Course: Cloud and Network Security - C3 - 2025

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Week 1 Assignment 1:

Class Exercise: Examine TCP/IP and OSI Models in Action

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Introduction

This report provides a comprehensive exploration of how data travels across a network by examining the interaction between the TCP/IP protocol suite and the OSI model using Cisco Packet Tracer. In Part 1, the focus was on generating and analyzing HTTP traffic, observing how data is encapsulated and transmitted between a client and a web server. Part 2 expanded the investigation to include other essential protocols such as DNS, ARP, and TCP, highlighting their specific roles in resolving domain names, managing sessions, and ensuring accurate data delivery. By stepping through these processes in Simulation Mode, this activity provided a clear and practical understanding of the complex operations that occur during everyday network communications.

Objectives

Part 1: Examine HTTP Web Traffic

Part 2: Display Elements of the TCP/IP Protocol Suite

Part 1: Examine HTTP Web Traffic

In Part 1 of this activity, I used the Packet Tracer (PT) Simulation mode to generate web traffic and examine HTTP. Below are the steps I followed as directed by the instructions given.

Step 1: Switching from Realtime to Simulation

a. Opened Packet Tracer and ensured the provided topology was loaded.
b. Located the Simulation/Realtime toggle button at the bottom-right corner of Packet Tracer.
c. Clicked the Simulation mode icon to switch from *Realtime* to *Simulation*.
d. Opened the Edit Filters option:

- Cleared all checkboxes using Show All/None.
- Selected HTTP only (under the *Misc* tab).
- Closed the filter window to display only HTTP traffic.

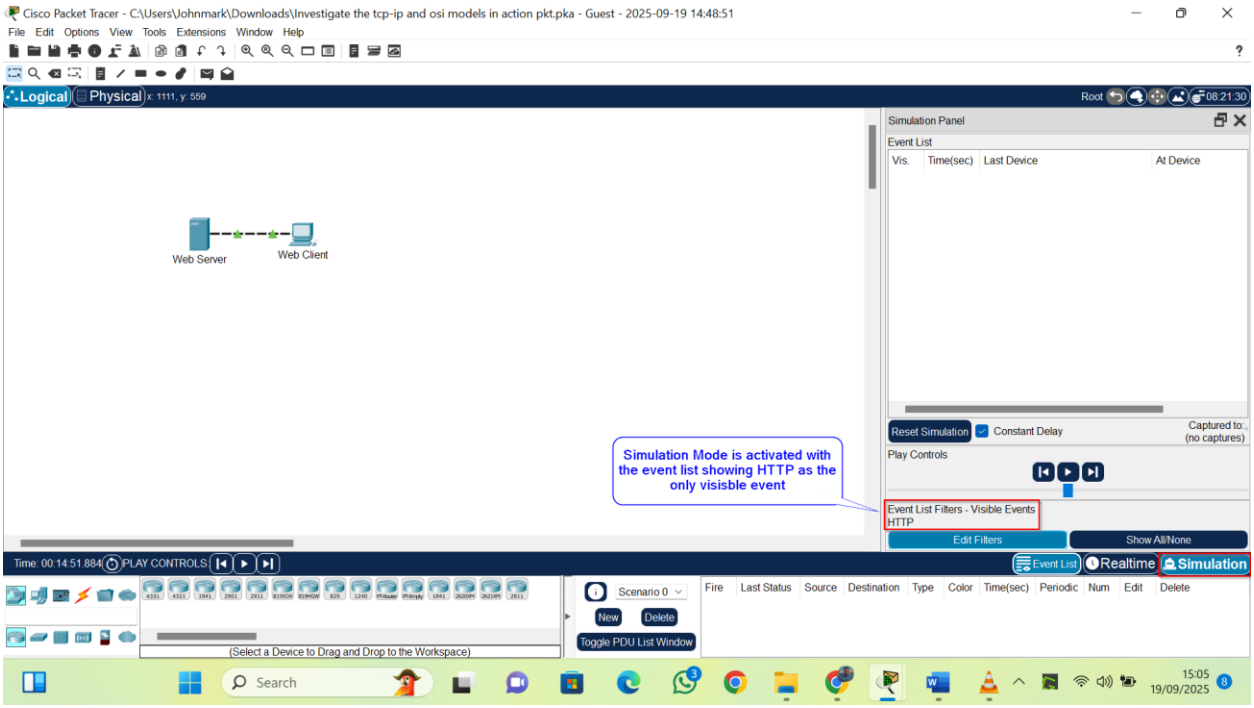


Image 1: Simulation mode enabled showing only HTTP events.

Step 2: Generating HTTP Traffic

Step two of the assignments required me to generate HTTP traffic. To do that I followed the following steps as requested.

a. Selected Web Client from the left pane.
b. Navigated to Desktop then Web Browser.
c. In the browser URL field, entered: www.osi.local
d. Clicked Go to request the webpage.
e. Used the Capture/Forward button four times to capture four HTTP events.

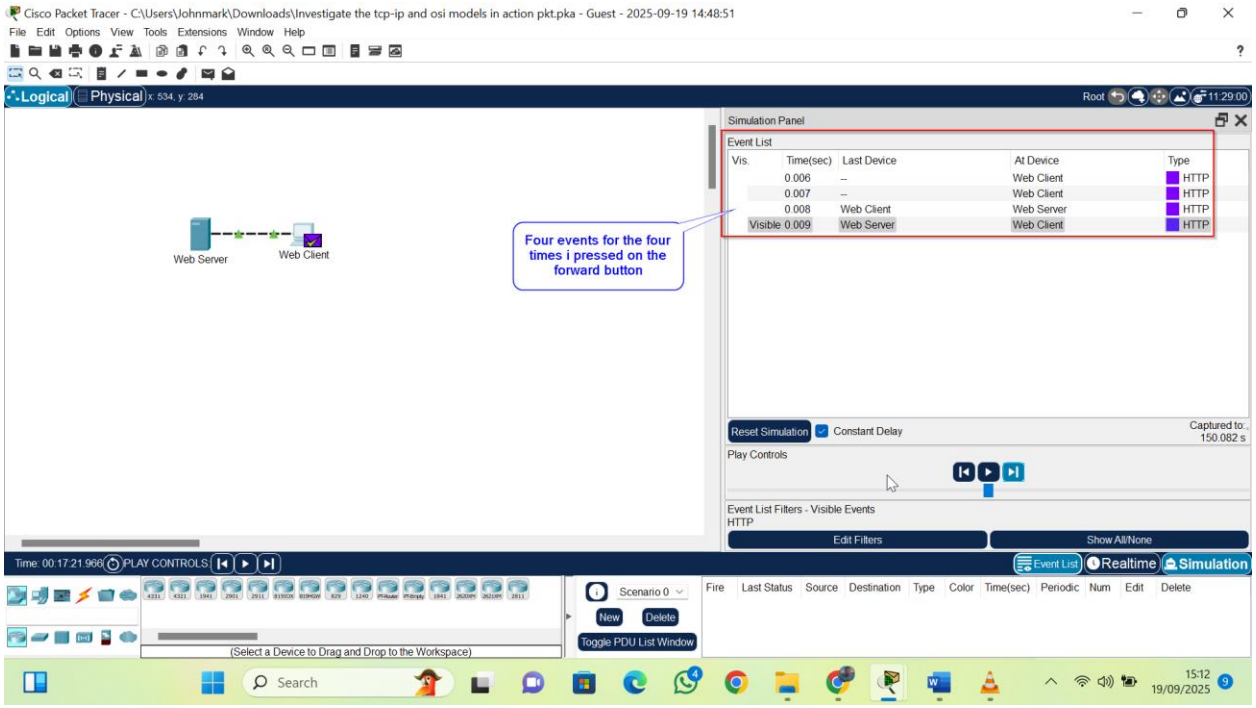


Image 2: Web browser showing the request and Simulation panel showing events.

