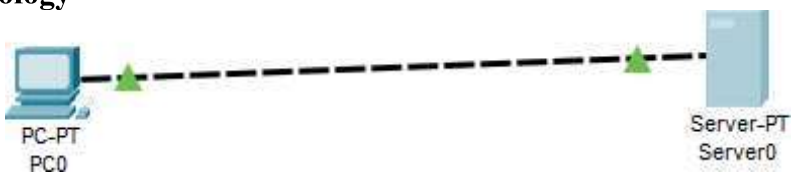
| TITLE: TCP-IP and OSI Models | GPREC-D/CS/EXPT-DCCN-04 |
|---|---|

**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.

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

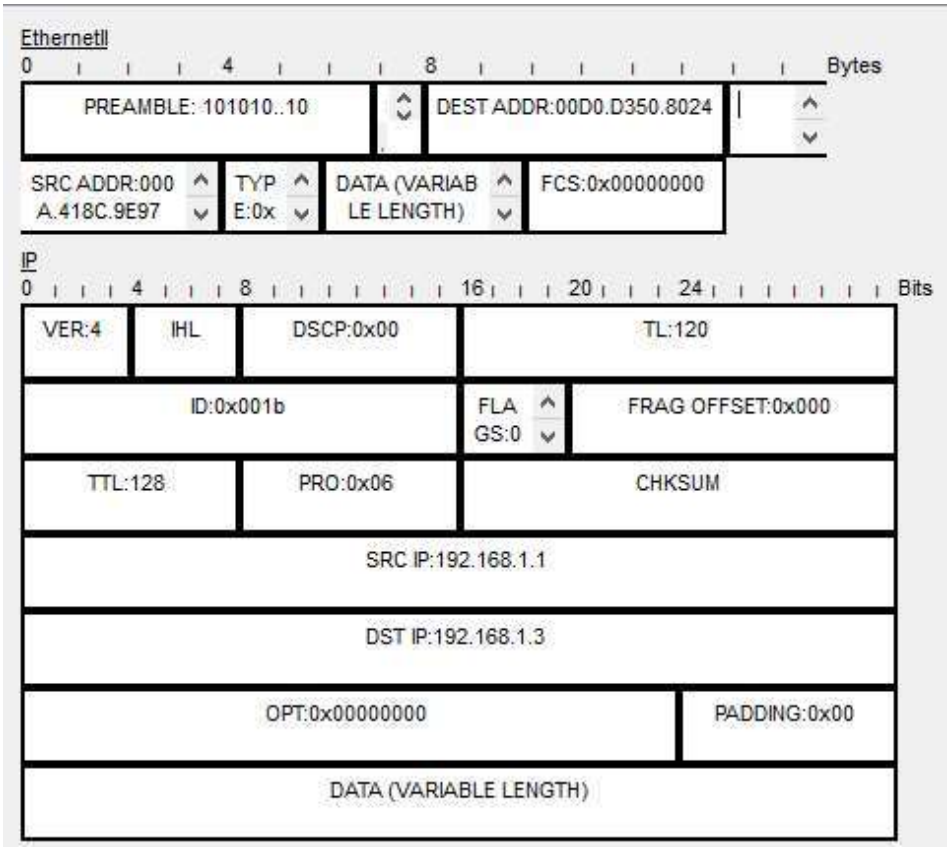
e. Click Next Layer.Layer 2 should be highlighted.

