Practice 1

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Label of PC used: Personal computer

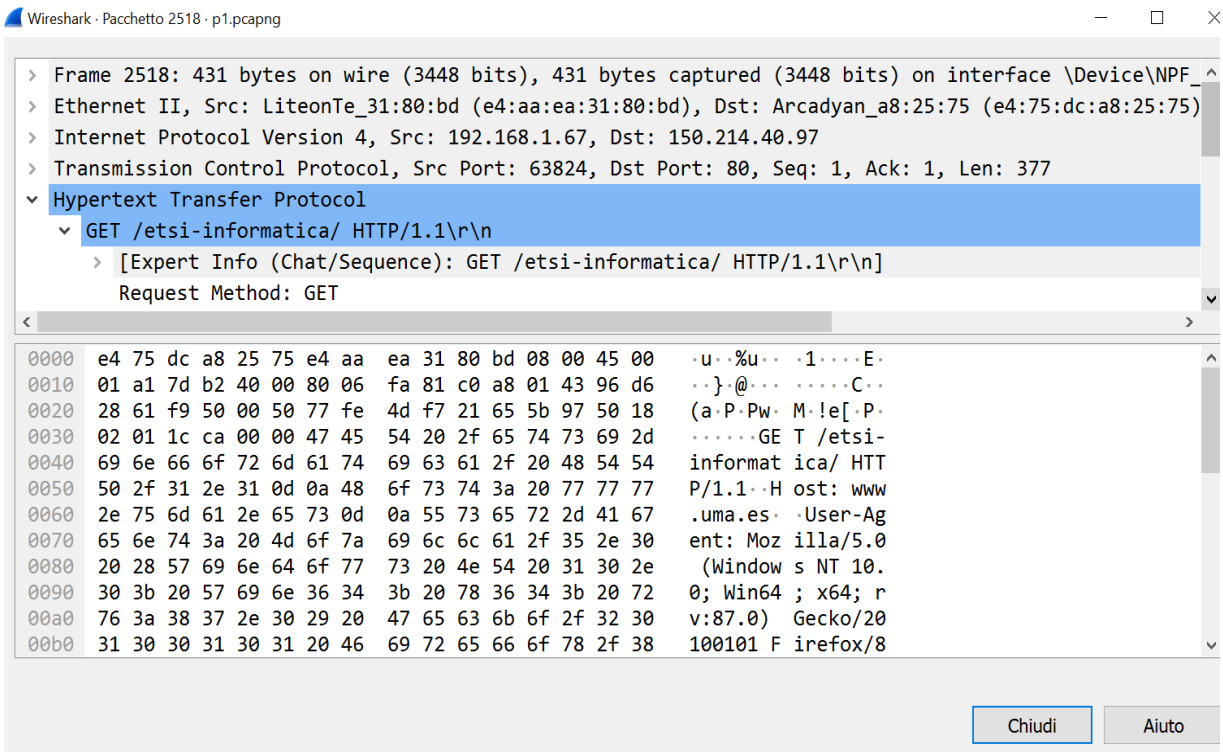
Exercise 1. Choose any http message, and find in the Ethernet II header the following information (make screenshots of the following data):

Frame number analysed: 2518
MAC address information of your computer.

MAC Address (in hexadecimal): e4 aa ea 31 80 bd
NIC Manufacturer (in hexadecimal): e4 aa ea name: LiteonTe
NIC serial number (in hexadecimal): 31 80 bd

MAC address information of gateway/router.

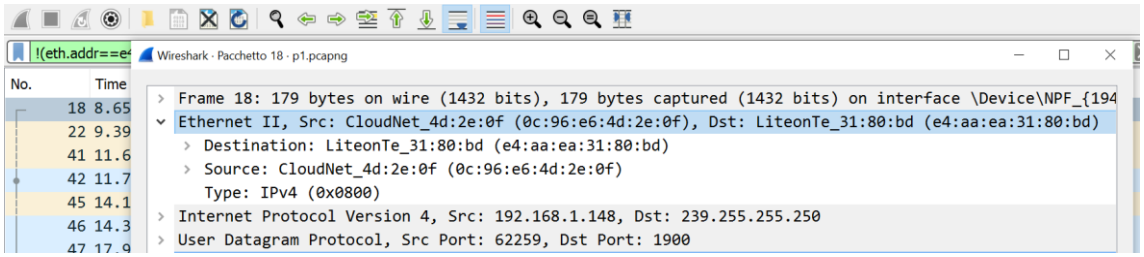
MAC Address (in hexadecimal): e4 75 dc a8 25 75
NIC Manufacturer (in hexadecimal): e4 75 dc name: Arcadyan
NIC serial number (in hexadecimal): a8 25 75