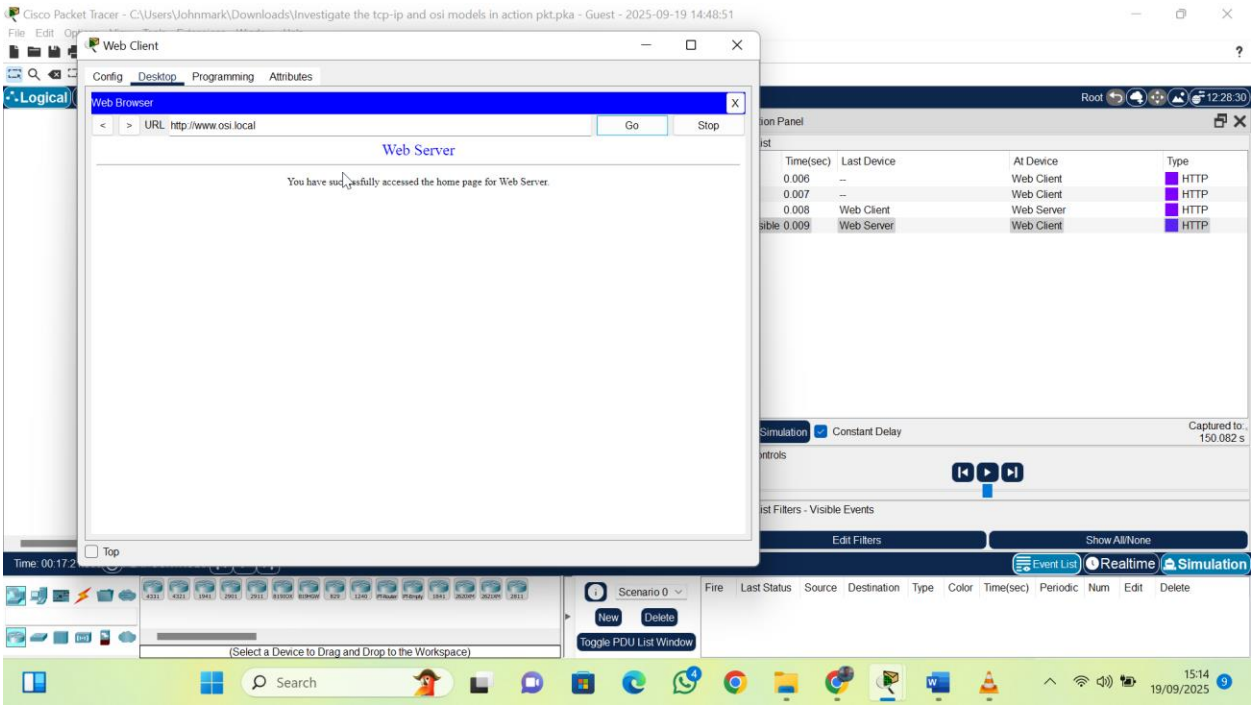


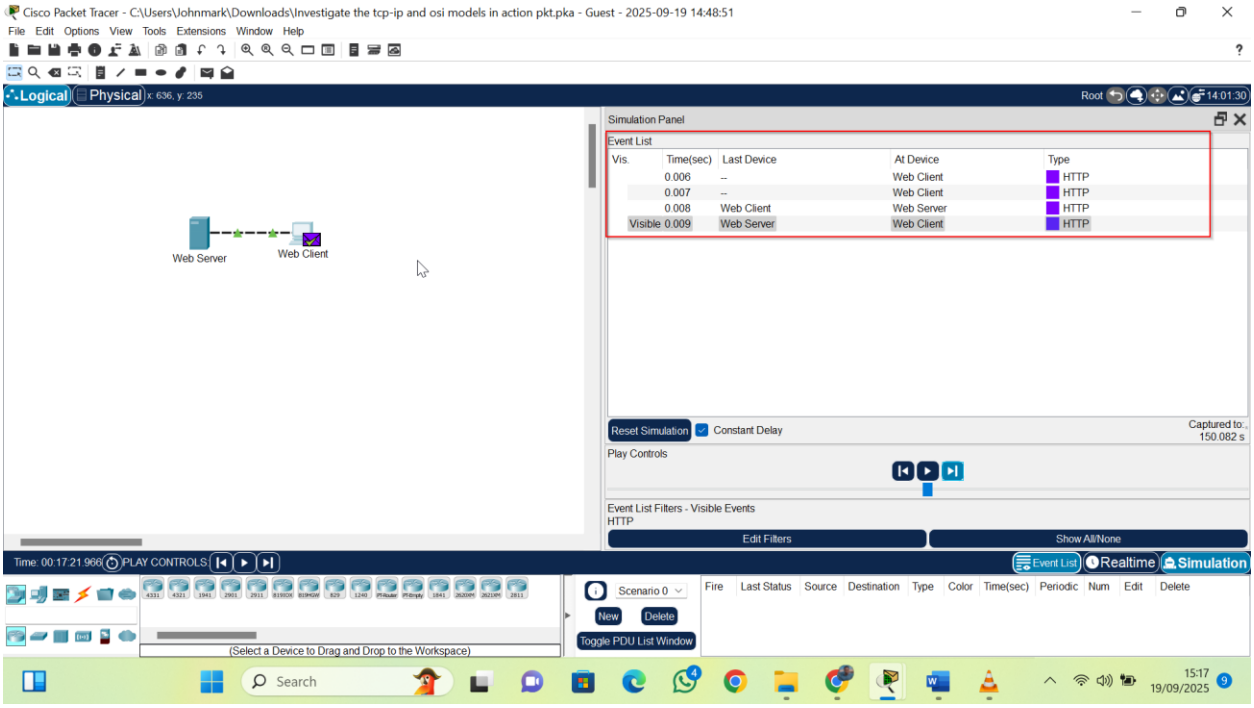
Image 3: results obtained.

Key observation: The client's web browser initially appeared blank and then began loading the page as events progressed.

Step 3: Exploring HTTP Packet Details

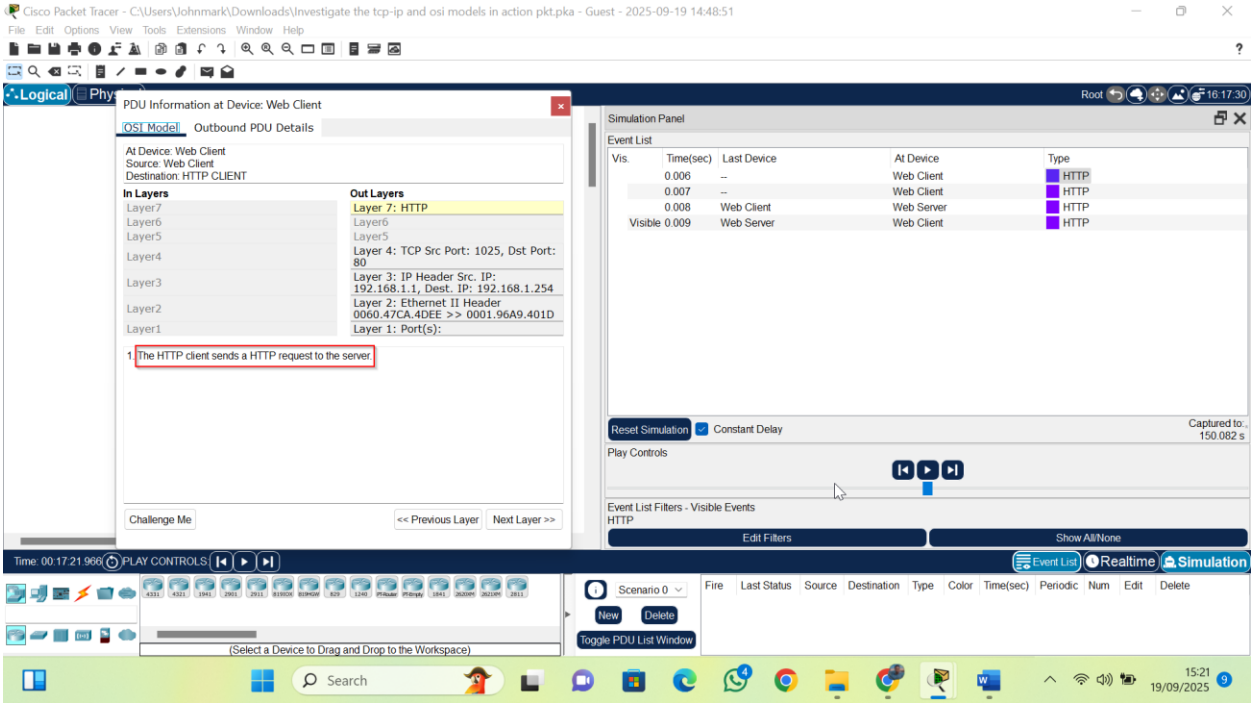
Part a:

Here we display the tab with the HTTP events.



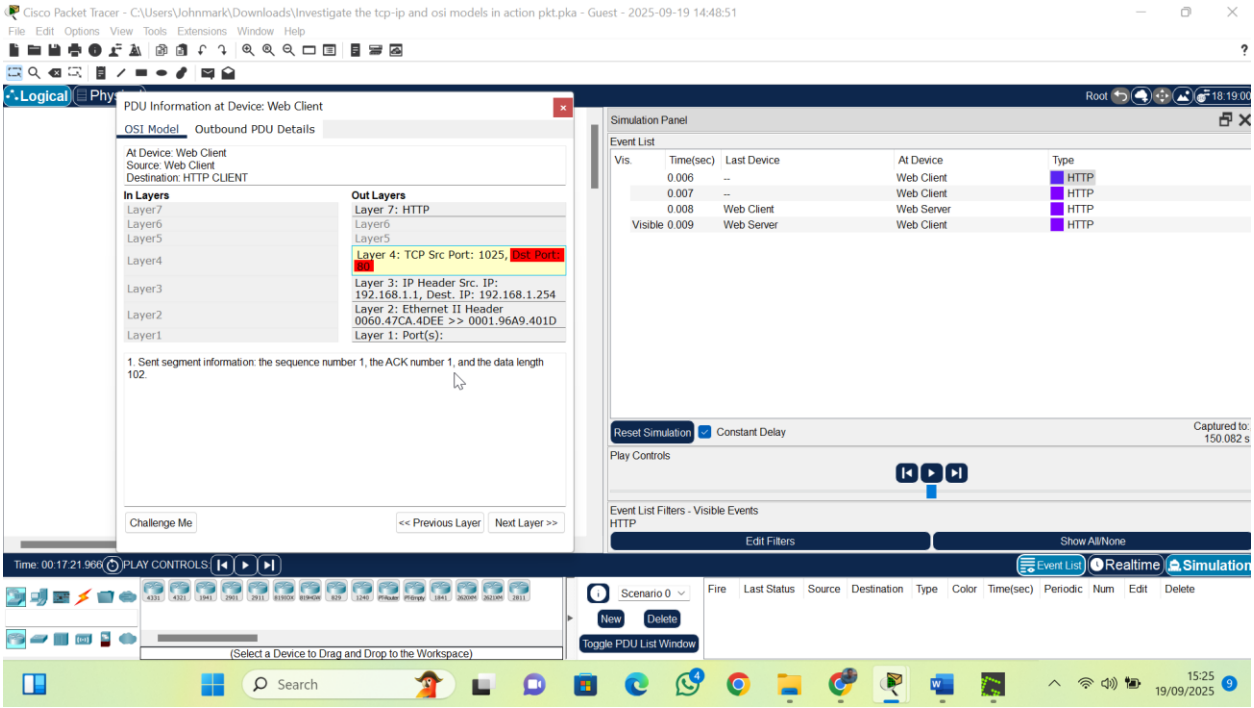
Part b:

a. **Layer 7:**
The number steps below the out layers box is: The HTTP client sends a HTTP request to the server.



