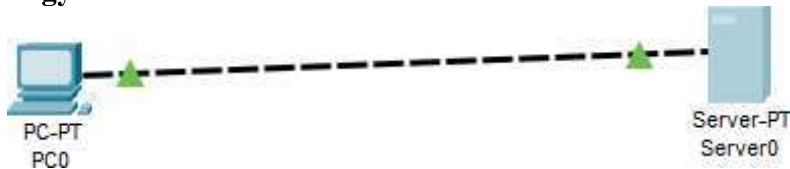


AIM: Investigate the TCP-IP and OSI Models using packet tracer.

Topology



Objectives

Part 1: Examine HTTP Web Traffic

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

Part 1: Examine HTTP Web Traffic

Step 1: Switch from Real time to Simulation mode

In the lower right corner of the Packet Tracer interface are tabs to toggle between Real time and Simulation mode. PT always starts in Real time 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 Real time mode to Simulation mode.
- b. Select HTTP from the Event List Filters.

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.

- a. Click Web Client
- b. Click the Desktop tab and click the Web Browser icon to open it.
- c. In the URL field, enter server ip address and click Go. Because time in Simulation mode is event-driven, we must use the Capture/Forward button to display network events.

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

Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.002	—	PC0	HTTP
	0.003	--	PC0	HTTP
	0.004	PC0	Server0	HTTP
	0.005	Server0	PC0	HTTP

Step 3: Explore the contents of the HTTP packet.

- a. Click the first colored square box under the Event List Info column. Ensure that the OSI Model tab is selected.
- b. Under the Out Layers column, ensure that the Layer 7 box is highlighted.

OSI Model

Outbound PDU Details

At Device: PC0

Source: PC0

Destination: HTTP CLIENT

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

Out Layers

Layer 7:
Layer6
Layer5
Layer 4: TCP Src Port: 1033, Dst Port: 80
Layer 3: IP Header Src. IP: 192.168.1.1, Dest. IP: 192.168.1.3
Layer 2: Ethernet II Header 000A.418C.9E97 >> 00D0.D350.8024
Layer 1: Port(s):

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

- c. Click Next Layer. Layer 4 should be highlighted.

1. Sent segment information: the sequence number 1, the ACK number 1, and the data length 100.

- d. Click Next Layer. Layer 3 should be highlighted.

1. The destination IP address is in the same subnet. The device sets the next-hop to destination.

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e. Click Next Layer. Layer 2 should be highlighted.

1. The next-hop IP address is a unicast. The ARP process looks it up in the ARP table.
2. The next-hop IP address is in the ARP table. The ARP process sets the frame's destination MAC address to the one found in the table.
3. The device encapsulates the PDU into an Ethernet frame.

f. Click Next Layer. Layer 1 should be highlighted.

1. The port FastEthernet0 is sending another frame at this time. The device buffers the frame to be sent later.

g. Click the Outbound PDU Details tab. Information listed under the PDU Details is reflective of the layers within the TCP/IP model.

EthernetII									
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Bytes									
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">PREAMBLE: 10101010</div> <div style="width: 5%; text-align: center;">↕</div> <div style="width: 45%;">DEST ADDR: 00D0.D350.8024</div> </div>									
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">SRC ADDR: 000A.418C.9E97</div> <div style="width: 5%; text-align: center;">↑ ↓</div> <div style="width: 15%;">TYP: E:0x</div> <div style="width: 5%; text-align: center;">↑ ↓</div> <div style="width: 25%;">DATA (VARIABLE LENGTH)</div> <div style="width: 5%; text-align: center;">↑ ↓</div> <div style="width: 30%;">FCS: 0x00000000</div> </div>									

IP											
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Bits											
VER: 4		IHL		DSCP: 0x00				TL: 120			
ID: 0x001b						FLA: 0 GS: 0		FRAG OFFSET: 0x000			
TTL: 128				PRO: 0x06				CHKSUM			
SRC IP: 192.168.1.1											
DST IP: 192.168.1.3											
OPT: 0x00000000								PADDING: 0x00			
DATA (VARIABLE LENGTH)											

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TCP									
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 184 188 192 196 200 204 208 212 216 220 224 228 232 236 240 244 248 252 256 Bits									
SOURCE PORT:1033									
DESTINATION PORT:80									
SEQUENCE NUMBER:1									
ACKNOWLEDGEMENT NUMBER:1									
OFFS ET:0x		RESERVED : 0b000000		FLAGS:0b 011000		WINDOW:65535			
CHECKSUM:0x0000					URGENT POINTER:0x0000				
OPTION								^ v	
DATA (VARIABLE LENGTH)								PADDING: 0b000 ...000 ^ v	
HTTP REQUEST									
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 184 188 192 196 200 204 208 212 216 220 224 228 232 236 240 244 248 252 256 Bytes									
HTTP Data:Accept-Language: en-us Accept: */*									

Click the next colored square box under the Event List > Info column. Only Layer 1 is active. The device is moving the frame from the buffer and placing it on to the network.