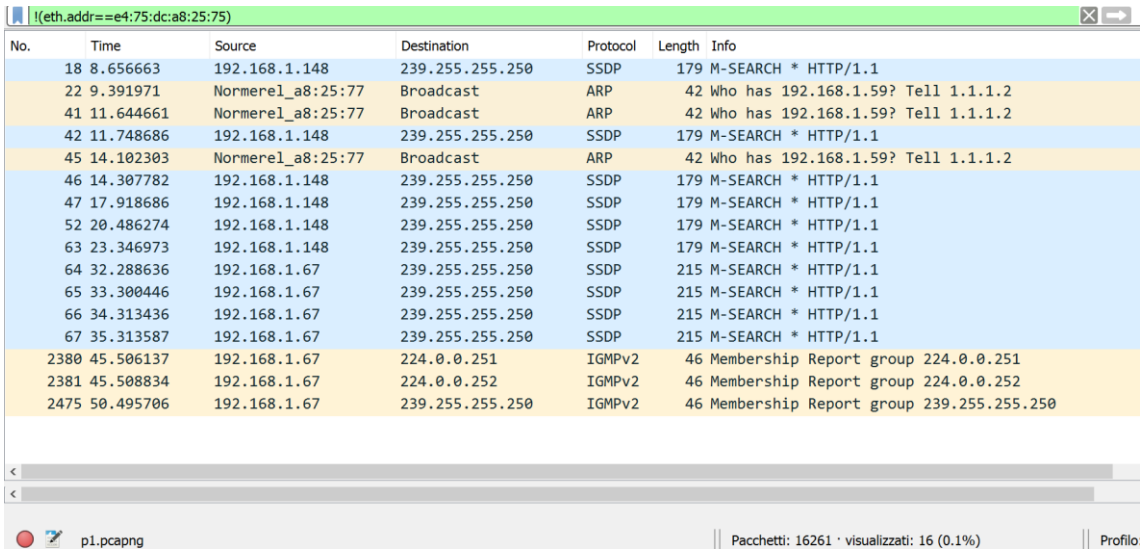
Exercise 2. Which filter do you apply to show all the frames where your MAC address is not used?

- Filter: !(eth.addr == e4:75:dc:a8:25:75)
- How many frames do you receive? 16
- Why do you receive these frames? (To answer this question, observe the features of the destination MAC addresses used by those frames) Because I excluded the frames with my MAC address, so in the features of the destinations MAC addresses I have another MAC address: e4:aa:ea:31:80:bd.

Example Frame 18:



Filter applied in Wireshark:



Exercise 3. Draw the protocol stack (as see in class – the lower level protocols in the bottom) that corresponds to one ARP packet, one ICMP packet, one DNS packet and one HTTP packet:

- Protocol stack of an ARP package (number of selected frame: 41)
- Protocol stack of an ICMP package (number of selected frame 2518)
- Protocol stack of a DNS package (number of selected frame: 20)
- Protocol stack of an HTTP package (number of selected frame: 17)

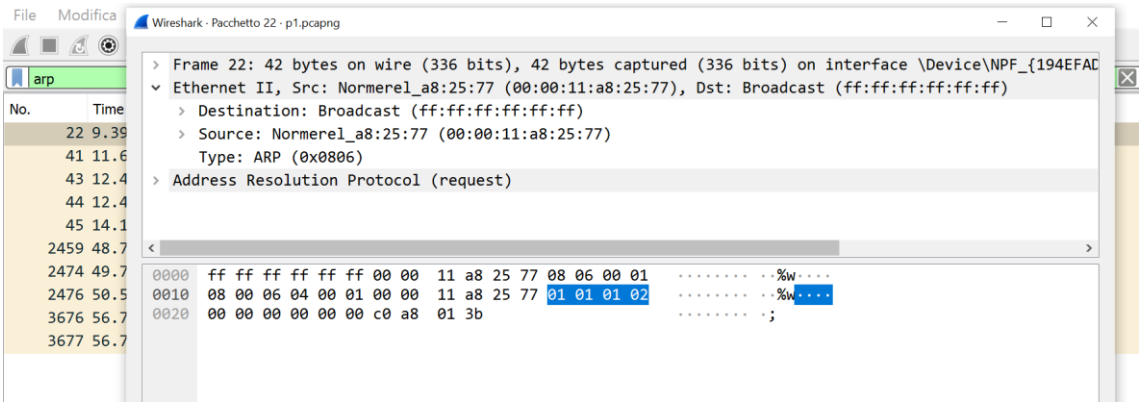
	ARP	*ICMP*	*DNS*	*HTTP*
Application			DNS	HTTP
Transport			UDP	TCP
Internet		IP/ICMP	IP	IP
Data Link	ETHERNET II/ARP	ETHERNET II	ETHERNET II	ETHERNET II

