

IT304 Lab2

Result analysis in Netsim and Introduction to Wireshark

1 Result analysis in Netsim

NetSim provides distinct quantitative metrics at various abstraction levels such as Network Metrics, Queue metrics, TCP Metrics, Application Metrics, etc., at the end of simulation. With the help of metrics, users can analyze the behavior of the modeled network and can compare the impact of different algorithms on end-to-end behavior

From the experiment we run in previous lab answer the following questions

1. Observe the animation and answer following questions.
 - (a) Other than data packets which control packets are sent by the applications.(What is the meaning of that control packets). When it is sent?
 - (b) A packet with same name is sent multiple times(i.e HD video1). Why is it so? Observe the table shown below animation and observe the difference in those packets with same packet id?
 - (c) Gmail and HTTP packets are not sent frequently. what can be the reason?
 - (d) Draw a message sequence diagram for Database and youtube application. For example message sequence diagram of Database application can include TCP SYN, TCP SYNACK, TCP ACK, DATABASE1(Multiple times), TCP FIN....
2. For every application calculate following parameters(Make a table):
 - Average Throughput
 - Average delay
 - Packet delivery ratio= $\frac{\text{Packetreceived}}{\text{packetstransmitted}}$
3. For every link calculate following parameters(Make a table):
 - Find the overhead ratio(in terms of number of packets and in terms of number of bytes) overhead ratio= $\frac{\text{Numberofcontrolpackets}}{\text{Numberofdatapacket}}$

4. Create a pivot table which shows how many packets(data+control) are sent between every pair of source and destination.(hint:
 - Format the excel sheet as table
 - Insert→pivot table
 - Select attributes for row column and values(take source id as row, destination id as column and control type packets as value)
 - click insert
5. Find how many packets are errored and how many packets are sent successfully between every pair of source and destination.(use packet status column in filter and values)
6. Show the distribution of inter arrival time of packets for youtube application through histogram.(hint:)
 - Apply following filters
 - (a) CONTROL PACKET TYPE/APP NAME=Youtube
 - (b) Receiver ID=Destination id of you tube application(what ever you have set)
 - Calculate the inter arrival time between two packets. Inter arrival time= PHY_LAYER_END_TIME difference of two consecutive packets($2^{nd}1^{st}$, $3^{rd}2^{nd}$..(before finding difference first copy the PHY_LAYER_END_TIME column to other excel sheet and then find difference)
 - plot histogram using this tool
<https://www.socscistatistics.com/descriptive/histograms/>

2 Introduction to wireshark

One's understanding of network protocols can often be greatly deepened by "seeing protocols in action" and by "playing around with protocols" – observing the sequence of messages exchanged between two protocol entities, delving down into the details of protocol operation, and causing protocols to perform certain actions and then observing these actions and their consequences. This can be done in simulated scenarios or in a "real" network environment such as the Internet. The Java applets that accompany this text take the first approach. In these Wireshark, we'll take the latter approach. You'll be running various network applications in different scenarios using a computer on your desk, at home, or in a lab. You'll observe the network protocols in your computer "in action," interacting and exchanging messages with protocol entities executing elsewhere in the Internet. Thus, you and your computer will be an integral part of these "live" labs. You'll observe, and you'll learn, by doing.

2.1 Installing wireshark

In order to run Wireshark, you will need to have access to a computer that supports both Wireshark and the libpcap or WinPCap packet capture library. The libpcap software will be installed for you, if it is not installed within your operating system, when you install Wireshark.. See <http://www.wireshark.org/download.html> for a list of supported operating systems and download sites.

Download and install the Wireshark software:

- Go to <http://www.wireshark.org/download.html> and download and install the Wireshark binary for your computer.

2.2 Running wireshark: introducing the user interface of wireshark

When you run the Wireshark program, the Wireshark graphical user interface shown in Figure 1 will be displayed. Initially, no data will be displayed in the various windows. The Wireshark interface has five major components:

- **command menus** : They are standard pull down menus located at the top of the window. Of interest to us now are the File and Capture menus. The File menu allows you to save captured packet data or open a file containing previously captured packet data, and exit the Wireshark application. The Capture menu allows you to begin packet capture.
- **Packet listing window** : It displays a one-line summary for each packet captured, including the packet number (assigned by Wireshark; this is not a packet number contained in any protocol's header), the time at which the packet was captured, the packet's source and destination addresses, the protocol type, and protocol-specific information contained in the packet. The packet listing can be sorted according to any of these categories by clicking on a column name. The protocol type field lists the highest level protocol that sent or received this packet, i.e., the protocol that is the source or ultimate sink for this packet.
- **Packet-header details window** : It provides details about the packet selected (highlighted) in the packet listing window. (To select a packet in the packet listing window, place the cursor over the packet's one-line summary in the packet listing window and click with the left mouse button.). These details include information about the Ethernet frame (assuming the packet was sent/received over an Ethernet interface) and IP datagram that contains this packet. The amount of Ethernet and IP-layer detail displayed can be expanded or minimized by clicking on the plus minus boxes to the left of the Ethernet frame or IP datagram line in the packet details window. If the packet has been carried over TCP or UDP, TCP or UDP details will also be displayed, which can similarly be expanded or minimized. Finally, details about the highest level protocol that sent or received this packet are also provided.