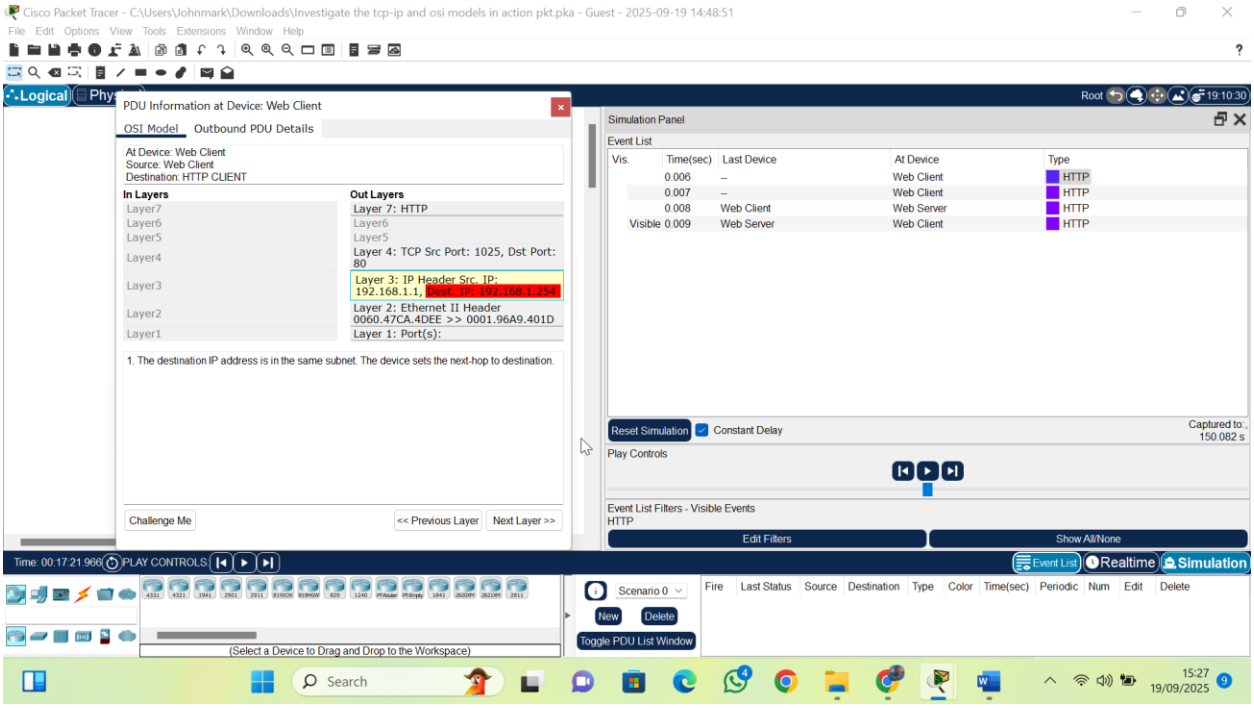
b. **Layer 4:**

Dst Port: **80** (standard HTTP port).

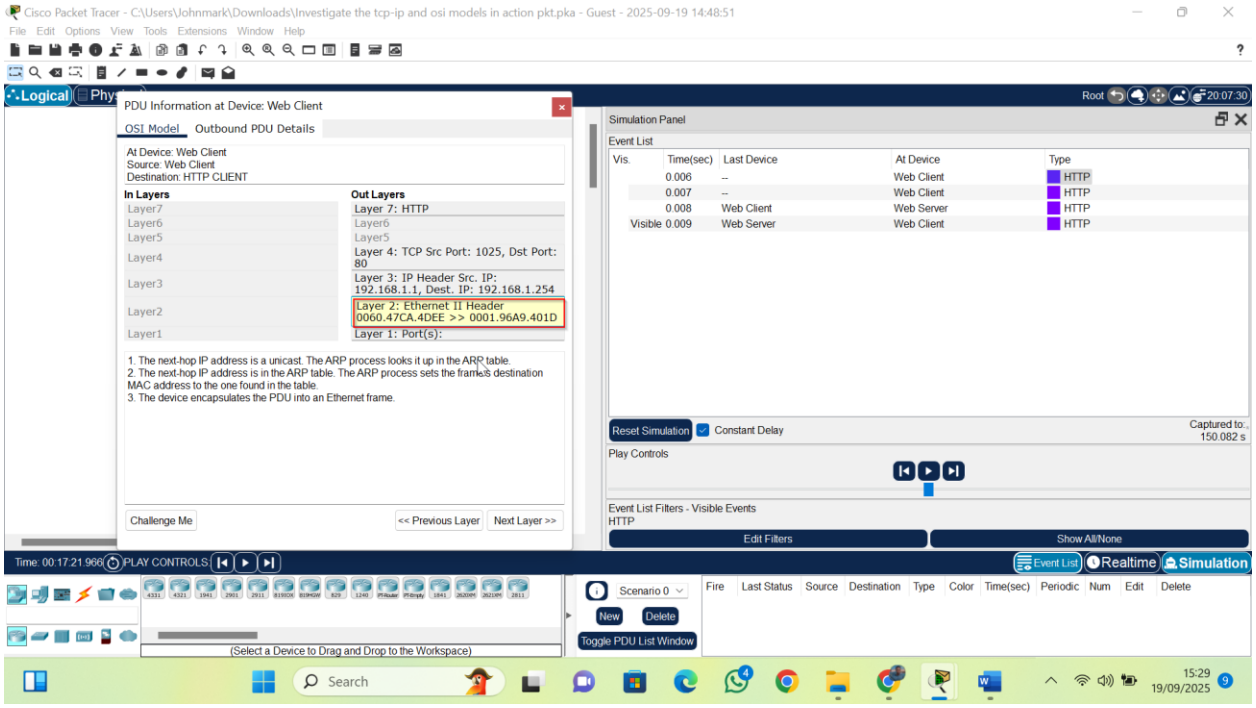


c. **Layer 3:**

Dest IP: **192.168.1.254**

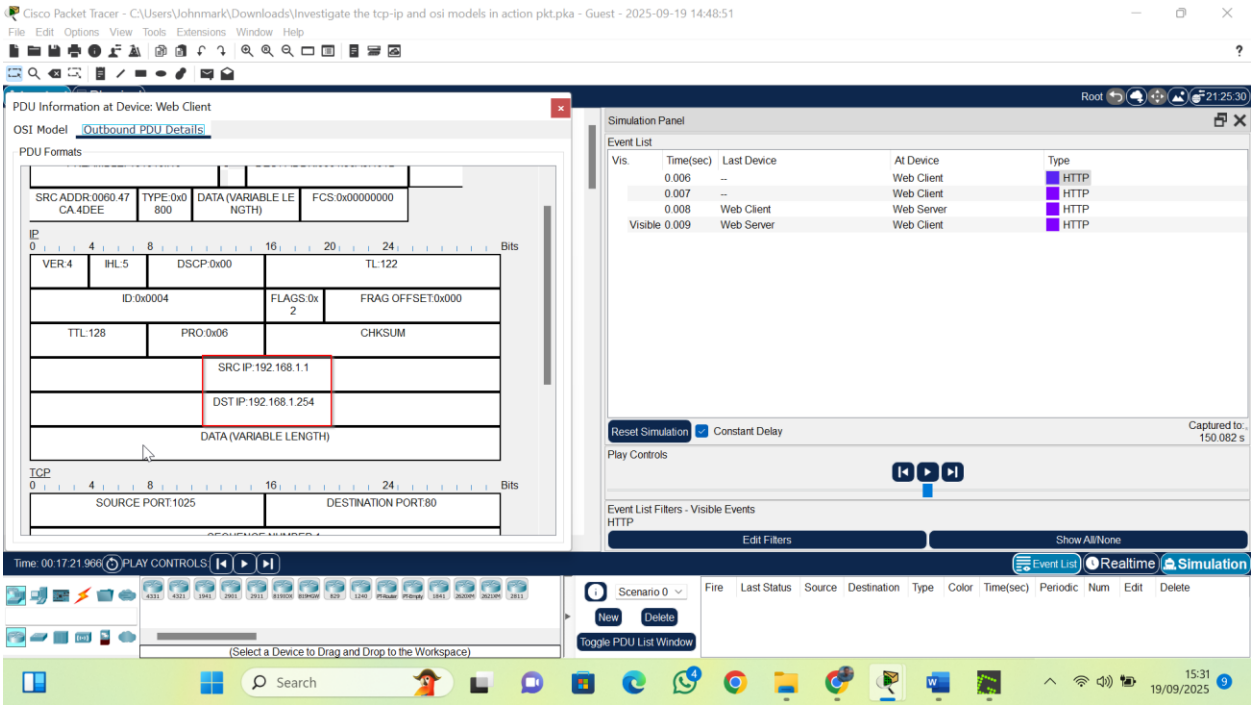


d. **Layer 2:** The image below shows the MAC addresses of the source and destination as shown on the boxed information.