Exercise 4. Observe carefully the Ethernet II **type** field in the obtained trace for each one of the previous messages. Fill the following table and answer the questions:

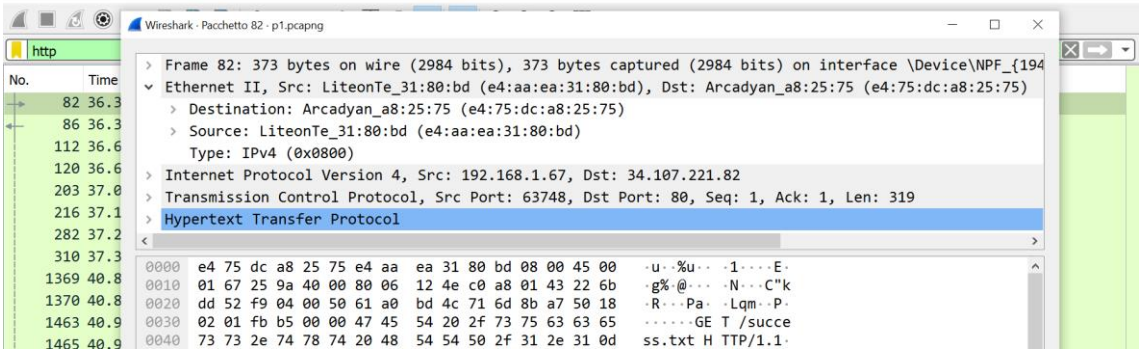
	Ethernet II header type	
	Hexadecimal	**Text**
ARP	0X0806	ARP
HTTP	0X0800	IPv4
ICMP	0X0800	IPv4
DNS	0X0800	IPv4

- What is this field? This field contains a hexadecimal value that is used to indicate the type of upper-layer protocol in the data field.
- Why is it the same for different frames? Because they are using the same protocol

Example ARP:



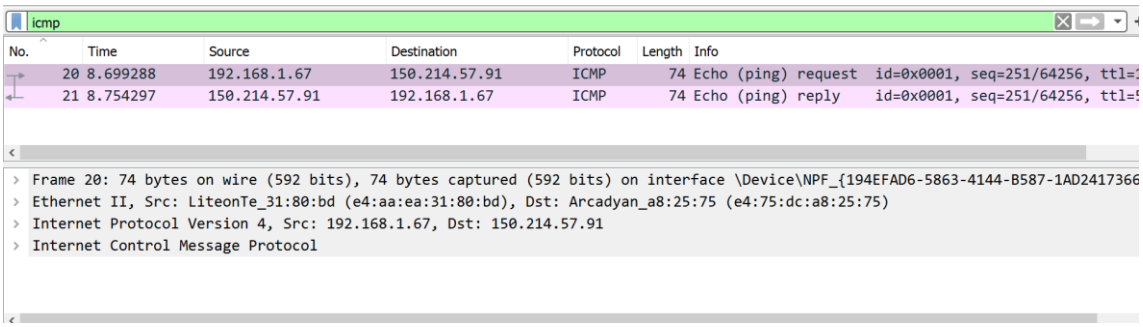
Example HTTP:



Exercise 5. In Wireshark observe **the difference between the time** of the first request ICMP (`Echo (ping) request`) and its answer (`Echo (ping) reply`):