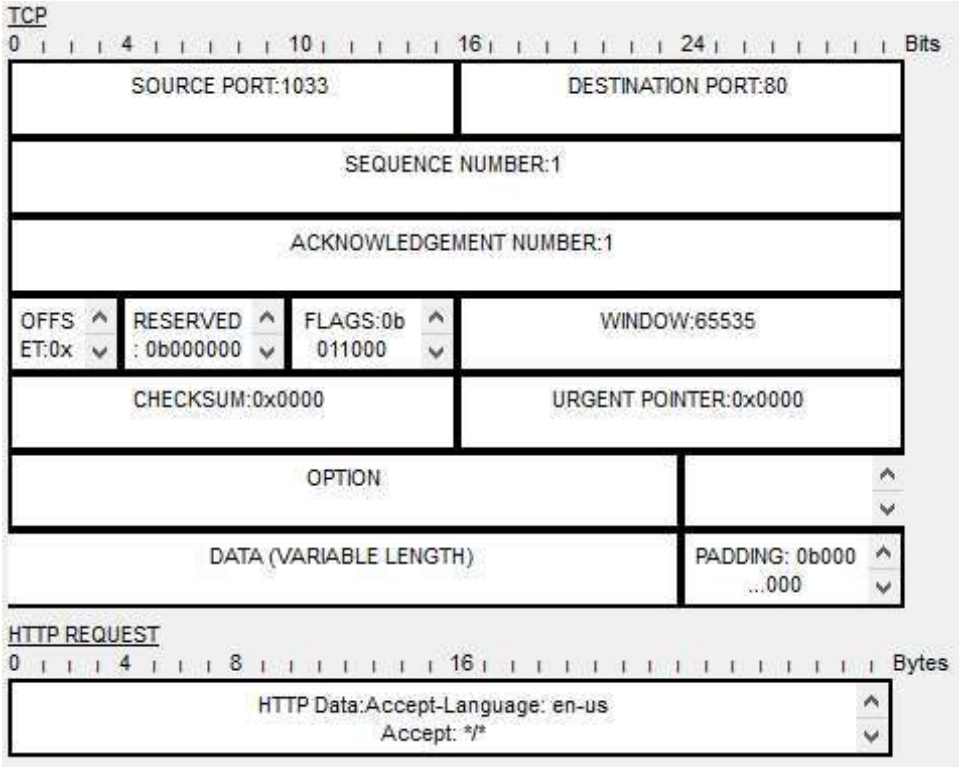
1. The next-hop IP address is a unicast. The ARP process looks it up in the ARP table.
2. The next-hop IP address is in the ARP table. The ARP process sets the frame's destination MAC address to the one found in the table.
3. The device encapsulates the PDU into an Ethernet frame.

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

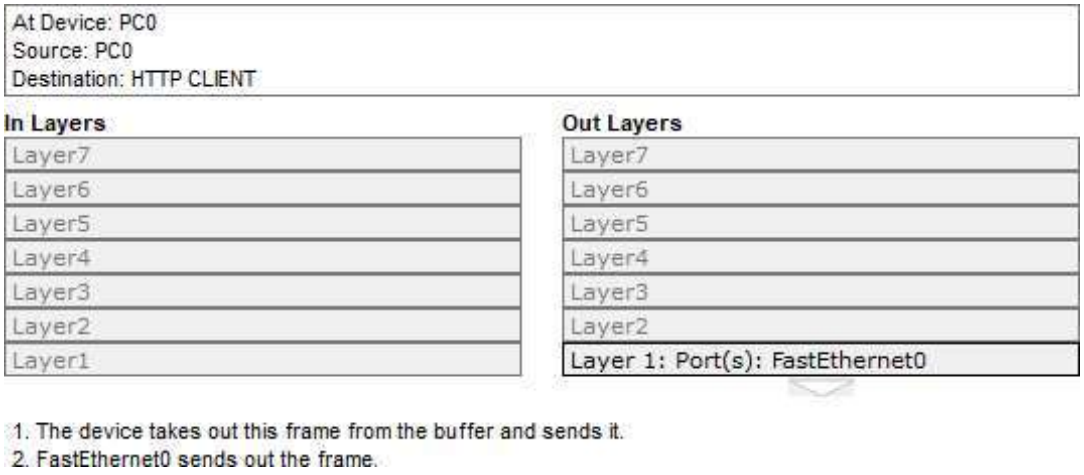
1. The port FastEthernet0 is sending another frame at this time. The device buffers the frame to be sent later.