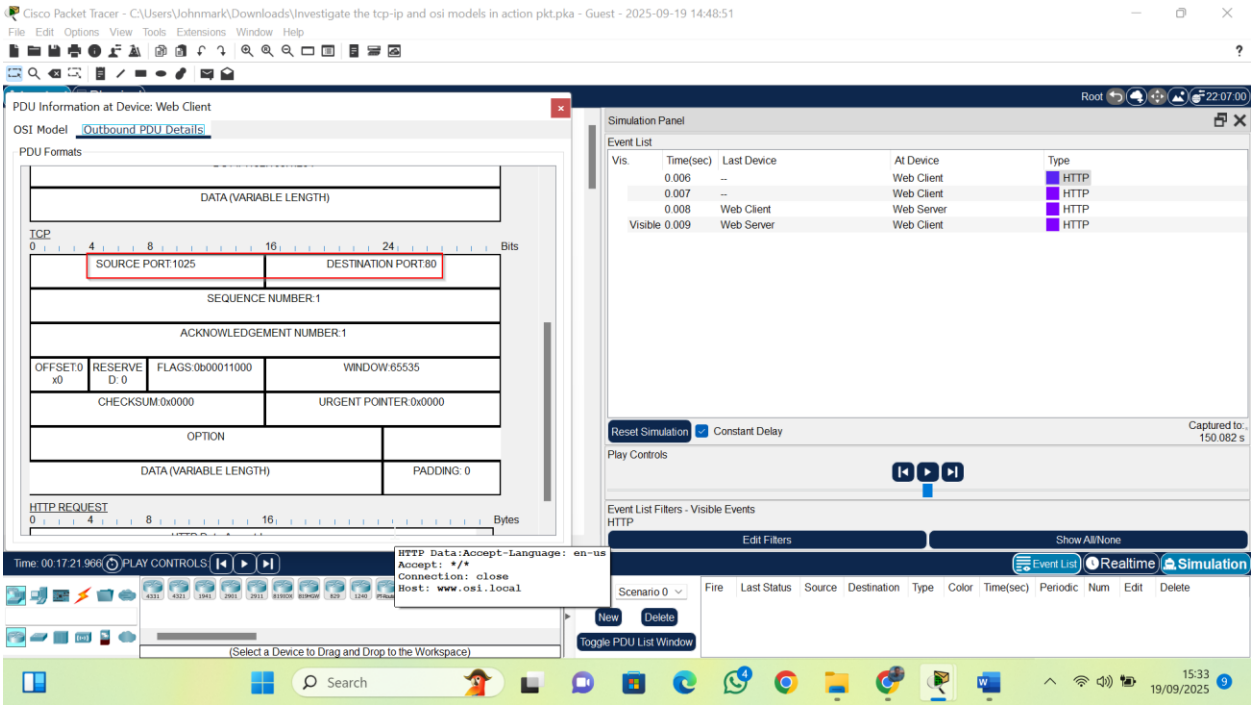


Part c:

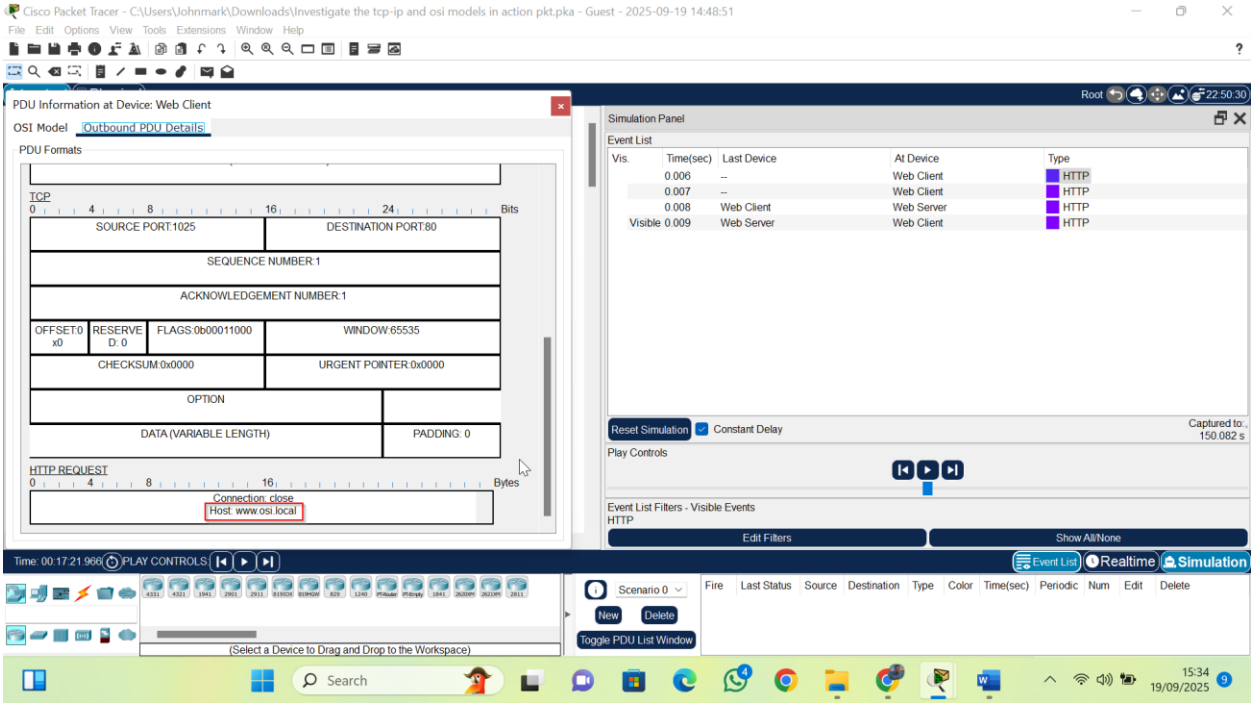
i. The information listed on the IP section which compares to the OSI model is the source IP and the destination IP. This is associated with the Layer 3



ii. At the TSP section of the PDU details, we have the source port and the destination port which Is associated with layer 4

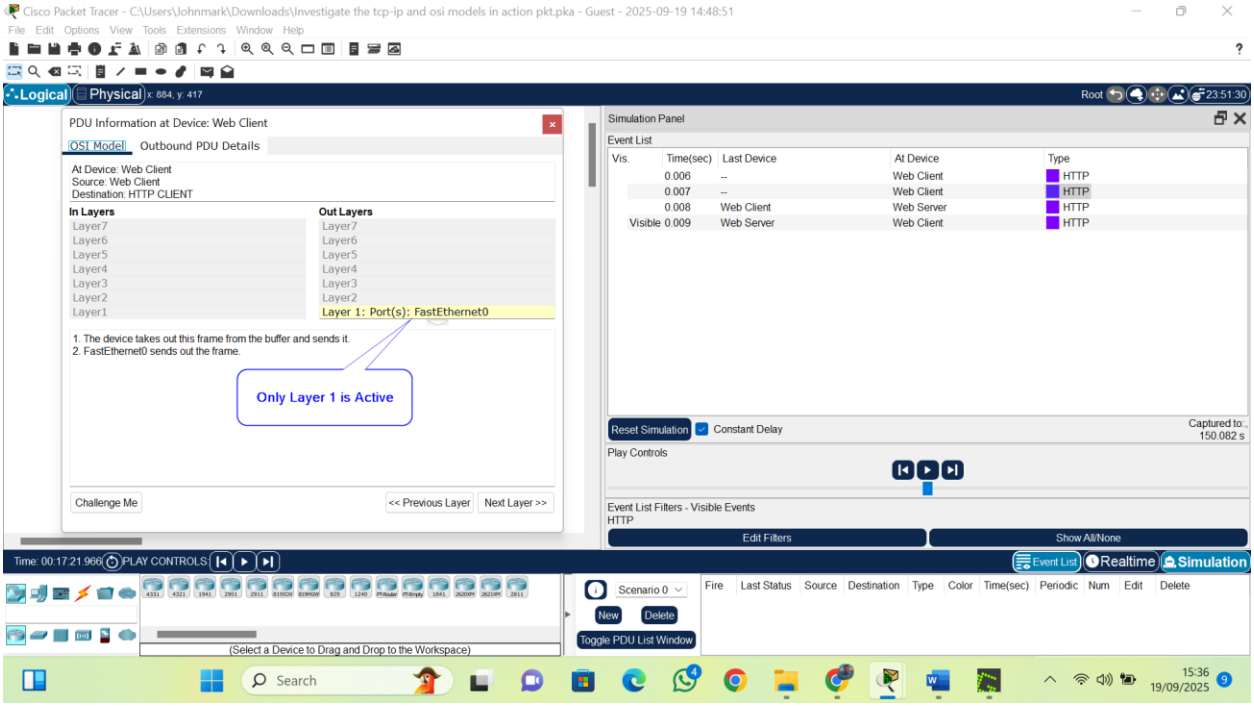


iii. The host listed is www.osi.local. It is associated with layer 7 of the OSI model tab



Part d:

Only layer 1 is active.