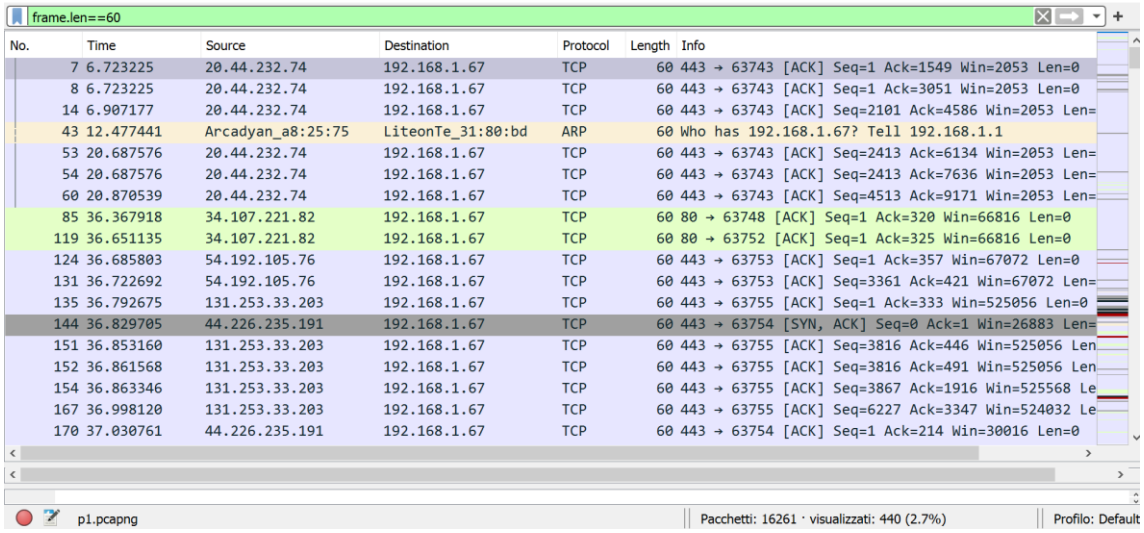
- Write down the specific frame numbers chosen: 20 and 21
- How much time has passed (in milliseconds)? (8,754297-8,699288) = 0,055009ms
- To which concept, taught in the lectures, matches that time? To the RTT (Round Trip Time)

Frames 20 and 21:



Exercise 6. Based on the lectures, the Ethernet frames must have a **minimum size of** 64 bytes. Wireshark does not show the CRC field, as it is automatically handled by the network card. Hence, the frame that Wireshark shows may have a size of 60 bytes or more:

- Check a frame of size 60 (filter: frame.len == 60).
- How many frames have this feature? 440
- Which mechanisms are used to fill the size if the transmitted data is less than 46 bytes)? It is used the Padding mechanism.



Exercise 7. Simulate that station A sends one frame to the AP having the stations in the two configurations: with/without hidden terminal. After choosing setting, press the start button, and observe stations B and C:

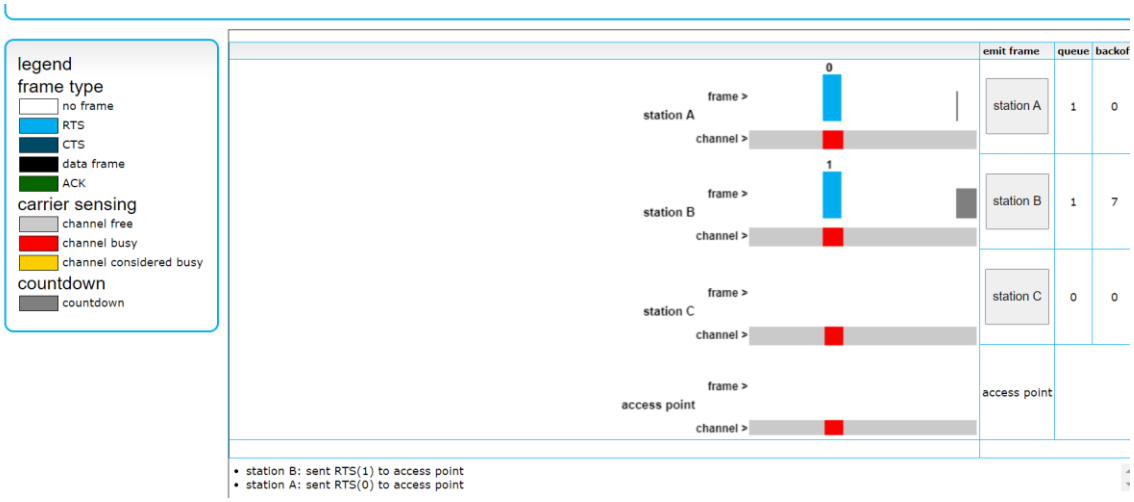
- When does the NAV timer start in each setting? The network allocation vector can be considered as a counter that counts down to zero. The maximum NAV duration is the transmission time required by frame, which is the time for which the channel will be busy. At the start of transmission of a frame, the NAV value is set to its maximum.
  Without the hidden terminal it starts when the station A sends the RTS to the access point.
  With hidden terminal starts after the access point send the CTS to station A.
- Why does it happen? Because a non-zero value indicates that the channel is busy, and so no station contends for it. When the NAV value decrements to 0, it indicates that the channel is free and the other stations can contend for it.
- Take a screenshot of each setting where one can see when the timer starts, and add them to the report indicating in one of them the DIFS and SIFS times observed.