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

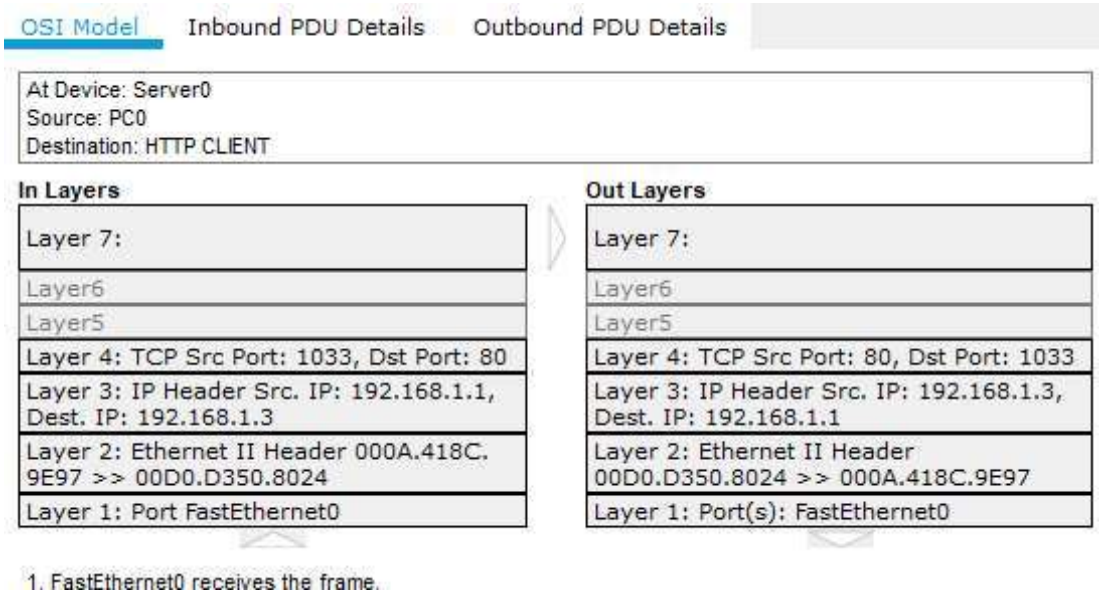





Click the next colored square box under the Event List > Info column. Only Layer 1 is active.The device is moving the frame from the buffer and placing it on to the network.




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.




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

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

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

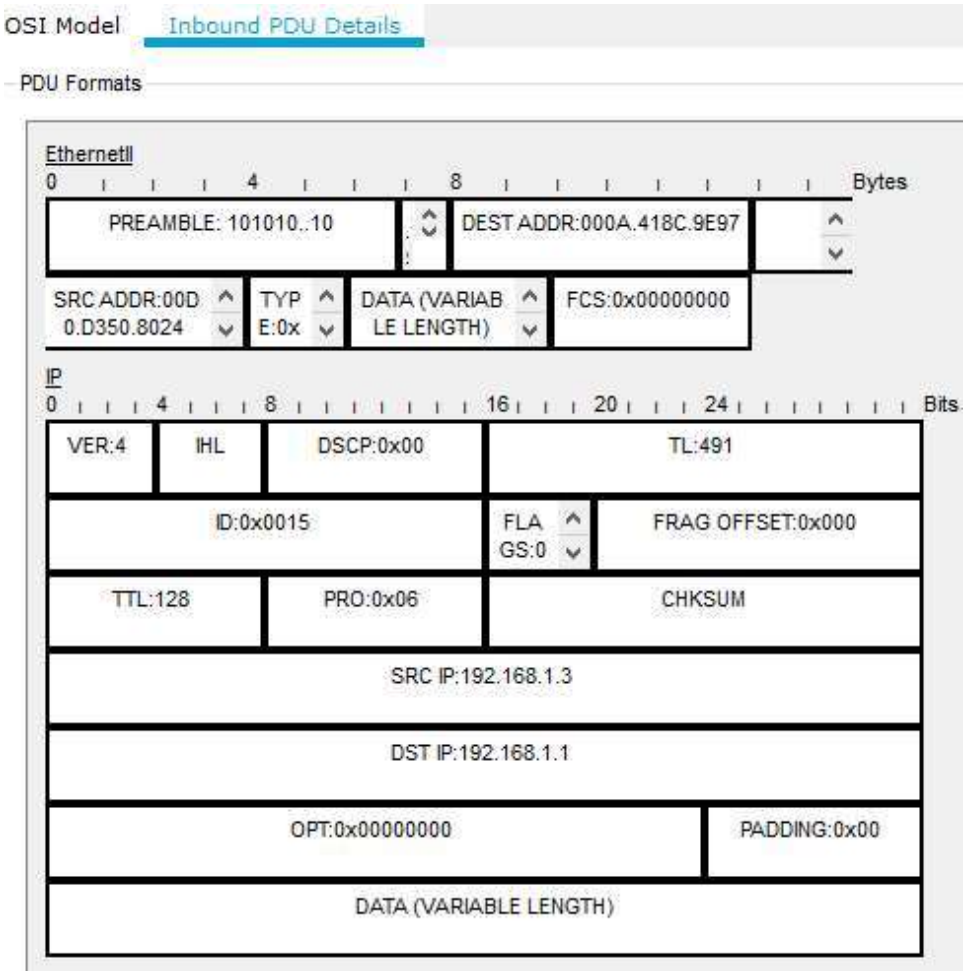
1. The packet's destination IP address matches the device's IP address or the broadcast address. The device de-encapsulates the packet.

