NET-1 LAB REPORT

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Acknowledgement

We want to thank the professor for helping us throughout the lab and providing valuable insights, and for cracking jokes and being friendly with us.

Goal of the Lab

The aim of the lab was to apply the concepts of computer networks taught in the theoretical classes. We learnt to configure IP networks from scratch, and ultimately create a large computer network comprising of many small sub-networks. We used Ethernet medium, added routes to the routing table, monitored traffic using wireshark, and got introduced to the various networking commands used in the Terminal on Linux.

Overview

A subnetwork or subnet is a logical subdivision of an IP network: The practice of dividing a network into two or more networks is called subnetting.

Computers that belong to a subnet are addressed with an identical most-significant bit-group in their IP addresses.

Each table in our practical was composed of 4 workstations, each comprising of 3 networking interfaces: eth0, eth1 and eth2 (eth standing for ethernet connection). Eth1 was prohibited from being tampered with since it was used for administrative purposes, and hence we used eth0 and eth2 connection ports on our workstations to make the sub-networks.

During the course of our experiment, we encountered and learned various concepts like:

IP Address: An Internet Protocol address (IP address) is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication, e.g., 192.168.1.15/24. An IP address serves two main functions: host or network interface identification and location addressing.

MAC Address: A media access control address (MAC address) of a device is a unique identifier assigned to a network interface controller (NIC). For communications within a network segment, it is used as a network address for most IEEE 802 network technologies, including Ethernet and Wi-Fi.

ARP Mechanism: The Address Resolution Protocol (ARP) is a communication protocol used for discovering the link layer address, such as a MAC address, associated with a given internet layer address.

The Address Resolution itself is a two step process – a request and a response.

It starts with the host broadcasting an ARP Request message to all the computers on the network since it does not know the intended target. The ARP Request has the target MAC address and the source MAC address in it and hence the computers with IP address different from the destination one reject the request.

The intended target PC sends an ARP Reply to the host since it knows the target MAC Address. This way communication is established on the network.

Router: A router is a networking device that forwards data packets between computer networks. A router is connected to two or more data lines from different IP networks.[b] When a data packet comes in on one of the lines, the router reads the network address information in the packet header to determine the ultimate destination. Then, using the information in its routing table or routing policy, it directs the packet to the next network on its journey.

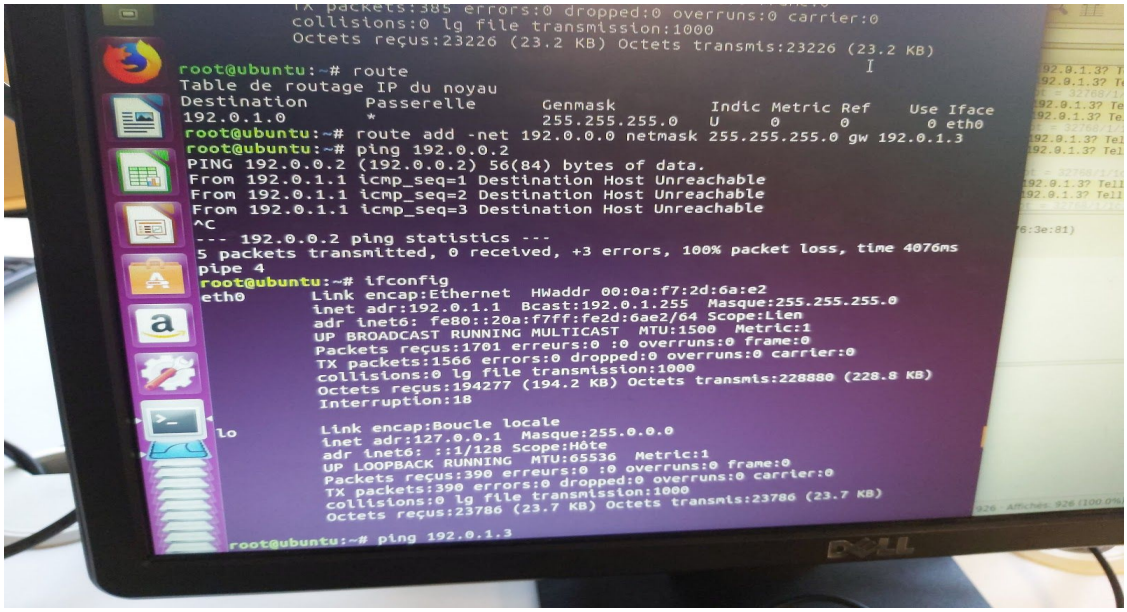
In our case, we made one of the PCs on our half table a Router to establish a connection between two different subnetworks so as to exchange information among any of the four PCs.

