CSE 421

Lab 2 :Observing DNS and ARP in Packet Tracer

ID 20101065

Introduction:

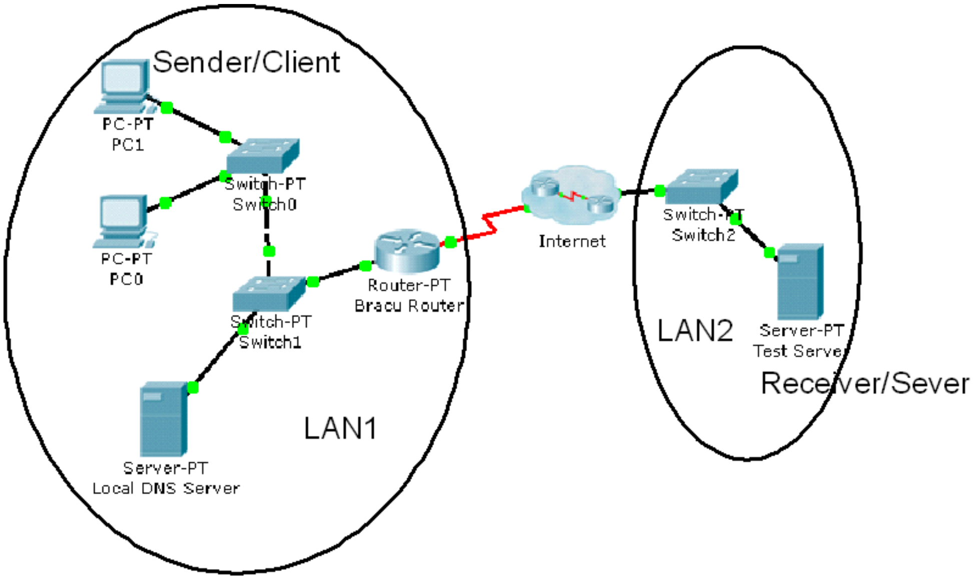
Simulation mode in Packet Tracer captures all network traffic flowing through the entire network . You will observe the packets involved in DNS and ARP process. These two protocols are the helping protocols when a web page is requested using HTTP.

Objectives:

1. Explore how PT uses the OSI Model and TCP/IP Protocols.
   - Creating a Simple PDU (test packet)
   - Switching from Realtime to Simulation Mode

2. Examine a Web Request Packet Processing and Contents
   - Accessing the PDU Information Window, OSI Model View
   - Investigating the layers and addresses in the OSI Model View
   - Animations of packet Flow

Task 1: Observe the network topology shown.

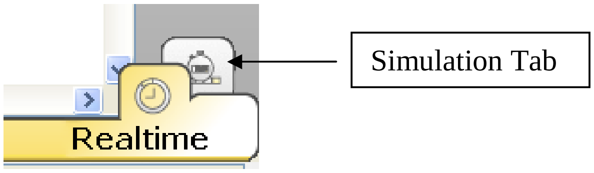


- **PC0**, **PC1** and the **Local DNS server**, **BRACU router** is part of a Local area network. BRACU router connects this LAN to the Internet through an ISP. The **Test server** shown is on another Local area network.
- You will access the web page **www.test.com** which is stored in the Test Web Server through PC1's web browser.
- To access this web page this activity will show you how and what packets are created and how the packets move through the network.
- For this activity we will only focus on DNS and ARP.

Task 1: Capture a web request using a URL from a PC.

Step 1 – Switching from Realtime to Simulation Mode

- In the far lower right of the PT interface is the toggle between Realtime and Simulation mode. PT always starts in realtime mode, in which networking protocols operate with realistic timings.



