Lab Week 2

The Internet Protocols

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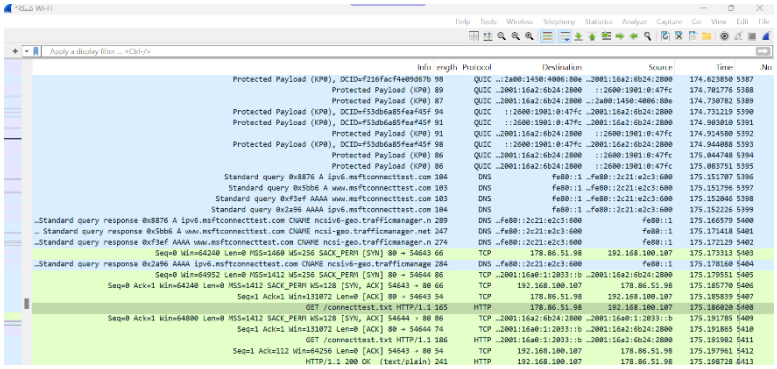
Part 1: Capturing HTTP Traffic.

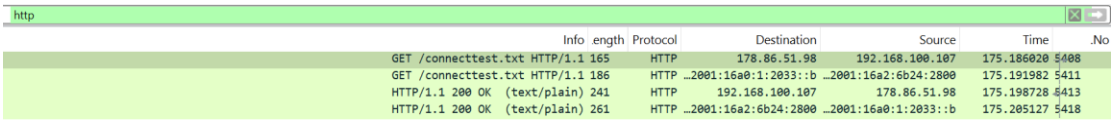
Task 1: Start Wireshark and capture packets.

"I opened Wireshark and Selected the network interface connected to the internet (Wi Fi) and them I Capturing Packets and then Open web browser and navigate to (https://qu.edu.sa) website after the website has fully loaded, stop capturing packets "

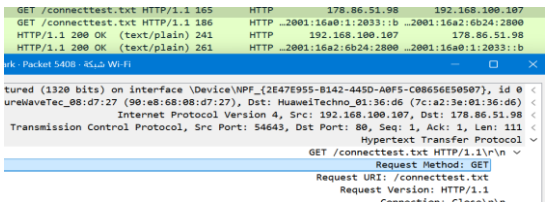


Task 2: Filter HTTP packets and analyze them.

In filter bar, I filter only HTTP packets from the capture, and I found HTTP request messages (GET) also another one with response codes (200 OK):



Here is HTTP request with GET method.

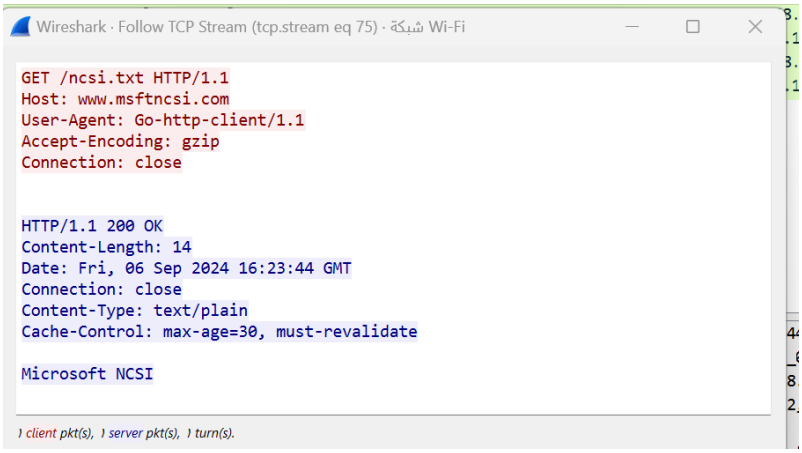


Here is HTTP response with response 200 ok.

Part 2: Analyzing TCP/IP Traffic.

Task 1: Filter TCP packets

Here I Select a TCP packet related to HTTP and select "Follow" -> "TCP Stream", This shows the entire conversation between the client and server.