Wireshark: Wireshark is a free and open-source packet analyzer. It is used for network troubleshooting, analysis, software and communications protocol development, and education.

We could monitor the entire traffic on the network which included the ping requests and replies from this platform and gather useful information like headers related to IP, ethernet and ICMP.

Our Experience

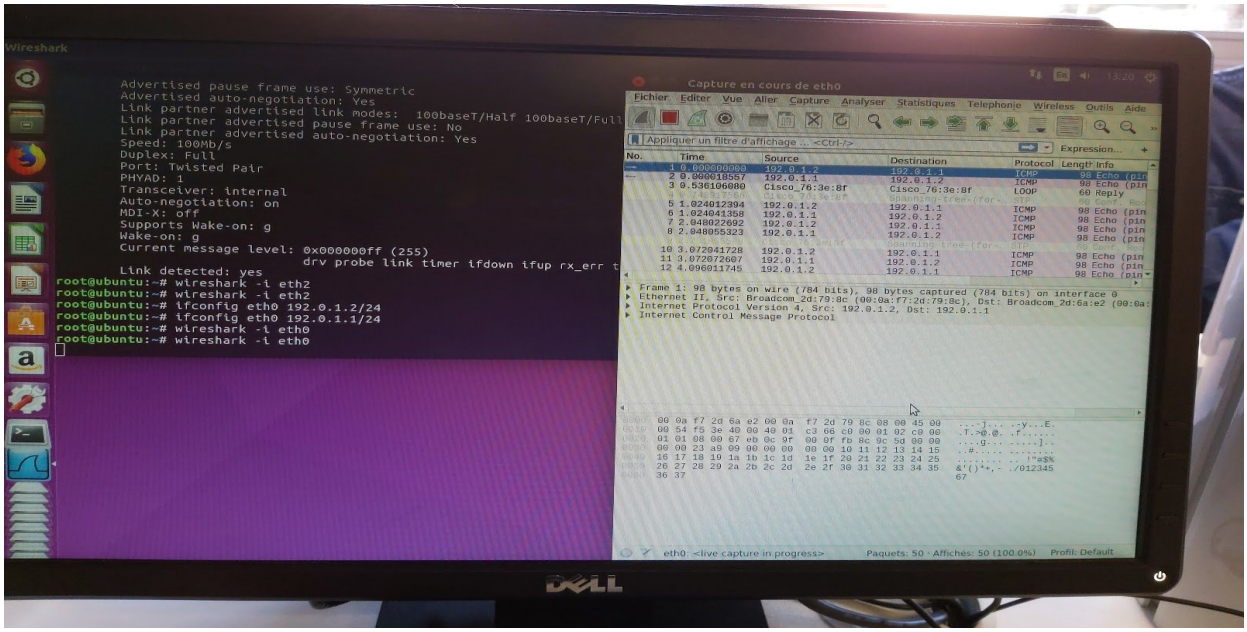
- The sub network was created in our particular case by connecting the eth0 port of one of our computers, which was present on the main router in the lab, with the eth0 port of another computer on the same half table. In this fashion, we created the hardware profile for 2 sub networks.
- We used Terminal on Ubuntu to set up and configure the network. We entered all the commands as the super user Root.
- We used the command ifconfig to enable and disable the eth interfaces, and ethtool to know all the technical details of an interface.
- To be able to communicate inside the subnetwork, we needed to assign an IP address to each interface in the computer. We used the command *ifconfig eth0 192.x.y.num/24* We gave the following IP addresses to our computers:
    - 192.0.0.1 and 192.0.0.2 for subnet-1
    - 192.0.1.1 and 192.0.1.2 for subnet-2
    - We got the x and y values for our workstations from the board where the map was made.



- After setting the IP address and enabling the interface, the connection was established and the subnet was up and running. To test out the communication, we used the *ping* commands which is a two way communication between the

computers in the subnet. At first we had 100% packet loss but on reconfiguring the IP addresses we were able to make it work. We got a sequence of data packets being sent to the other computer as well as the time required for the communication.