Part e:

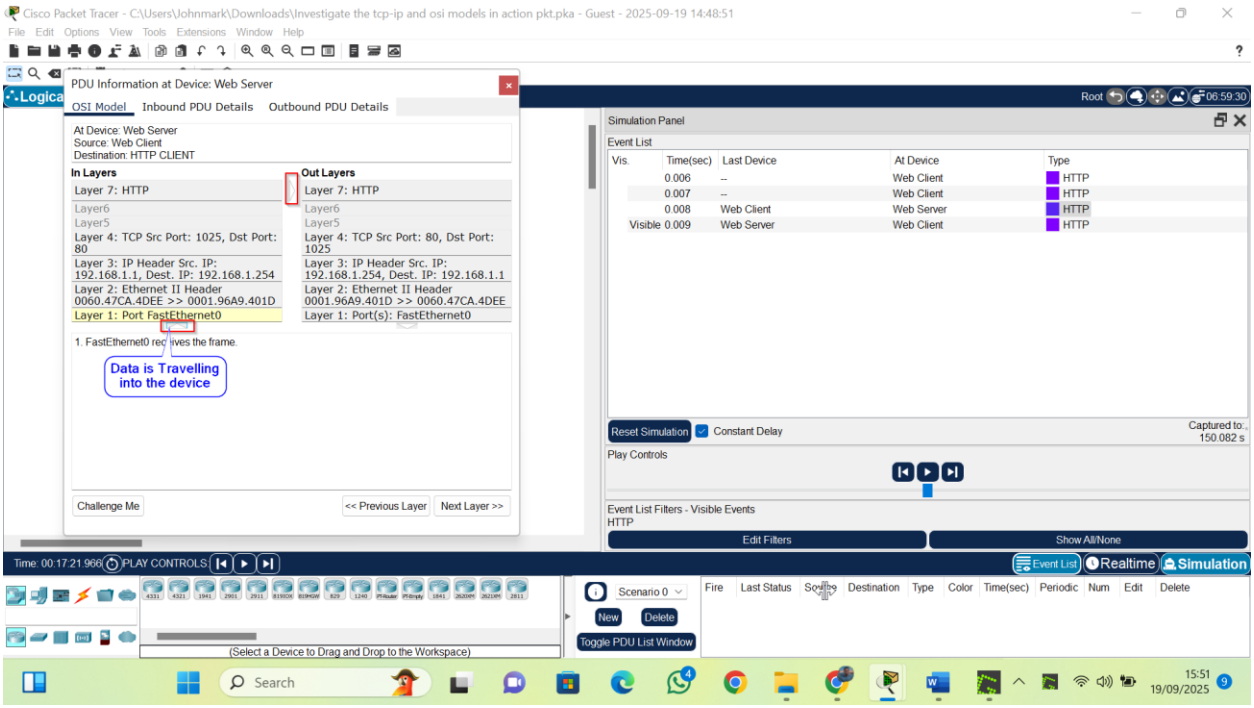
Major Differences:

- *Out Layers:* Show how the client sends the HTTP GET request.

  Encapsulation = building a new packet to send data back.

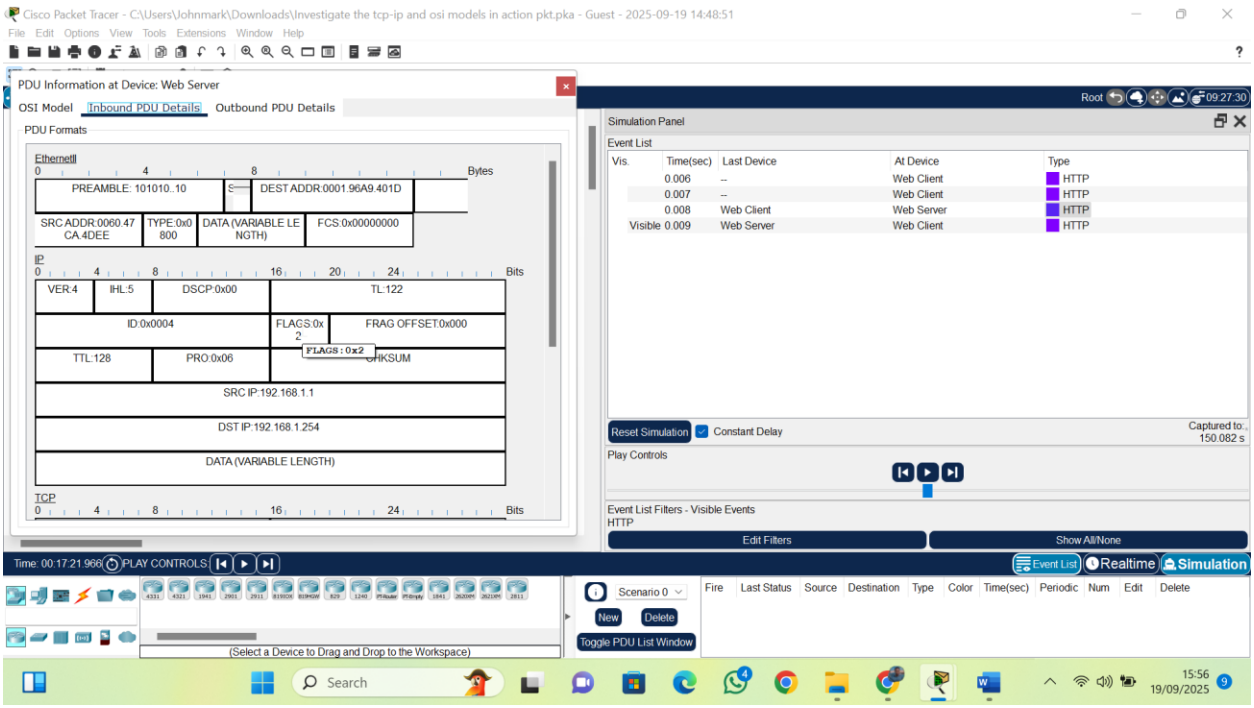
- *In Layers:* Show how the server processes the incoming data and sends a response.

  Decapsulation = breaking down the packet to read the data.

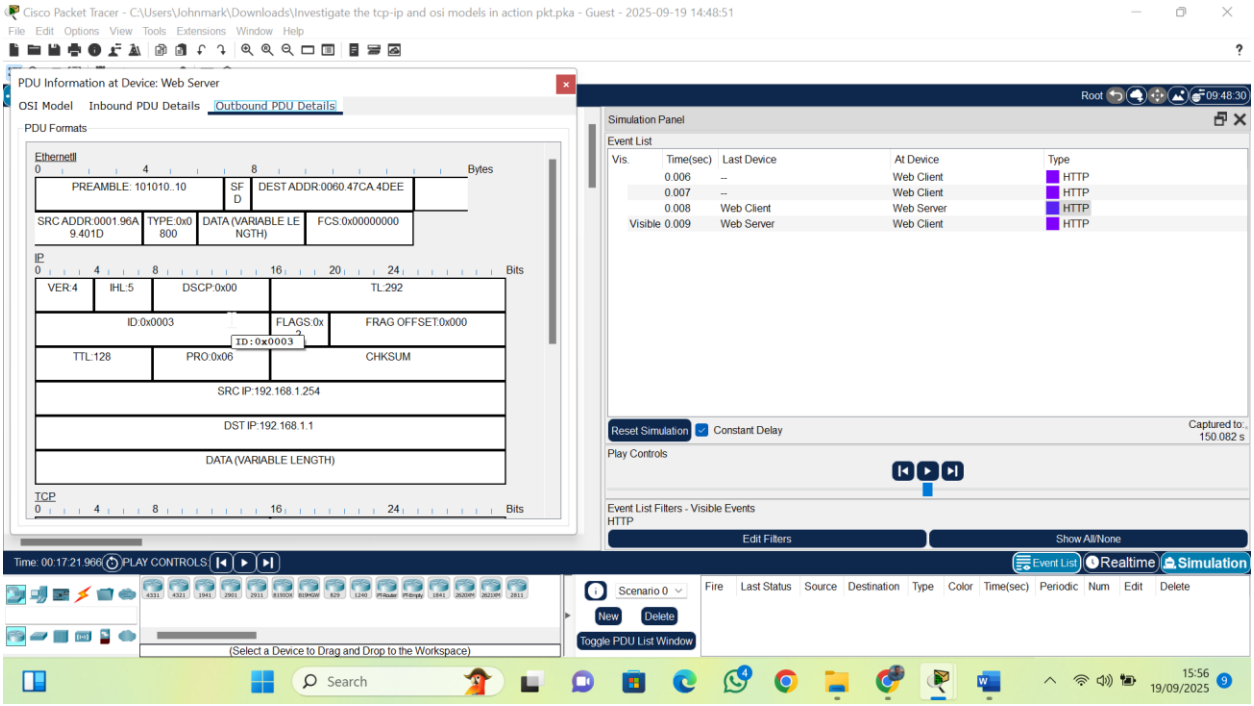


Part f:

Inbound: Shows what the device received.

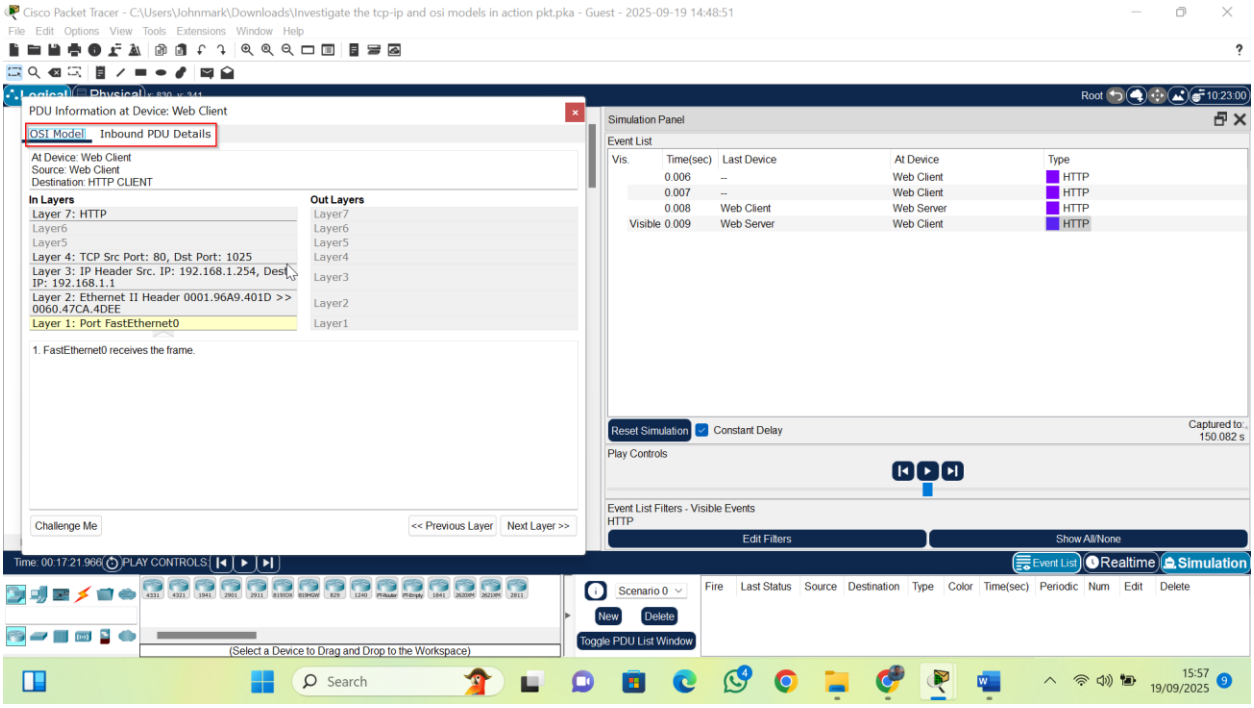


Outbound: Shows what the device sends back.



