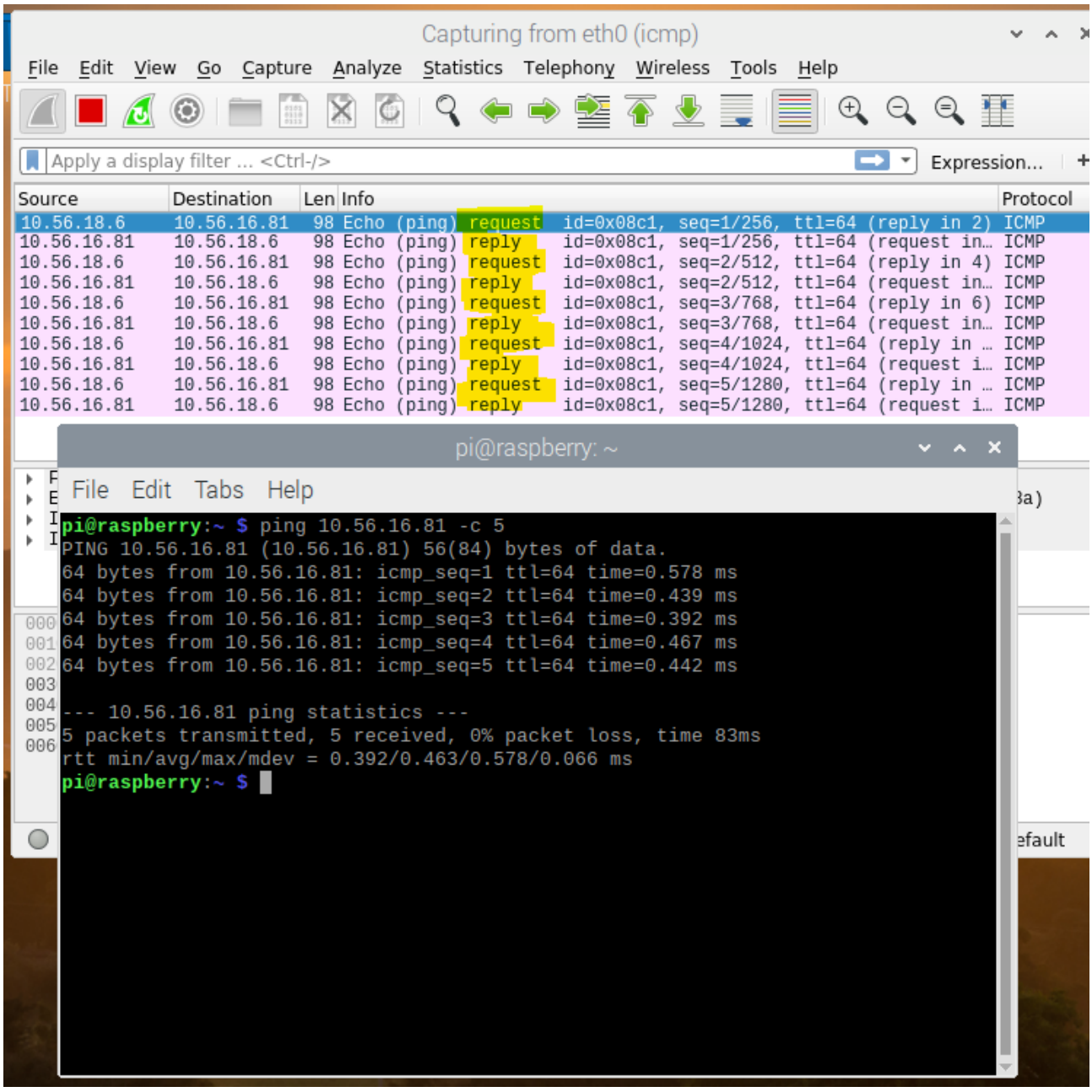
Once the base has been cloned twice follow this guide on setting up a static connection on both.
https://gitlab.com/PerPer/networking/-/blob/master/Semester_Literature/2_semester_network_literature/Raspberry/Raspberry_Network_Per_Dahlstroem_UCL.md

Remember that the connection type is Ethernet not wired as he guide says.