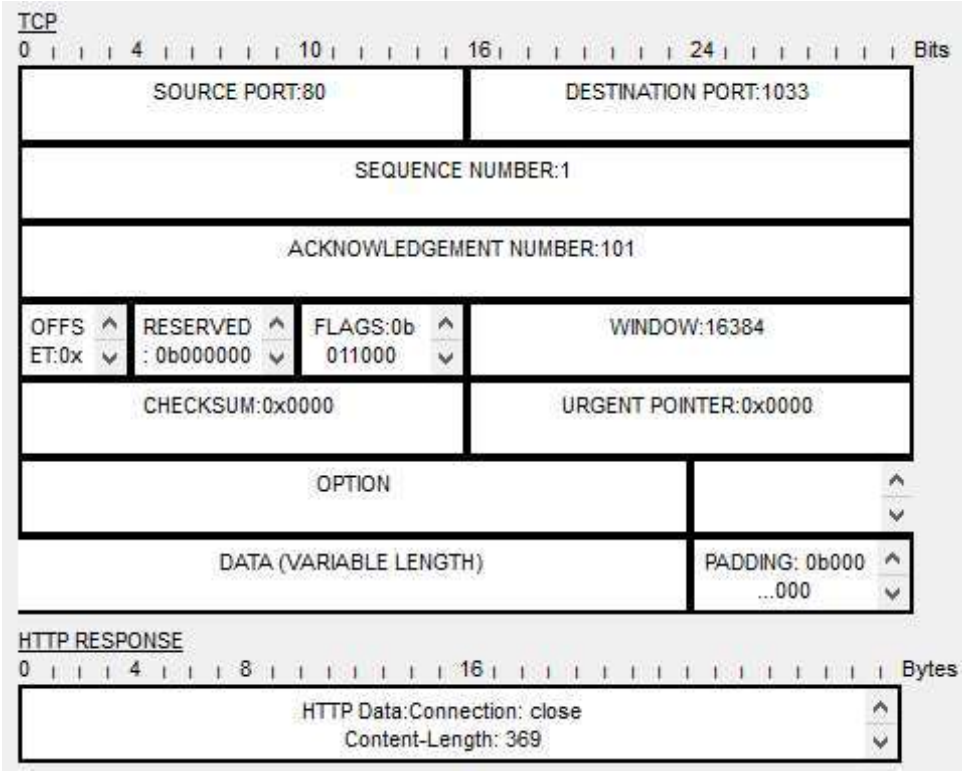
## Layer4

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.

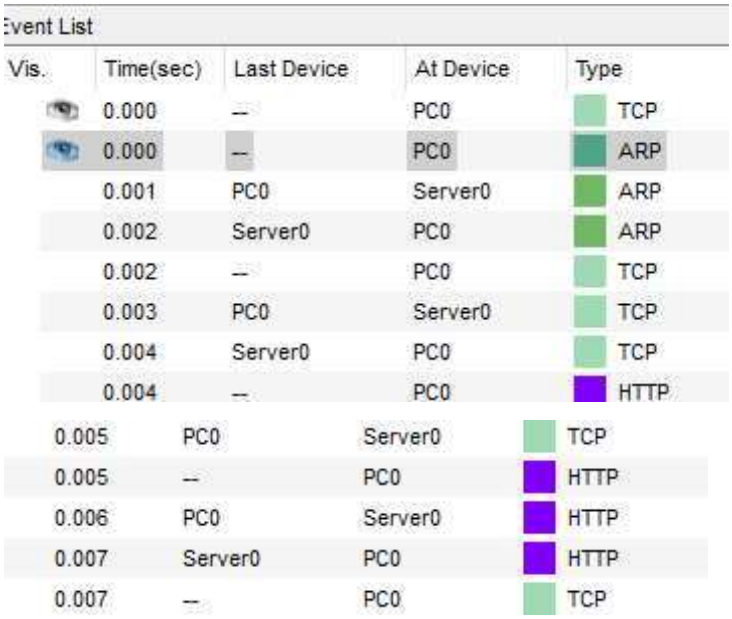

OSI Model
Inbound PDU Details
PDU Formats
EthernetII
0
4
8
Bytes
PREAMBLE: 101010..10
DEST ADDR:000A.418C.9E97
SRC ADDR:00D 0.D350.8024
TYP E:0x
DATA (VARIAB LE LENGTH)
FCS:0x00000000
IP
0
4
8
16
20
24
Bits
VER:4
IHL
DSCP:0x00
TL:491
ID:0x0015
FLA GS:0
FRAG OFFSET:0x000
TTL:128
PRO:0x06
CHKSUM
SRC IP:192.168.1.3
DST IP:192.168.1.1
OPT:0x00000000
PADDING:0x00
DATA (VARIABLE LENGTH)