Part g:

last colored event has just two tabs because there is no outbound traffic being generated as this is the last step of transaction. The packet has arrived at the final destination.



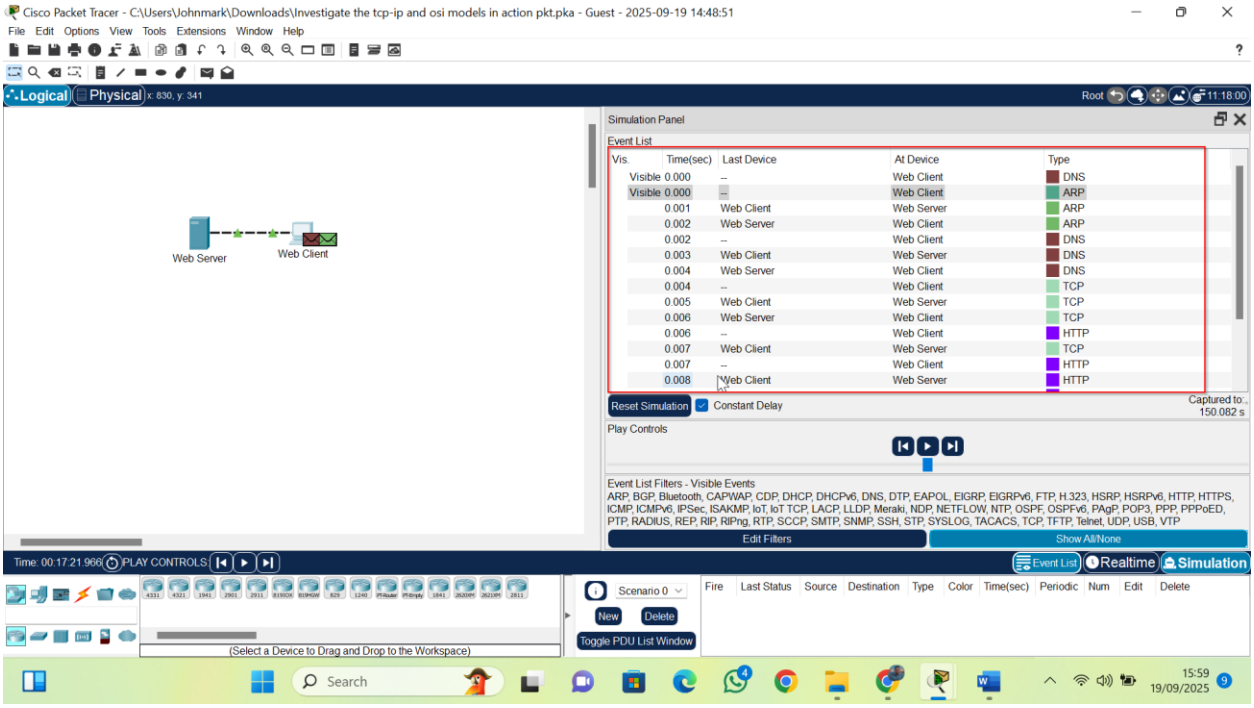
Part 2: Display Elements of the TCP/IP Protocol Suite

Part a: Close ALL PDU Windows

In this part of the activity, the goal is to examine other critical protocols within the TCP/IP suite using Packet Tracer's Simulation Mode.
Beyond HTTP, protocols such as ARP, DNS, and TCP are essential for seamless communication between devices.
This part focuses on:

- Understanding the role of each protocol.
- Viewing their encapsulation process.
- Identifying how they interact across the layers of the OSI model.

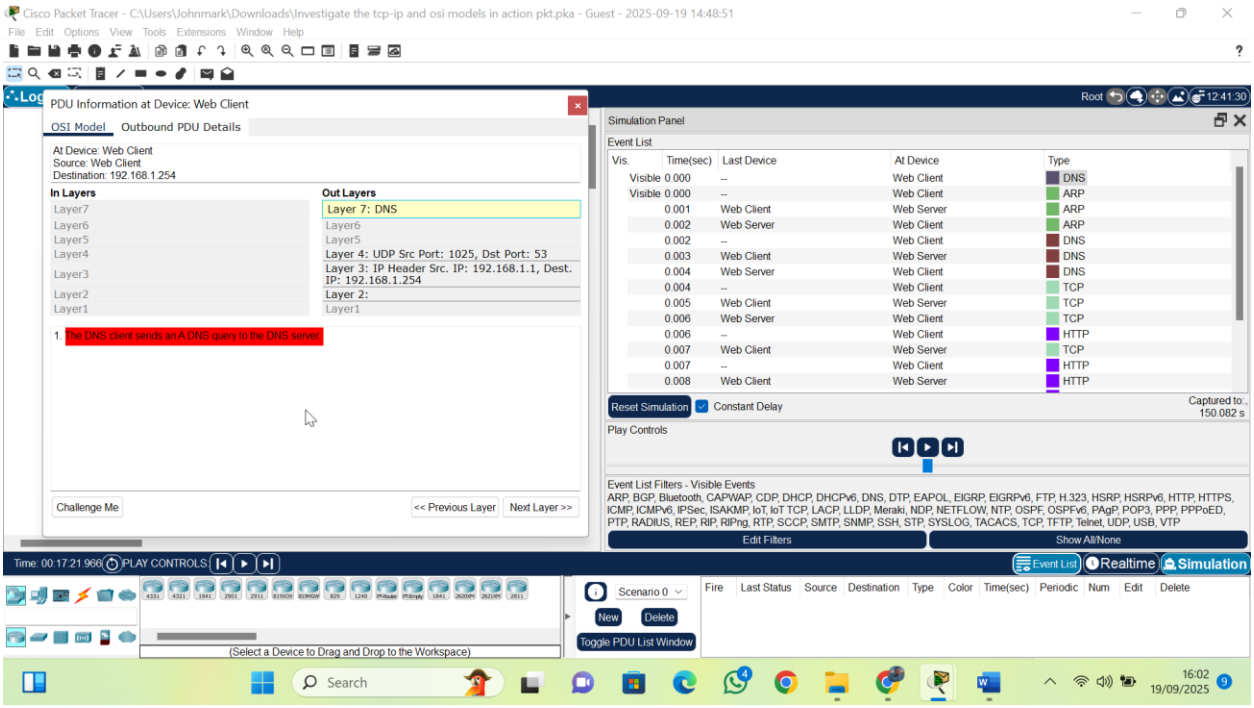
Part b: View Additional Events



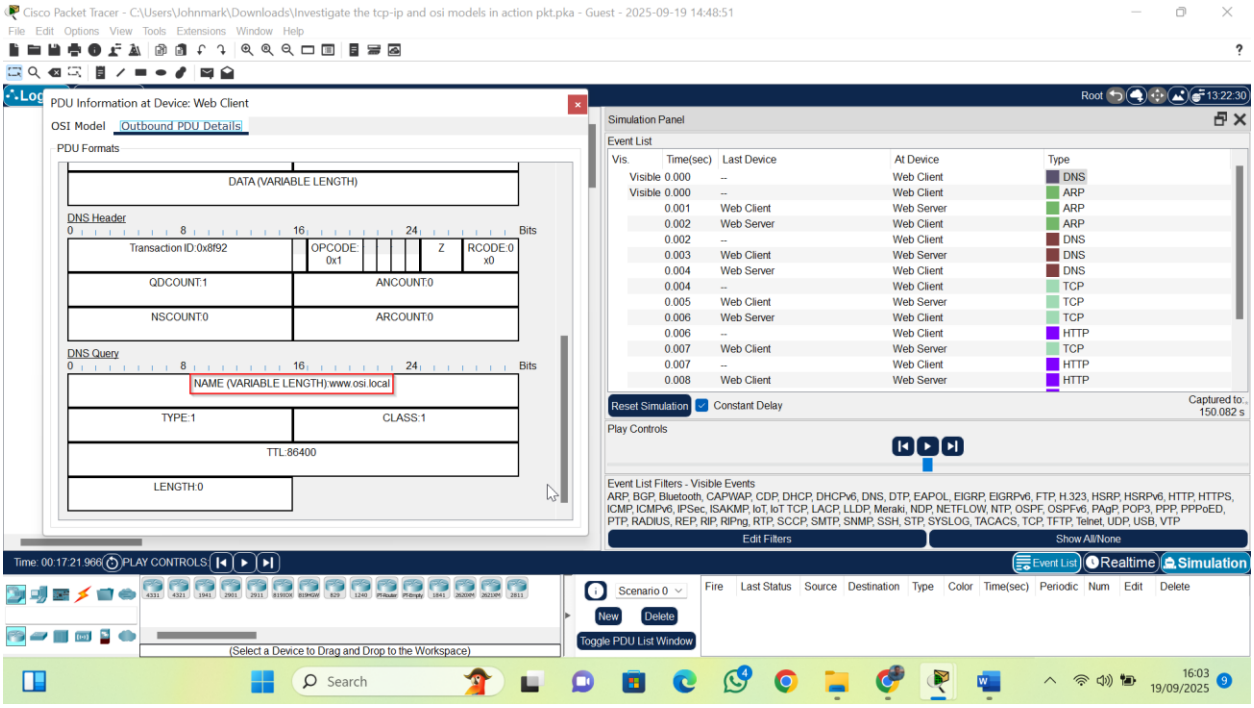
The image above shows additional protocols with examples such as ARP, DNS, TCP

Part c: First DNS Event

The image below shows the DNS query process at Layer 7. "The DNS client sends a DNS query to the DNS server."