The Ip for PC1 is 10.56.16.80
The Ip for PC2 is 10.56.16.81

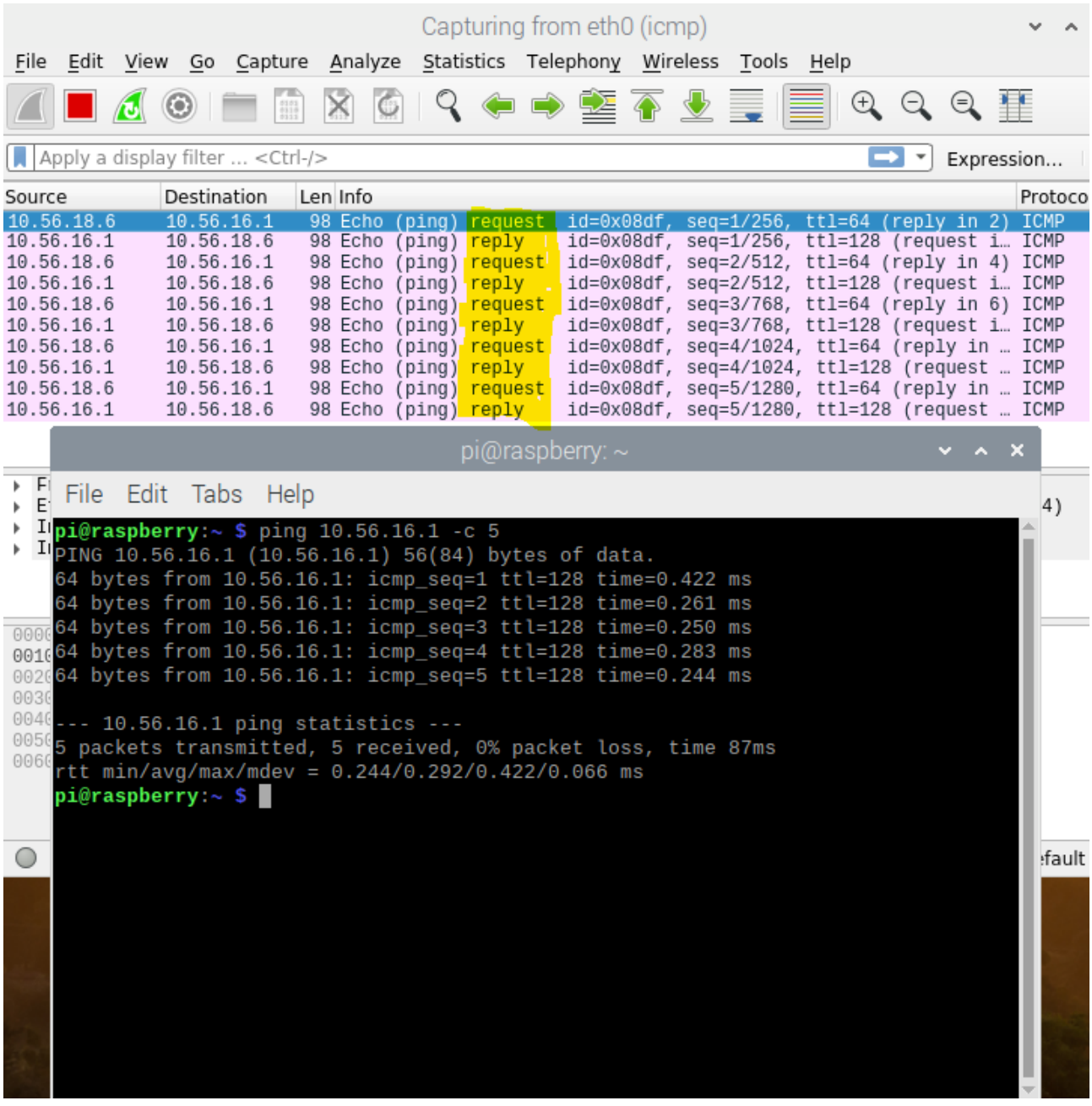
10. Using ping to verify connectivity between networking devices Pc1 and Pc2 + Wireshark

For a detailed guide on how to use Wireshark please look up the paper on "Assignment 2 VMnet8, Network diagrams, Linux software, static IPs and traffic monitoring"
The guide in the paper is for Xubunto machines but the procedure is the same



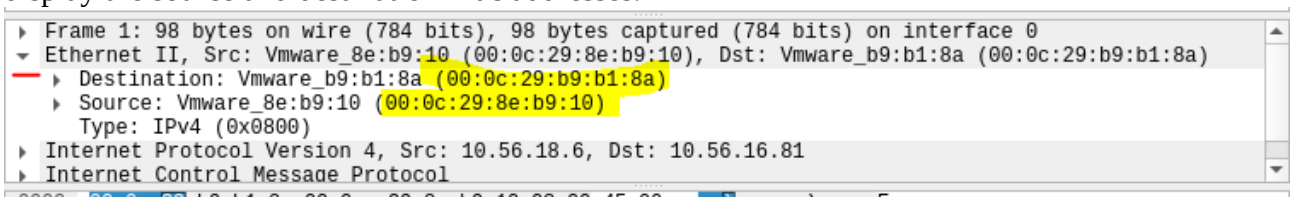
Pinging 10.56.16.81 from PC2 form PC1 Shows that there is connectivity between the two computers. Wireshark shows that all ping requests was meet with a reply.

