Packet Tracer - Investigating the TCP/IP and OSI Models in Action

Topology

Web Server —— Web Client
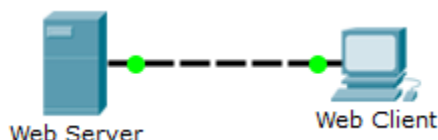
Objectives

Part 1: Examine HTTP Web Traffic

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

Background

This simulation activity is intended to provide a foundation for understanding the TCP/IP protocol suite and the relationship to the OSI model. Simulation mode allows you to view the data contents being sent across the network at each layer.

As data moves through the network, it is broken down into smaller pieces and identified so that the pieces can be put back together when they arrive at the destination. Each piece is assigned a specific name (protocol data unit [PDU]) and associated with a specific layer of the TCP/IP and OSI models. Packet Tracer simulation mode enables you to view each of the layers and the associated PDU. The following steps lead the user through the process of requesting a web page from a web server by using the web browser application available on a client PC.

Even though much of the information displayed will be discussed in more detail later, this is an opportunity to explore the functionality of Packet Tracer and be able to visualize the encapsulation process.

Part 1: Examine HTTP Web Traffic

In Part 1 of this activity, you will use Packet Tracer (PT) Simulation mode to generate web traffic and examine HTTP.

Step 1: Switch from Realtime to Simulation mode.

In the lower right corner of the Packet Tracer interface are tabs to toggle between **Realtime** and **Simulation** mode. PT always starts in **Realtime** mode, in which networking protocols operate with realistic timings. However, a powerful feature of Packet Tracer allows the user to "stop time" by switching to Simulation mode. In Simulation mode, packets are displayed as animated envelopes, time is event driven, and the user can step through networking events.

a. Click the **Simulation** mode icon to switch from **Realtime** mode to **Simulation** mode.

b. Select **HTTP** from the **Event List Filters**.

　1) HTTP may already be the only visible event. Click **Edit Filters** to display the available visible events. Toggle the **Show All/None** check box and notice how the check boxes switch from unchecked to checked or checked to unchecked, depending on the current state.

　2) Click the **Show All/None** check box until all boxes are cleared and then select **HTTP**. Click anywhere outside of the **Edit Filters** box to hide it. The Visible Events should now only display HTTP.

Step 2:   Generate web (HTTP) traffic.

Currently the Simulation Panel is empty. There are six columns listed across the top of the Event List within the Simulation Panel. As traffic is generated and stepped through, events appear in the list. The **Info** column is used to inspect the contents of a particular event.

Note: The Web Server and Web Client are displayed in the left pane. The panels can be adjusted in size by hovering next to the scroll bar and dragging left or right when the double-headed arrow appears.

a.   Click **Web Client** in the far left pane.

b.   Click the **Desktop** tab and click the **Web Browser** icon to open it.

c.   In the URL field, enter **www.osi.local** and click **Go**.

Because time in Simulation mode is event-driven, you must use the **Capture/Forward** button to display network events.

d.   Click **Capture/Forward** four times. There should be four events in the Event List.

Look at the Web Client web browser page. Did anything change?

_yes, it displayed the webpage _____

_____

Step 3:   Explore the contents of the HTTP packet.

a.   Click the first colored square box under the **Event List** > **Info** column. It may be necessary to expand the **Simulation Panel** or use the scrollbar directly below the **Event List**.

The **PDU Information at Device: Web Client** window displays. In this window, there are only two tabs (**OSI Model** and **Outbound PDU Details**) because this is the start of the transmission. As more events are examined, there will be three tabs displayed, adding a tab for **Inbound PDU Details**. When an event is the last event in the stream of traffic, only the **OSI Model** and **Inbound PDU Details** tabs are displayed.

b.   Ensure that the **OSI Model** tab is selected. Under the **Out Layers** column, ensure that the **Layer 7** box is highlighted.

What is the text displayed next to the **Layer 7** label?   HTTP_____

What information is listed in the numbered steps directly below the **In Layers** and **Out Layers** boxes?

The HTTP client sends a HTTP request to the server._____

c.   Click **Next Layer**. Layer 4 should be highlighted. What is the **Dst Port** value?   80 _____

d.   Click **Next Layer**. Layer 3 should be highlighted. What is the **Dest. IP** value?   192.168.1.254_____

e.   Click **Next Layer**. What information is displayed at this layer?

MAC address of the sender and the receiver.

_____

f.   Click the **Outbound PDU Details** tab.

Information listed under the **PDU Details** is reflective of the layers within the TCP/IP model.

Note: The information listed under the **Ethernet II** section provides even more detailed information than is listed under Layer 2 on the **OSI Model** tab. The **Outbound PDU Details** provides more descriptive and detailed information. The values under **DEST MAC** and **SRC MAC** within the **Ethernet II** section of the **PDU Details** appear on the **OSI Model** tab under Layer 2, but are not identified as such.

What is the common information listed under the **IP** section of **PDU Details** as compared to the information listed under the **OSI Model** tab? With which layer is it associated?

_____Dest IP and SRC IP, layer 3_____

What is the common information listed under the **TCP** section of **PDU Details**, as compared to the information listed under the **OSI Model** tab, and with which layer is it associated?

_____SRC PORT: 1025 and SRC PORT: 1025 in layer 4

What is the **Host** listed under the **HTTP** section of the **PDU Details**? What layer would this information be associated with under the **OSI Model** tab?