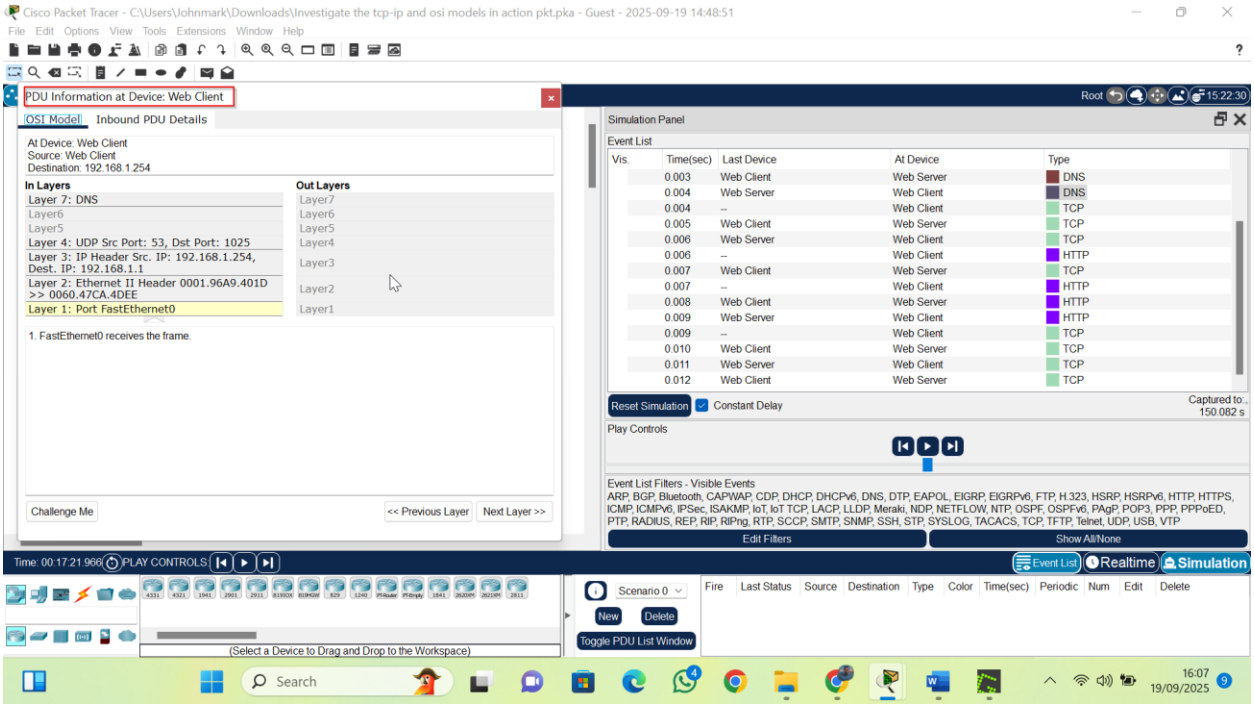
Part d: Check Outbound PDU Details



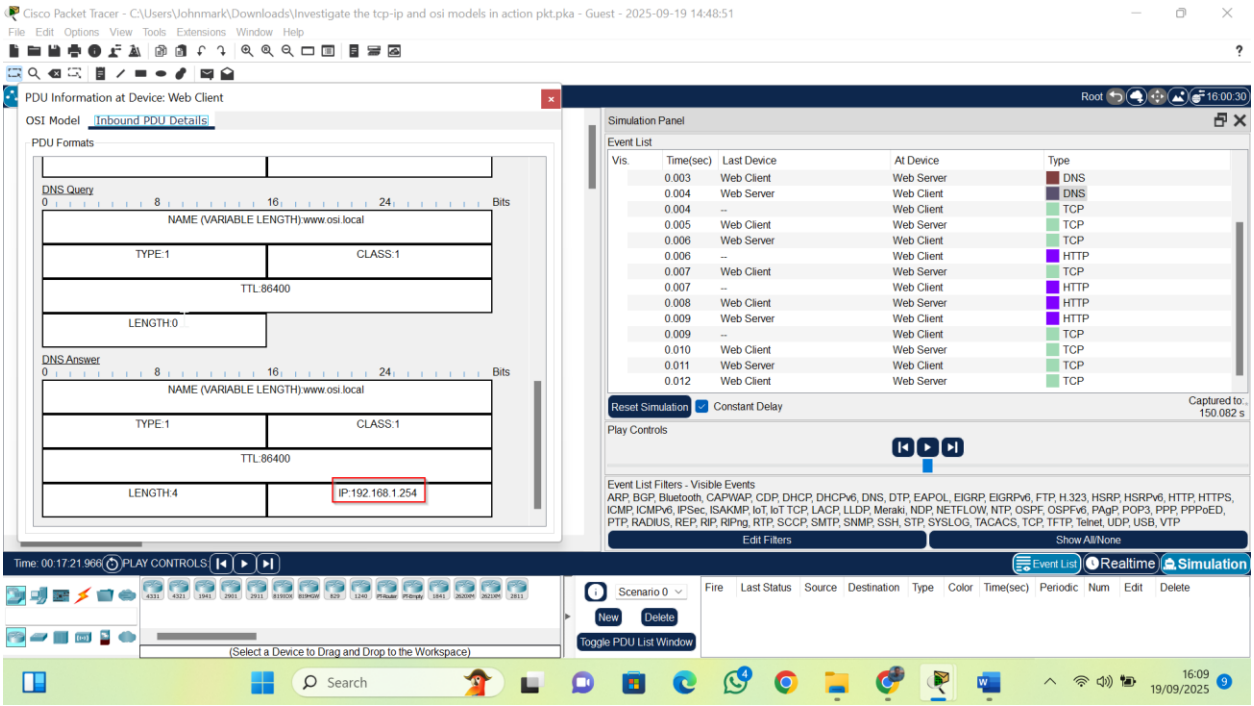
On the name field, the name is www.osi.local