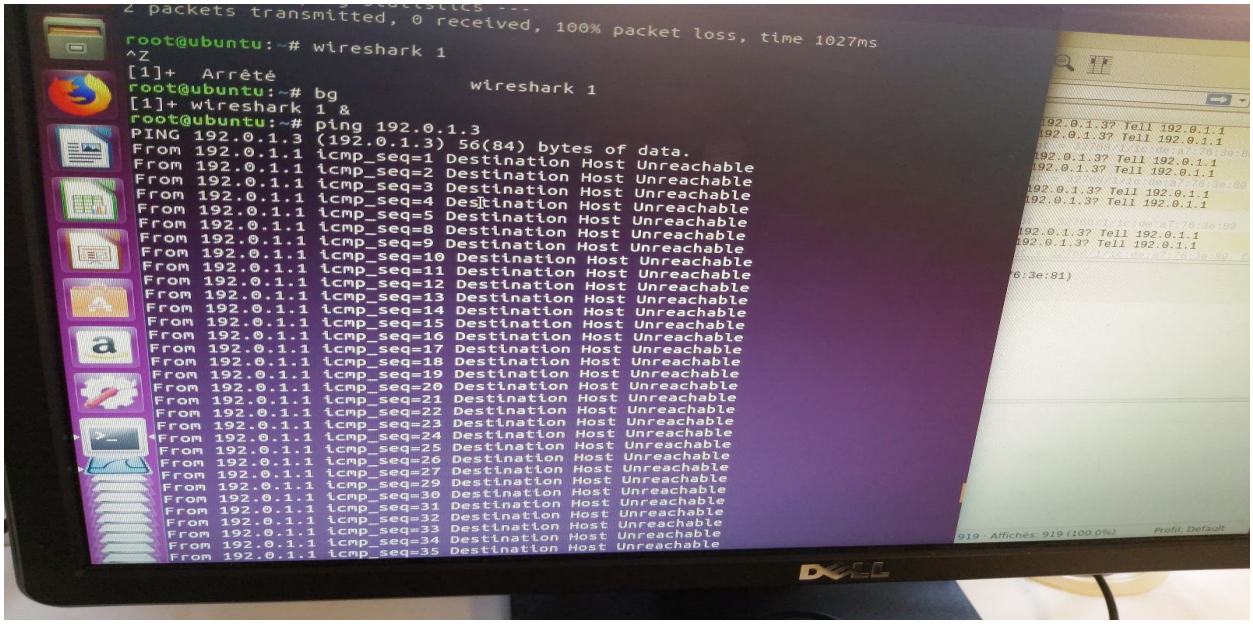
- On the other computer in the subnet, we used *Wireshark* to get a detailed log of the two way communication between the computers. We could see the very fast data transfer. We also viewed more information such as the headers, the MAC addresses of source and destination and the IP address source and destination for the network communication.



- To create a subnet of 4 computers, we used eth2. We made one of the workstation as the router between the two subnets and connected the eth2 of this workstation to the other subnet. We assigned a different IP address to the router- 192.0.1.3
- We set up a route in the routing table using the command *route add -net* followed by the desired route specifications. We could view the routing table using the *route* command. To configure the router, we used the *echo* command. This way, we had set up a subnetwork consisting of 4 computers.
- We executed a ping command using the router and were able to communicate between the two subnetworks. We ultimately had to create the network of all the computers, but due to several hurdles and time constraint, were not able to do so. However, the professor explained the procedure and we gained useful insight from it.

Challenges

- The terminal on our workstation was in French, so we faced difficulty in understanding the commands, prompts and instructions.
- The keyboards on all of our workstations were AZERTY but worked like QWERTY, and we had to keep guessing the keys in order to type any command.
- Some of the wires were faulty and the connection couldn't be established even after connecting them, and we weren't able to ping each other. So we had to change them and we spent a lot of time on figuring out the issue.
- We faced some trouble while creating one master workstation as the router, and creating routes for successful ethernet connection between two different subnets. The destination was unreachable while sending a ping request.



Feedback

The lab handout provided to us was not descriptive enough for us to carry out our practical work. The instructions on occasions were a little unclear and non sequential, so we faced a lot of problems in smoothly completing our lab assignment.

Since there were a lot of students with difficulties and only a single professor to help everyone, so it would have been a little easier if a second helping hand was available.