__Host: www.osi.local , layer 7 _____

g. Click the next colored square box under the **Event List** > **Info** column. Only Layer 1 is active (not grayed out). The device is moving the frame from the buffer and placing it on to the network.
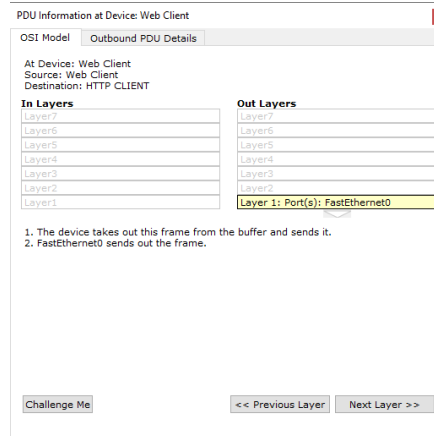
h. Advance to the next HTTP **Info** box within the **Event List** and click the colored square box. This window contains both **In Layers** and **Out Layers**. Notice the direction of the arrow directly under the **In Layers** column; it is pointing upward, indicating the direction the information is travelling. Scroll through these layers making note of the items previously viewed. At the top of the column the arrow points to the right. This denotes that the server is now sending the information back to the client.

Comparing the information displayed in the **In Layers** column with that of the **Out Layers** column, what are the major differences?

_____the information in inbound such as des tip and src ip is swapped with outbound ip dest and src , and the same thing applied to the MAC address_____

i. Click the **Outbound PDU Details** tab. Scroll down to the **HTTP** section.

What is the first line in the HTTP message that displays?

_____HTTP/1.1 200 OK means that the requested page is successfully delivered by the server.

_____

j. Click the last colored square box under the **Info** column. How many tabs are displayed with this event and why?

_____OSI model and inbound PDU details taps only, because the information already has been delivered successfully and no need for outbound information anymore.

_____

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

In Part 2 of this activity, you will use the Packet Tracer Simulation mode to view and examine some of the other protocols comprising of the TCP/IP suite.

Step 1: View Additional Events

a. Close any open PDU information windows.

b. In the Event List Filters > Visible Events section, click **Show All**.

What additional Event Types are displayed?

_____TCP , DNS, and ARP._____

_____

_____

_____

These extra entries play various roles within the TCP/IP suite. If the Address Resolution Protocol (ARP) is listed, it searches MAC addresses. DNS is responsible for converting a name (for example, **www.osi.local**) to an IP address. The additional TCP events are responsible for connecting, agreeing on communication parameters, and disconnecting the communications sessions between the devices. These protocols have been mentioned previously and will be further discussed as the course progresses. Currently there are over 35 possible protocols (event types) available for capture within Packet Tracer.

c. Click the first DNS event in the **Info** column. Explore the **OSI Model** and **PDU Detail** tabs and note the encapsulation process. As you look at the **OSI Model** tab with **Layer 7** highlighted, a description of what is occurring is listed directly below the **In Layers** and **Out Layers** ("1. The DNS client sends a DNS query to the DNS server."). This is very useful information to help understand what is occurring during the communication process.

d. Click the **Outbound PDU Details** tab. What information is listed in the **NAME**: in the DNS QUERY section?

_____www.osi.local _____

e. Click the last DNS **Info** colored square box in the event list. Which device is displayed?

_____web Client _____

What is the value listed next to **ADDRESS**: in the DNS ANSWER section of the **Inbound PDU Details**?

192.168.1.254

_____

f. Find the first **HTTP** event in the list and click the colored square box of the **TCP** event immediately following this event. Highlight **Layer 4** in the **OSI Model** tab. In the numbered list directly below the **In Layers** and **Out Layers**, what is the information displayed under items 4 and 5?

. The TCP connection is successful.

. The device sets the connection state to ESTABLISHED.

TCP manages the connecting and disconnecting of the communications channel along with other responsibilities. This particular event shows that the communication channel has been ESTABLISHED.

g. Click the last TCP event. Highlight Layer 4 in the **OSI Model** tab. Examine the steps listed directly below **In Layers** and **Out Layers**. What is the purpose of this event, based on the information provided in the last item in the list (should be item 4)? The device sets the connection state to CLOSED.

Challenge

This simulation provided an example of a web session between a client and a server on a local area network (LAN). The client makes requests to specific services running on the server. The server must be set up to listen on specific ports for a client request. (Hint: Look at Layer 4 in the **OSI Model** tab for port information.)

Based on the information that was inspected during the Packet Tracer capture, what port number is the **Web Server** listening on for the web request?

The web server is listening to port 80_____

_____

What port is the **Web Server** listening on for a DNS request?

53_____

_____

Suggested Scoring Rubric

Activity Section	Question Location	Possible Points	Earned Points
Part 1: Examine HTTP Web Traffic	Step 2d	5	
	Step 3b-1	5	
	Step 3b-2	5	
	Step 3c	5	
	Step 3d	5	
	Step 3e	5	
	Step 3f-1	5	
	Step 3f-2	5	
	Step 3f-3	5	
	Step 3h	5	
	Step 3i	5	
	Step 3j	5	
	Part 1 Total	**60**	
Part 2: Display Elements of the TCP/IP Protocol Suite	Step 1b	5	
	Step 1d	5	
	Step 1e-1	5	
	Step 1e-2	5	
	Step 1f	5	
	Step 1g	5	
	Part 2 Total	**30**	
Challenge	1	5	
	2	5	
	Part 3 Total	**10**	
	Total Score	**100**	

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File   Edit   Options   View   Tools   Extensions   Help

Activity Results

Time Elapsed: 01:07:22

Congratulations Omar Ismail Alomory! You completed the activity.

Overall Feedback | Assessment Items | Connectivity Tests

If you are having difficulty completing this activity, revisit the following resources:

- Section: Network Protocols and Standards
- Activity - Mapping Protocols of the TCP/IP Suite
- Activity - Identify Layers and Functions