At Device: PC0	
Source: PC0	
Destination: HTTP CLIENT	

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

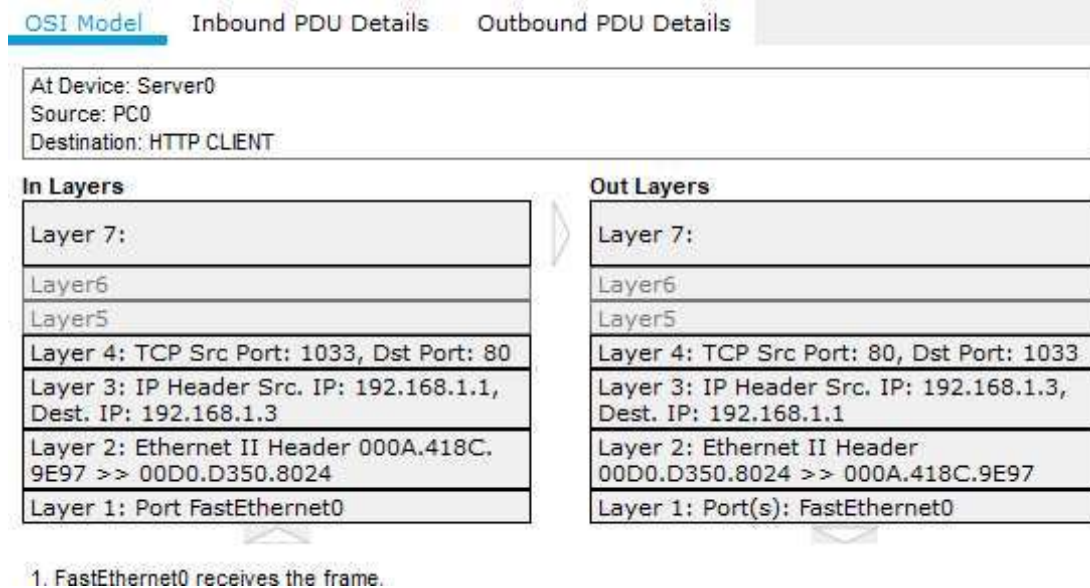
Out Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer 1: Port(s): FastEthernet0

1. The device takes out this frame from the buffer and sends it.
2. FastEthernet0 sends out the frame.

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.

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Layer4

1. Sent segment information: the sequence number 1, the ACK number 101, and the data length 471.

Layer3

1. The destination IP address is in the same subnet. The device sets the next-hop to destination.

Layer 2

1. The next-hop IP address is a unicast. The ARP process looks it up in the ARP table.
2. The next-hop IP address is in the ARP table. The ARP process sets the frame's destination MAC address to the one found in the table.
3. The device encapsulates the PDU into an Ethernet frame.

Layer1

1. FastEthernet0 sends out the frame.

Receiver side

Layer1

1. FastEthernet0 receives the frame.

Layer2

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1. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
2. The device decapsulates the PDU from the Ethernet frame.

Layer3

1. The packet's destination IP address matches the device's IP address or the broadcast address. The device de-encapsulates the packet.

Layer4

1. The device receives a TCP PUSH+ACK segment on the connection to 192.168.1.1 on port 1033.
2. Received segment information: the sequence number 1, the ACK number 1, and the data length 100.
3. The TCP segment has the expected peer sequence number.
4. TCP processes payload data.
5. TCP reassembles all data segments and passes to the upper layer.

Layer7

1. The server receives a HTTP request.

Click the next colored square box under the Event List > Info column.

OSI Model Inbound PDU Details

At Device: PC0
Source: PC0
Destination: HTTP CLIENT

In Layers	Out Layers
Layer 7:	Layer7
Layer6	Layer6
Layer5	Layer5
Layer 4: TCP Src Port: 80, Dst Port: 1033	Layer4
Layer 3: IP Header Src. IP: 192.168.1.3, Dest. IP: 192.168.1.1	Layer3
Layer 2: Ethernet II Header 00D0.D350.8024 >> 000A.418C.9E97	Layer2
Layer 1: Port FastEthernet0	Layer1

1. FastEthernet0 receives the frame.

Layer2

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1. The frame's destination MAC address matches the receiving port's MAC address, the broadcast address, or a multicast address.
2. The device decapsulates the PDU from the Ethernet frame.

Layer3

1. The packet's destination IP address matches the device's IP address or the broadcast address. The device de-encapsulates the packet.

Layer4

1. The device receives a TCP PUSH+ACK segment on the connection to 192.168.1.3 on port 80.
2. Received segment information: the sequence number 1, the ACK number 101, and the data length 471.
3. The TCP segment has the expected peer sequence number.
4. The TCP segment has the expected ACK number. The device pops the last sent segment from the buffer.
5. TCP processes payload data.
6. TCP reassembles all data segments and passes to the upper layer.