Request/reply	Source IP + MAC	Destination IP + MAC
Request	IP 10.56.16.6 MAC 00:0c:29:8e:b9:10	IP 10.56.16.81 MAC 00:0c:29:b9:b1:8a
Reply	IP 10.56.16.81 MAC 00:0c:29:b9:b1:8a	IP 10.56.16.6 MAC 00:0c:29:8e:b9:10



Pinging the router (10.16.56.1) yields same result, showing that the computer has access to the router.

To find the Mac addresses in Wireshark look in the second box, press the arrow by Ethernet to display the source and destination Mac addresses.



Request/reply	Source IP + MAC	Destination IP + MAC
Request	IP 10.56.18.6 MAC 00:0c:29:8e:b9:10	IP 10.56.16.1 MAC 00:50:56:f2:f3:84
Reply	IP 10.56.16.1 MAC 00:50:56:f2:f3:84	IP 10.56.18.6 MAC 00:0c:29:8e:b9:10

11. Compare the IP and MAC addresses found in Wireshark with IP and MAC addresses found in CMD

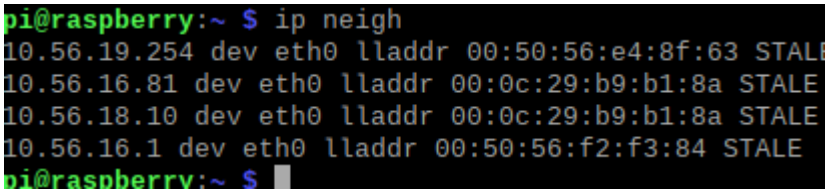
Device	IP (CMD)	MAC (CMD)	IP(Wireshark)	MAC(Wireshark)
.1		00:50:56:f2:f3:84		00:50:56:f2:f3:84
Respberry_buster_PC1		00:0c:29:8e:b9:10		00:0c:29:8e:b9:10
Respberry_BusterPC2		00:0c:29:b9:b1:8a		00:0c:29:b9:b1:8a

12. ARP table

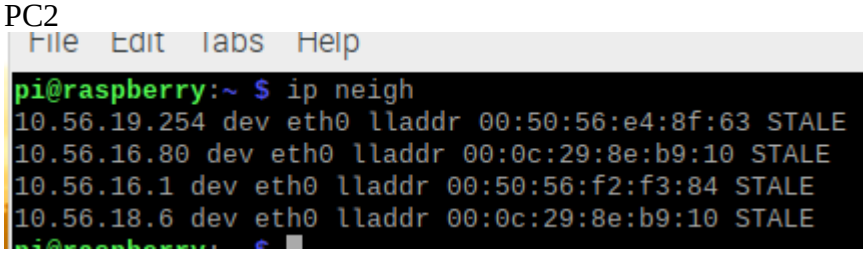
Device name	IP address	MAC address
.1 Gateway	10.56.16.1	00:50:56:f2:f3:84 MAC
.6 Gateway	10.56.18.6	MAC 00:0c:29:8e:b9:10
Raspberry_Buster_PC1	10.56.16.80	MAC 00:0c:29:8e:b9:10
Raspberry_Buster_PC2	10.56.16.81	MAC 00:0c:29:b9:b1:8a

13. Using ip neigh Linux command to inspect ARP table on the clones

PC1



PC2



PC1 and PC2 both have the Mac and IP addresses which was assumed in the manual table
So does the two gateways viable in Wireshark .1 and .6
However .254 and .10 was not on the manual table, this is presumably caused by the network adaptor but it remains uncertain.

14. Conclusion

In conclusion the setup of the Raspberry VM and cloning aswell as software installation was all done correctly however there seems to have been made an error when setting up the internet connection and as a result there is some interference form the network adapter, presumably that's the reason why the gateway changes (needs confirmations form Per)

However all of the learning goals for the assignment has been meet.

15. Sources

- Installing and setting up a Raspberry Pi Buster OS in WMWW
  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

- Setting up a static connection
  https://gitlab.com/PerPer/networking/-/blob/master/Semester_Literature/2_semester_network_literature/Raspberry/Raspberry_Network_Per_Dahlstroem_UCL.md