Introduction to Programming & Networking for Electrical Engineering
Lab 05– Networking

E/21/291
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[i] List the protocols involved in the communication.

- IP
- HTTP - HYPERTEXT TRANSFER PROTOCOl used by web applications
- TCP - transfer control protocol used by Transport layer
- DNS - domain name system protocol used to resolve web addresses

[ii] Justify the purpose of each protocol used in downloading a web page.

- IP (Internet Protocol): Ensures that data packets are correctly addressed and routed between the web server and the recipient.

- TCP (Transmission Control Protocol): Establishes and maintains a reliable connection, organizes packets in the correct order, and guarantees delivery through acknowledgments.

- DNS (Domain Name System): Converts the domain name entered in the browser into its corresponding numeric IP address.

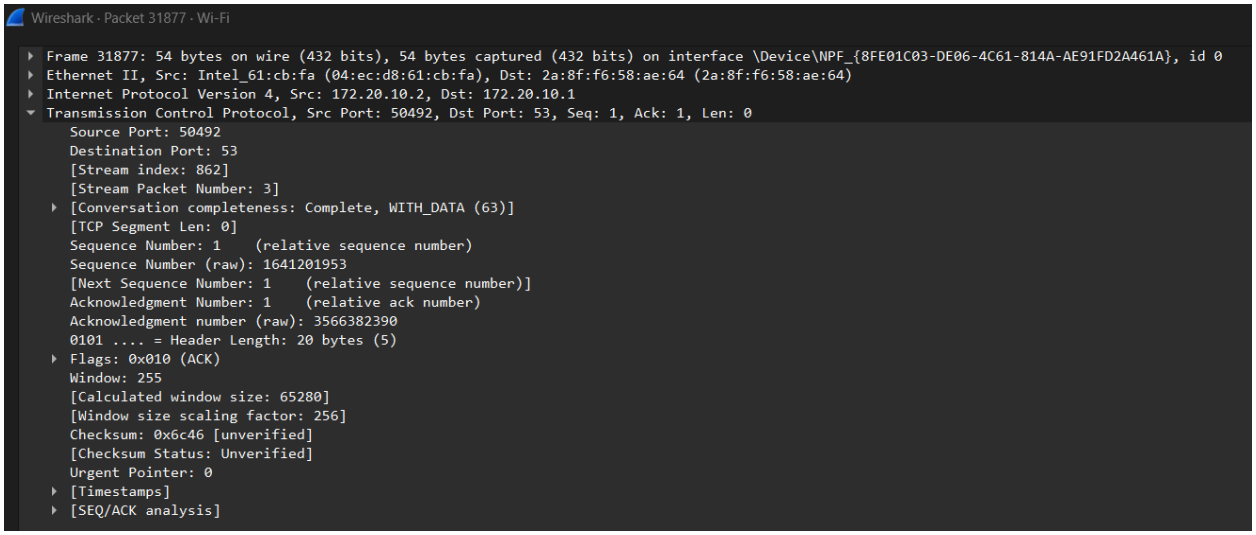
- HTTP (Hypertext Transfer Protocol): The primary application-layer protocol responsible for sending GET requests to web servers and retrieving HTML content.

[iii] Identify the packets that establish the TCP connection between the client and server (3- way handshake).

The TCP three-way handshak**e** establishes a reliable connection between a client and a server. It consists of the following steps,

1. SYN): The client sends a request to initiate a connection, setting the SYN flag.
2. SYN-ACK **:** The server responds, acknowledging the request and agreeing to establish the connection, setting both the SYN and ACK flags.
3. ACK : The client confirms the connection by sending a final acknowledgment with the ACK flag set.

[iv] Capture a TCP packet and list its key parameters (e.g., sequence number,acknowledgment number, flags).



- Source Port : 50492
- Destination Port : 53
- Stream index : 862
- Steam packet Number: 23
- Conversations Completeness: complete with data (63)
- TCPSegmentLen : 0
- SequenceNumber : 1
- Next Sequence Number: 29
- AcknowledgementNumber : 1
- AcknowledgementNumber(raw) :1641201953
- Flags : 0X010(ACK)
- Window : 255
- Checksum : 0x6c46
- Urgentpointer :0

[v] Identify the parameters used for retransmissions, flow control, and congestion control.

- Retransmissions: Occur when an acknowledgment (ACK) is not received within the expected time frame.
  Key parameters: Sequence Number, Acknowledgment Number, Flags.

- Flow Control: Regulates the amount of data that can be transmitted before requiring an acknowledgment, preventing buffer overflow.
  Key parameter: Window size.

- Congestion Control: Manages network congestion by dynamically adjusting the window size to prevent excessive data transmission.
  Key parameters: Congestion Window, Acknowledgment Number.

[vi] Briefly explain how those parameters work in each case.

- Retransmission - If a sender does not receive an ACK within the timeout period, it retransmits the packet. TCP assumes the packet was lost due to network issues or congestion.

- Flow Control (Sliding Window Protocol) - The receiver advertises the amount of data it can handle using the window size, preventing buffer overflow and ensuring smooth data transmission.

- Congestion Control - TCP dynamically adjusts its sending rate based on detected congestion