- In simulation mode, you can visually see the flow of packets when you send data from an application. A new window named "**Event List**" will appear. This window will show the packets (PDUs) as colored envelopes.
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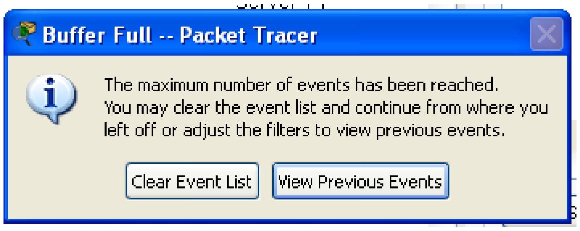
Step 2 – Run the simulation and capture the traffic.

- Click on the PC1. Click on the **Desktop tab**. Open the **Web Browser** from the **Desktop**.
- Write **www.test.com** into the browser. Clicking on **Go** will initiate a web server request. **Minimize** the PC1 Client window.
- Look at the Event List Window. Two packets appear in the **Event List**, a **DNS request** from **PC1** to the **Local DNS server** needed to resolve the URL "www.test.com" to the IP address of the Test server.
- Before the DNS request can be sent, we need to know the DNS Server's MAC address. So the 2nd PDU is the **ARP request** needed to resolve the IP address of the DNS server to its hardware MAC address.
- Now click the **Auto Capture / Play** button in the Event List Window to run the simulation and capture events.
- Sit tight and observe the packets flowing through the network.


Buffer Full -- Packet Tracer

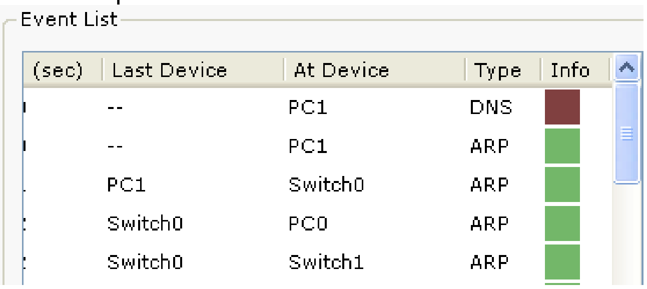
The maximum number of events has been reached.
You may clear the event list and continue from where you left off or adjust the filters to view previous events.

- When the above message appears Click "View Previous Events".
- Click on PC1. The web browser will now display a web page.
- Minimize the PC1 window again.

Step 3 – Examine the following captured traffic.

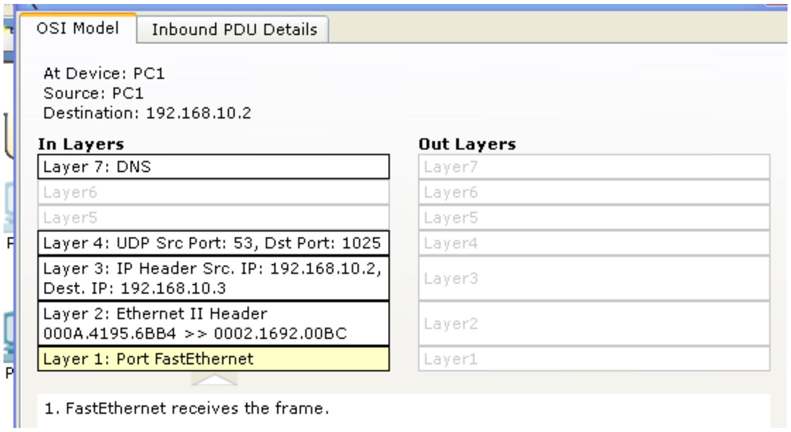
	Last Device	At Device	Type
1.	PC1	Switch 0	ARP
2.	Local DNS Server	Switch 1	ARP
3.	PC1	Switch 0	DNS
4.	Local DNS Server	Switch 1	DNS
5.	--	PC1	HTTP

- Find the following packets given in the table above in the **Event List**, and click on the colored square in the **Info** column.


Event List

(sec)	Last Device	At Device	Type	Info
	--	PC1	DNS	🟥
	--	PC1	ARP	🟩
	PC1	Switch0	ARP	🟩
	Switch0	PC0	ARP	🟩
	Switch0	Switch1	ARP	🟩

- When you click on the Info square for a packet in the event list the **PDU information** window opens.