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

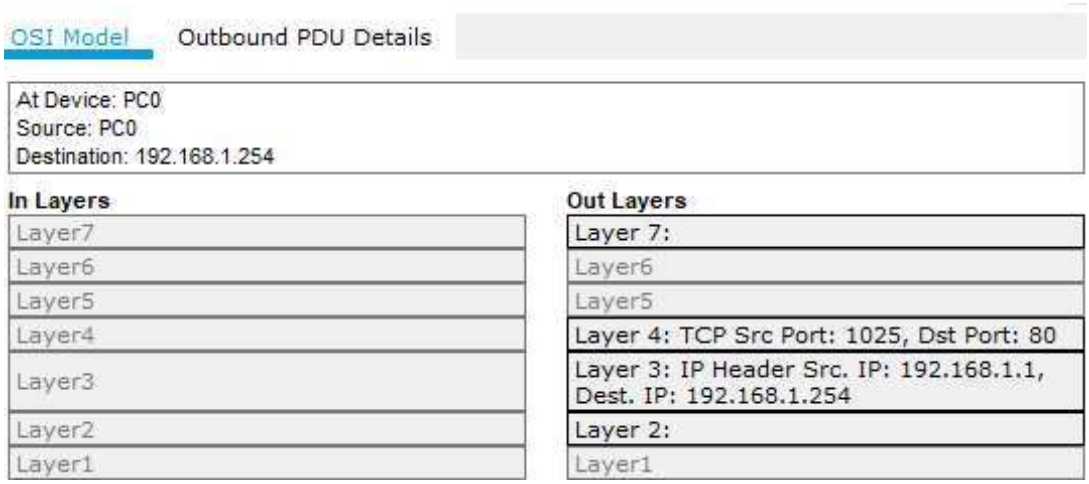
In the Event List Filters > Visible Events section, click Show All.



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

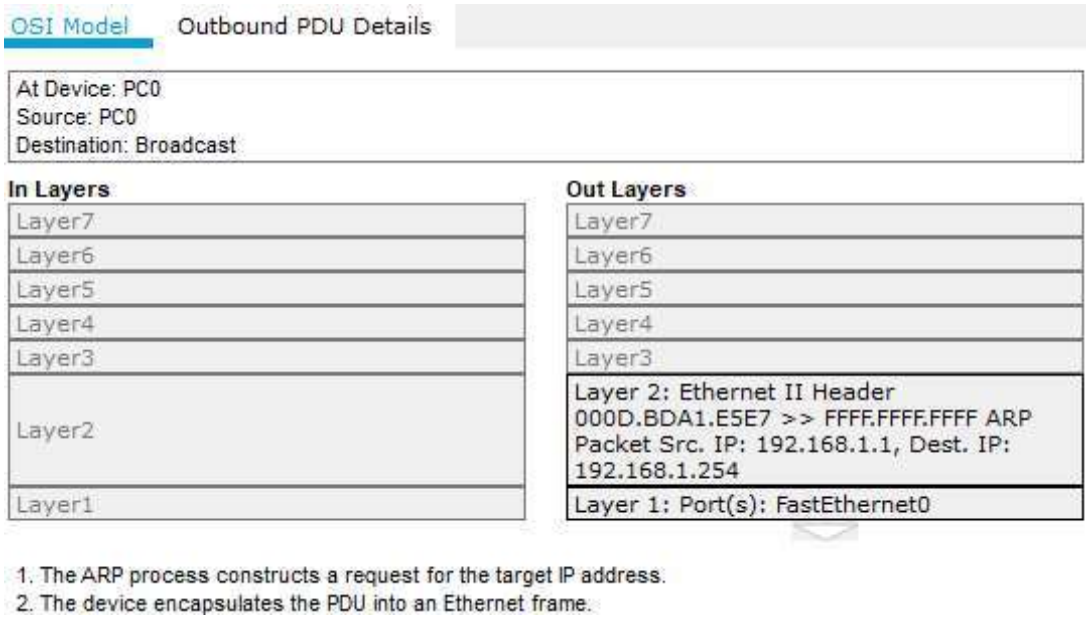


OSI Model | Outbound PDU Details

At Device: PC0
Source: PC0
Destination: 192.168.1.254

| In Layers | Out Layers |
|---|---|
| Layer7 | Layer 7: |
| Layer6 | Layer6 |
| Layer5 | Layer5 |
| Layer4 | Layer 4: TCP Src Port: 1025, Dst Port: 80 |
| Layer3 | Layer 3: IP Header Src. IP: 192.168.1.1, Dest. IP: 192.168.1.254 |
| Layer2 | Layer 2: |
| Layer1 | Layer1 |

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




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