Task 2: Analyze TCP handshake and investigate Data Transfer and Termination

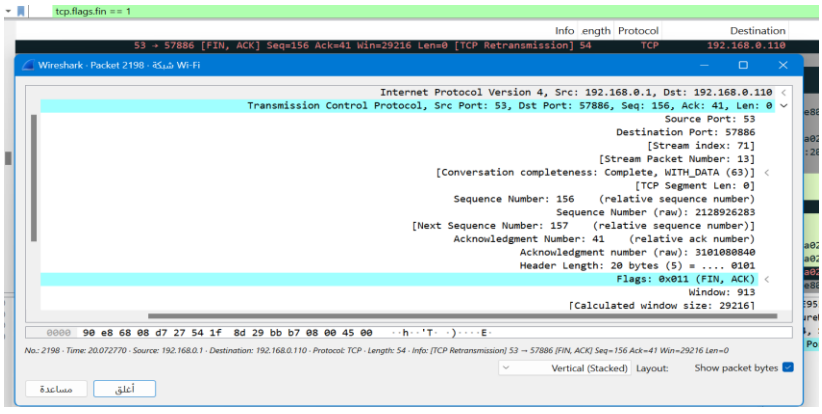
I Find packets related to the TCP three-way handshake (SYN: Initiates a connection, SYN-ACK: Acknowledges and responds to the SYN, ACK: Acknowledges the SYN-ACK and establishes the connection.)

Here sequence and acknowledgment numbers.

Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM [SYN] 80 → 55622 66	TCP	2.18.31.89	192.168.100.107	112.066103 3716
Seq=0 Ack=1 Win=64240 Len=0 MSS=1412 SACK_PERM WS=128 [SYN, ACK] 55622 → 80 66	TCP	192.168.100.107	2.18.31.89	112.141839 3718
Seq=1 Ack=1 Win=131072 Len=0 [ACK] 80 → 55622 54	TCP	2.18.31.89	192.168.100.107	112.141971 3719

I use the "Follow TCP Stream" option to view the entire conversation between the client and server. This feature will show the data exchanged in a more readable format.

I looked at the TCP termination process (FIN, ACK packets) by using " tcp.flags.fin == 1" in the filter.



Part 3: Capturing and Analyzing UDP Traffic

Task 1: Generate UDP traffic and capture packets

In the filter bar, I type UDP

```
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.966486 191
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.966652 192
  Len=33 443 → 53817 75        UDP       86.51.76.204     192.168.0.110      2.966726 193
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.966840 194
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.967044 195
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.967304 196
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.967488 197
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.967661 198
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.967857 199
Len=1250 53817 → 443 1292      UDP      192.168.0.110      86.51.76.204      2.968072 200
```

Observe the source and destination ports, length, and data.

```
                                                                    User Datagram Protocol, Src Port: 443, Dst Port: 53817
                                                                                                  Source Port: 443
                                                                                             Destination Port: 53817
                                                                                                       Length: 1258
                                                                                          Checksum: 0xfcdb [unverified]
                                                                                          [Checksum Status: Unverified]
                                                                                                    [Stream index: 1]
                                                                                        [Stream Packet Number: 183]
                                                                                                    [Timestamps]
                                                                                               UDP payload (1250 bytes)
                                                                                                    Data (1250 bytes)
: 4df2c857d8c2b348616f48ae17bccf8e1d4606194cc45625e411f36f4037463e04a19b0ac06e34c382a2ebcb396fe0209b5c4d754bf9beefd103a70b46b11f9011e1
                                                                                                    [Length: 1250]
```

Compare the simplicity of UDP headers with TCP headers:

The UDP header is much simpler, consisting of only 4 fields while TCP header is significantly more complex because TCP offers features like connection establishment, reliability, flow control, and congestion control. The TCP header consists of 10 mandatory fields

Part 4: Comparing TCP and UDP by filling in the following tables. Save your work (e.g., in an MS Word document), and upload it to your online git repo.

Task 1: Fill in the following table and provide reasons.

	TCP or UDP	Reasons
Reliability and Connection Establishment	TCP	TCP uses acknowledgments (ACKs), Error Detection and Correction and Sequencing, unlike UDP
Data Integrity and Ordering	TCP	Each TCP segment includes a checksum for error detection, Guaranteed Ordering, Acknowledgments and Retransmissions, Error Detection and Correction unlike UDP

Task 2: Identify the use Cases and Performance of TCP and UDP.

	TCP	UDP
Use case	• Web browsing • Email • File Transfer	• Live video • Online gamming • Audio streaming
Performance	Reliability, Throughput, Latency, Overhead, Connection-Oriented Nature, Data Ordering and Performance Optimization Techniques	Optional checksum enables error detection, while minimal overhead, lack of connection setup, and small headers ensure high throughput, low latency, and reduced overhead.