Without hidden terminal:

With hidden terminal:

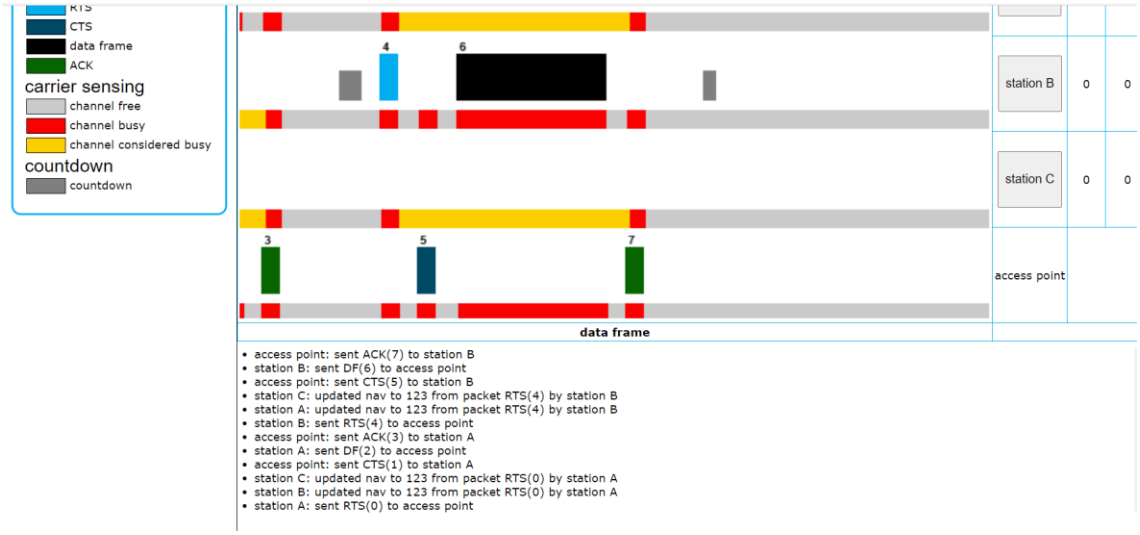
Exercise 8. Without hidden terminal, simulate that stations A and B try to send a frame (press in A and B before clicking Start):

- How does the protocol detect that a collision occurs? It senses the medium after transmitting and detects if the signal being transmitted is different from the signal originally transmitted, in this case it means a collision occurred.
- How is it able to finally send one to the nodes without causing a collision? By retransmitting using the exponential backoff algorithm, until the AP sends out a CTS and puts all other nodes in NAV
- Take screenshots of the whole process and add them to the report.



Exercise 9. Now use both settings (with/without hidden terminal), and continue as follows: press the start button in order to send, but immediately press also B (before the graphical confirmation of A's send):

- Without hidden terminal:
  - Why is not station B starting to send (RTS transmission) before A finishes?
    Because station B is updated to NAV when station A sends the RTS, then it waits until station A finishes.



- With hidden terminal:
  - Why is A not detecting B RTS and AP CTS collision?
    Because the terminal is hidden.

  - Why does B send the RTS when A is sending the frame?
    Because it doesn't sense that station A is sending the frame and it is trying to send its RTS.
  - How is that A's frame is able to correctly arrive?
    It retransmits the frame after every collision until the duration of the countdown of B reaches a time where there is no collision. Then, the AP will send the ACK back to station A verifying that the frame arrived correctly.