Part e: Examine the Last DNS Info Event

The captured device is web client in this case,

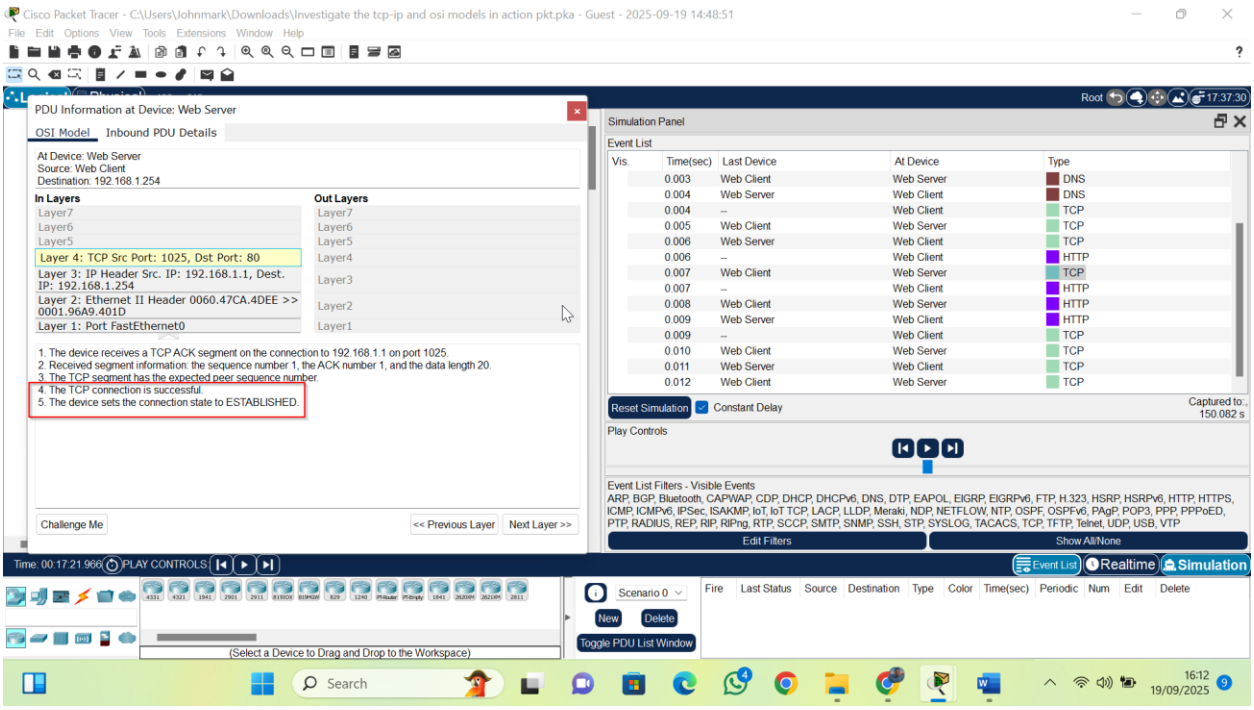


In the DNS ANSWER section, the address field displays: 192.168.1.254

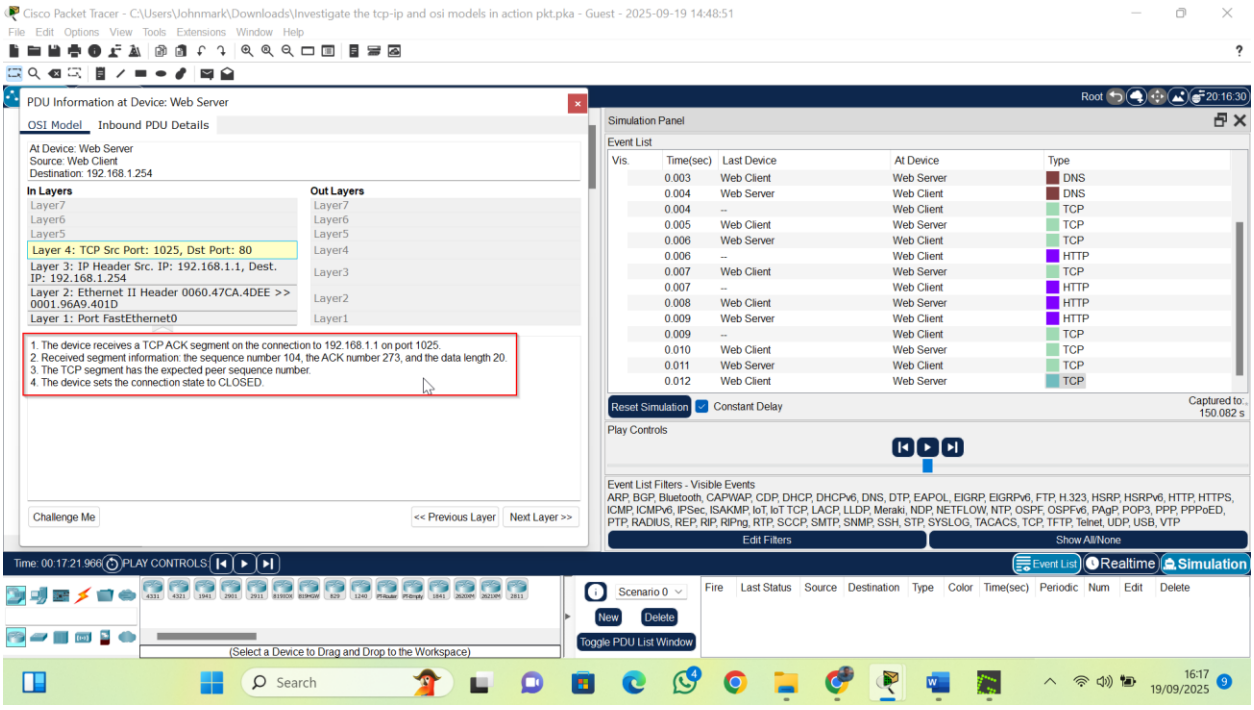


Part f: TCP event

Information displayed under 4: The TCP connection is successful: confirms the three-way handshake 5: The Device sets connection state to ESTABLISHED: TCP session is now active



Part g: Examine the Last TCP Event

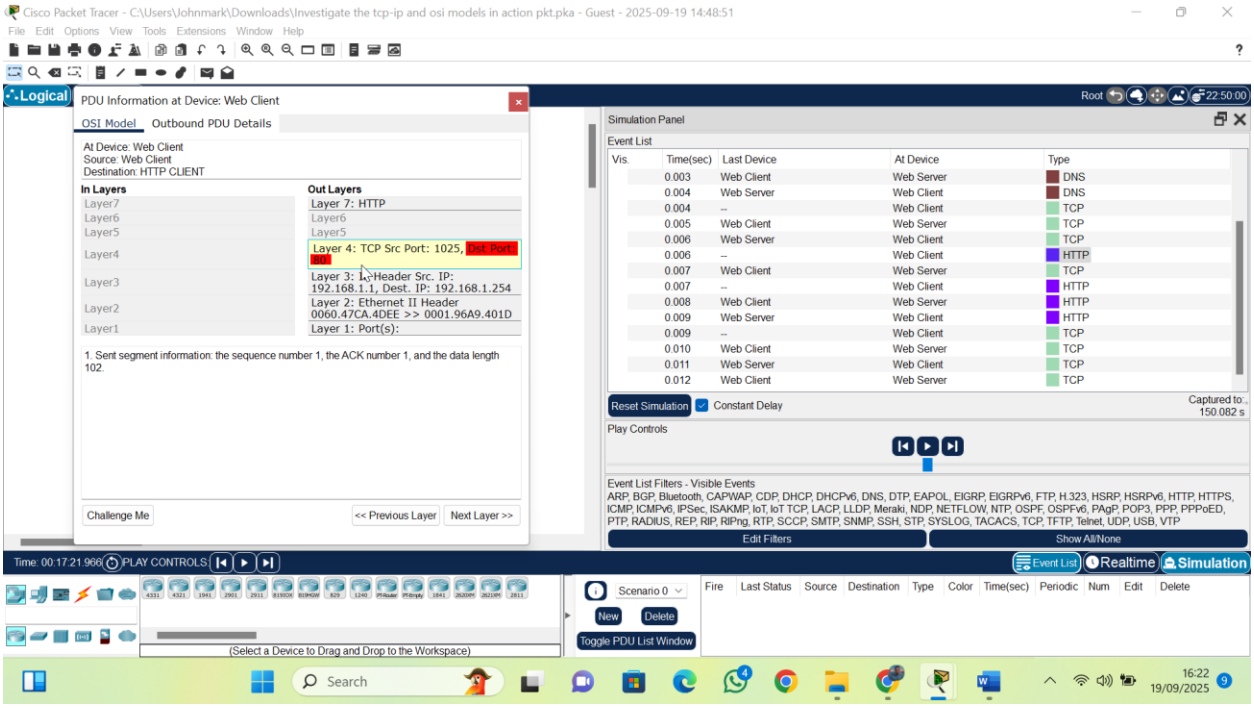


The purposes of the las event “The Device Sets the connection state to CLOSED” is to gracefully

Challenge Question

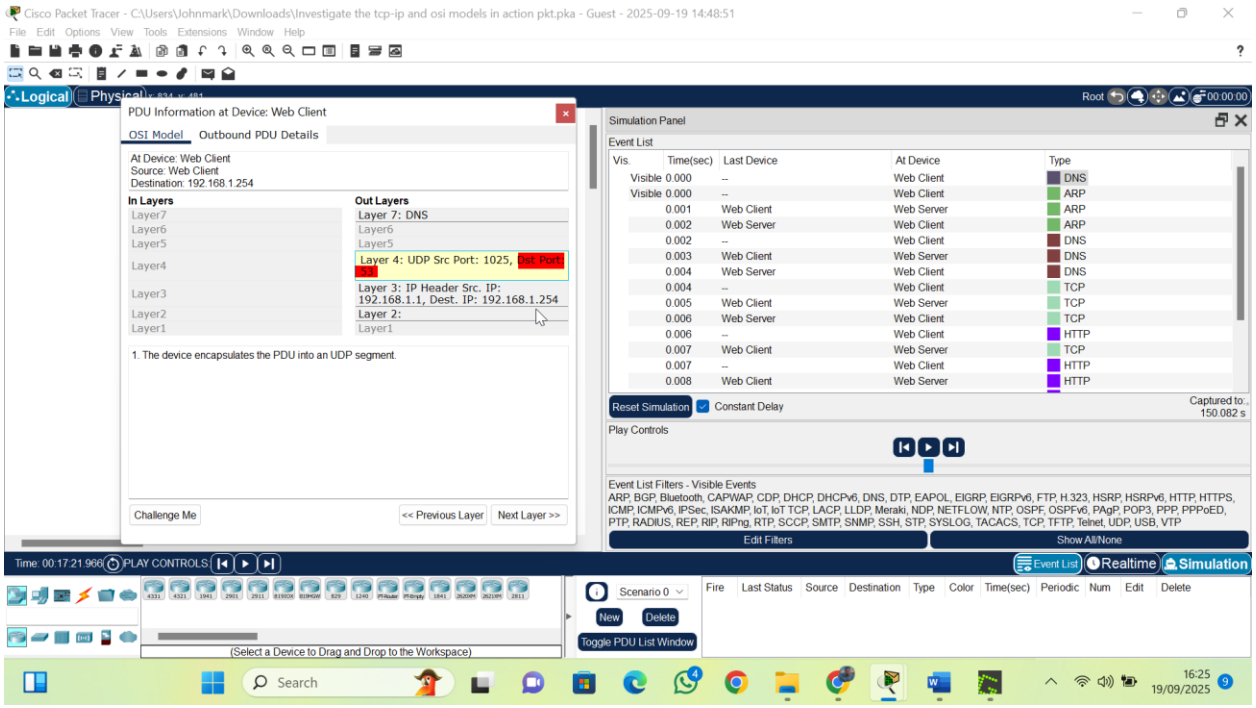
1. **Web Server Port for HTTP**

Looking at the destination port of any HTTP event the port number is 80.



2. **DNS Port Number**

DNS uses port 53. I checked on a DNS event and looked for layer four and chose the destination port.



Conclusion

Through this activity, I developed a deeper understanding of how multiple network protocols work together to facilitate seamless communication between devices. Part 1 demonstrated how web traffic flows through the layers of the OSI model, while Part 2 showcased the importance of protocols like DNS, ARP, and TCP in supporting functions such as name resolution, hardware address mapping, and session management. Using Packet Tracer to visualize these interactions reinforced key networking concepts and highlighted the critical role of the TCP/IP suite in real-world networking. This knowledge provides a strong foundation for analyzing, troubleshooting, and configuring network systems.