Layer7

1. The HTTP client receives a HTTP reply from the server. It displays the page in the web browser.

OSI Model [Inbound PDU Details](#)

PDU Formats

EthernetII									
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Bytes									
PREAMBLE: 101010..10						DEST ADDR: 000A.418C.9E97			
SRC ADDR: 00D0.D350.8024		TYP: E:0x		DATA (VARIABLE LENGTH)		FCS: 0x00000000			

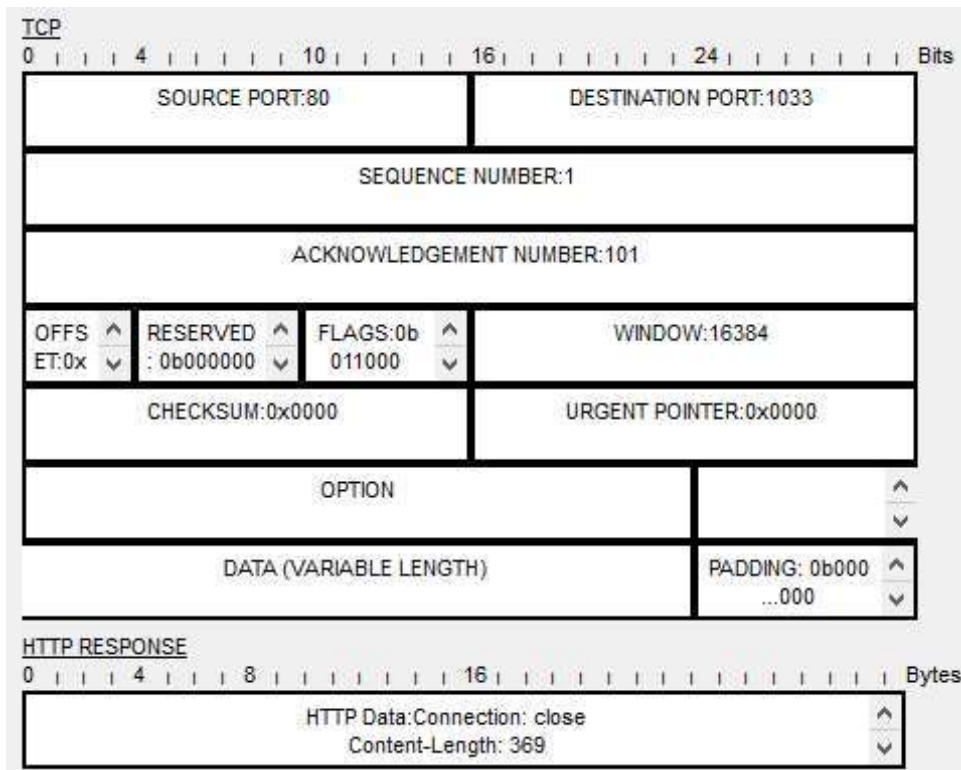
IP									
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Bits									
VER: 4		IHL		DSCP: 0x00		TL: 491			
ID: 0x0015						FLAG: 0		FRAG OFFSET: 0x000	
TTL: 128		PRO: 0x06		CHKSUM					
SRC IP: 192.168.1.3									
DST IP: 192.168.1.1									
OPT: 0x00000000						PADDING: 0x00			
DATA (VARIABLE LENGTH)									

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

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

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Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC0	TCP
	0.000	--	PC0	ARP
	0.001	PC0	Server0	ARP
	0.002	Server0	PC0	ARP
	0.002	--	PC0	TCP
	0.003	PC0	Server0	TCP
	0.004	Server0	PC0	TCP
	0.004	--	PC0	HTTP
	0.005	PC0	Server0	TCP
	0.005	--	PC0	HTTP
	0.006	PC0	Server0	HTTP
	0.007	Server0	PC0	HTTP
	0.007	--	PC0	TCP

Click the first colored square box TCP under the Event List Info column

OSI Model

Outbound PDU Details

At Device: PC0
Source: PC0
Destination: 192.168.1.254

In Layers

Layer7
Layer6
Layer5
Layer4
Layer3
Layer2
Layer1

Out Layers

Layer 7:
Layer6
Layer5
Layer 4: TCP Src Port: 1025, Dst Port: 80
Layer 3: IP Header Src. IP: 192.168.1.1, Dest. IP: 192.168.1.254
Layer 2:
Layer1

Click the next colored square box ARP under the Event List Info column

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OSI Model

Outbound PDU Details

At Device: PC0 Source: PC0 Destination: Broadcast	
In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer2	Layer 2: Ethernet II Header 000D.BDA1.E5E7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.254
Layer1	Layer 1: Port(s): FastEthernet0

1. The ARP process constructs a request for the target IP address.
2. The device encapsulates the PDU into an Ethernet frame.

Click the next colored square box ARP under the Event List Info column

OSI Model

Inbound PDU Details

Outbound PDU Details

At Device: Server0 Source: PC0 Destination: Broadcast	
In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer4	Layer4
Layer3	Layer3
Layer 2: Ethernet II Header 000D.BDA1.E5E7 >> FFFF.FFFF.FFFF ARP Packet Src. IP: 192.168.1.1, Dest. IP: 192.168.1.254	Layer 2: Ethernet II Header 0002.177D. 5C55 >> 000D.BDA1.E5E7 ARP Packet Src. IP: 192.168.1.254, Dest. IP: 192.168.1.1
Layer 1: Port FastEthernet0	Layer 1: Port(s): FastEthernet0

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