At Device: PC1
Source: PC1
Destination: 192.168.10.2

In Layers	Out Layers
Layer 7: DNS	Layer7
Layer6	Layer6
Layer5	Layer5
Layer 4: UDP Src Port: 53, Dst Port: 1025	Layer4
Layer 3: IP Header Src. IP: 192.168.10.2, Dest. IP: 192.168.10.3	Layer3
Layer 2: Ethernet II Header 000A.4195.6BB4 >> 0002.1692.00BC	Layer2
Layer 1: Port FastEthernet	Layer1

1. FastEthernet receives the frame.

- This windows displays the OSI layers and the information at each layer for each device. (At Device).
- If you click on these layers, the algorithm used by the device (in this case, the PC) is displayed. View what is going on at each layer.
- Examine the PDU information for the remaining events in the exchange.

<u>Packets 1&2 representing ARP packets:</u>

Packet 1 represents the ARP request by PC1. Which devices' MAC addresses are included as source and destination?

Source MAC : PC1 Destination MAC: None

Why is PC1 sending an ARP packet?

PC-1 needs to know the MAC Address of the Local DNS Server, but initially it has only the IP Address of the local DNS Server. So, in order to get the MAC Address, PC-1 is sending the ARP Packet.

Why was this packet sent to all devices?

This ARP request is sent to all devices because PC-1 doesn't know how many devices are in this network and exactly which one is out target. For this reason, the ARP packet works like a broadcasting system that goes to every device, if the device is not our target then the request is discarded if it is our target device then it gets accepted and we get our target device.

Packet 2 represents the ARP reply by the Local DNS server. What is the difference in the devices' MAC addresses are included as source and destination?

In this packet- Source is the DNS server instead of PC-1, and Destination is Local DNS Server

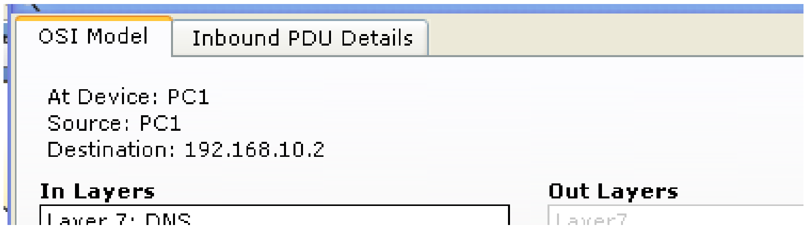
Source MAC: Local DNS Server Destination MAC: PC-1

<u>Packets 3&4 representing DNS packets:</u>

Packet 3 represents the DNS request made by PC1, why? Which devices' IP addresses are included as source and destination?

The DNS request is made to get the IP address of the Test Website Server that we were trying to go.

Source IP: PC-1 Destination IP: Local DNS Server



At Device: PC1
Source: PC1
Destination: 192.168.10.2

In Layers
Layer 7: DNS

Out Layers
Layer7

Click onto “Inbound PDU details” tab. Scroll down, you should come across “DNS Query”. What is the purpose of this DNS Query?

PC-1 was trying to go to test.com, so it needs the IP address of test.com which can be given by the Local DNS Server. Now, the dns server needs to know which sites IP address is PC-1 is requesting, for this reason the DNS query has the URL of the test website to get back the IP address.

Packet 4 is the reply from the DNS server, what is the difference between Packet 1 and Packet 2 source and destination IP addresses?

Packet 1:-
Source IP: PC-1
Destination IP: Local DNS Server

Packet 2:-
Source IP: Local DNS Server IP
Destination IP: PC-1 IP

For packet 4, click onto “Inbound PDU details” tab. Scroll down, do you see anything different after the DNS query?

It contains a DNS Answer Field. In this field, the IP address of test site is found.

Packets 5 is the HTTP request for the web page made by PC1.

Details of this packet will be observed later.