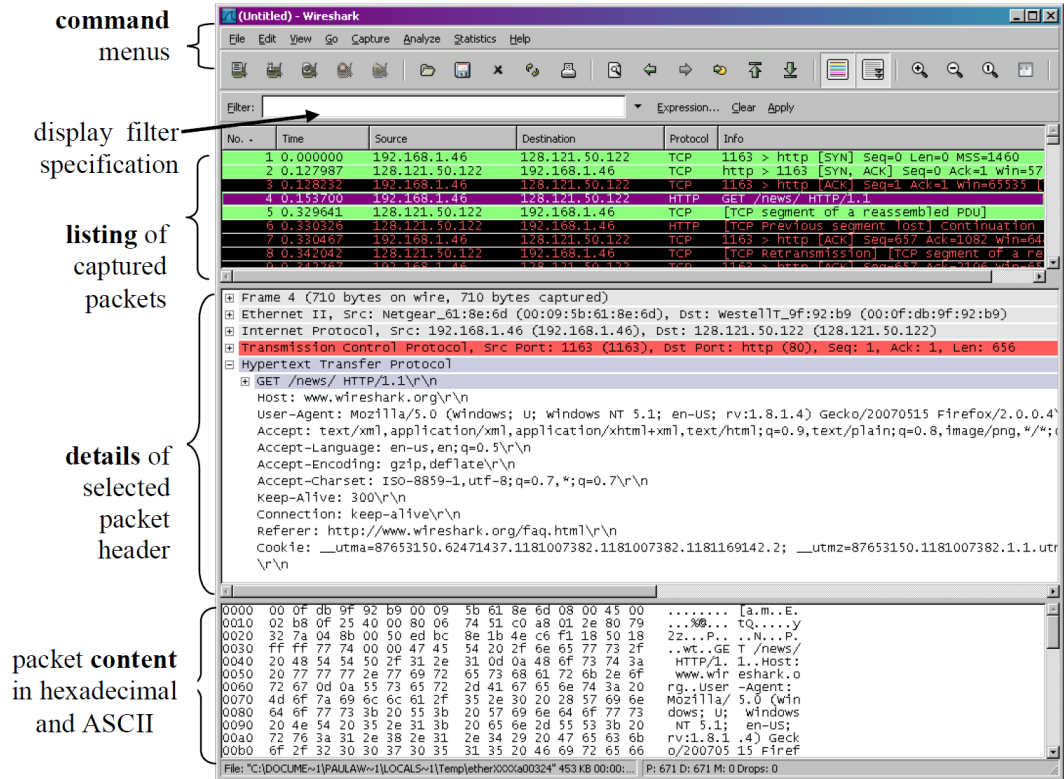


Figure 1: User interface of wireshark



Figure 2: capture window

- **Packet-contents window** : It displays the entire contents of the captured frame, in both ASCII and hexadecimal format.
- **packet display filter field** : Towards the top of the Wireshark graphical user interface, is the packet display filter field, into which a protocol name or other information can be entered in order to filter the information displayed in the packet-listing window (and hence the packet-header and packet-contents windows). In the example below, we'll use the packet-display filter field to have Wireshark hide (not display) packets except those that correspond to HTTP messages.

2.3 Experiment

Make sure that your computer is connected to the Internet via a wired Ethernet interface. Do the following.

1. Start up your favorite web browser, which will display your selected home-page.
2. Start up the Wireshark software.
3. To begin packet capture, you will need to select an interface that is being used to send and receive packets (mostly likely the wireless interface). as shown in Figure 2.
4. While Wireshark is running, enter the URL: <http://gaia.cs.umass.edu/wireshark-labs/INTRO-wireshark-file1.html>
5. After your browser has displayed the INTRO-wireshark-file1.html page, stop Wireshark packet capture by selecting stop in the Wireshark capture window.

6. Type in “http” (without the quotes, and in lower case – all protocol names are in lower case in Wireshark) into the display filter specification window at the top of the main Wireshark window. Then select Apply (to the right of where you entered “http”). This will cause only HTTP message to be displayed in the packet-listing window.
7. Select the first http message shown in the packet-listing window. This should be the HTTP GET message that was sent from your computer to the gaia.cs.umass.edu HTTP server. When you select the HTTP GET message, the Ethernet frame, IP datagram, TCP segment, and HTTP message header information will be displayed in the packet-header.
8. Try to understand the each an every field of the packet header.

2.4 Questions

Look at the packet header of http GET message and answer the questions.

1. What are the ip addresses of source and destination?
2. What is the frame length?
3. What is the sequence number and acknowledgement number?

Look at the packet of http OK packet and answer the questions.

1. What are the ip addresses of source and destination?
2. What is the frame length?
3. What is the sequence number and acknowledgement number?

2.5 Analyse Netsim output with Wireshark

1. Enable wireshark on source node of Database application and client node of youtube application.(hint:
 - right click on the wired node
 - go to its properties
 - In the general properties go to wireshark option. Set it ONLINE
2. Observe the captured packets and answer following questions:
 - (a) write down the protocol stack used for Database application
 - (b) write down the protocol stack used for youtube application.
 - (c) which kind of control packets are sent by both the applications?

3 Study Star, Bus and Ring topologies and analyze their throughputs

3.1 Introduction

- **Star topology:** In local area networks with a star topology, each network host is connected to a central switch with a point-to-point connection. In Star topology every node (computer workstation or any other peripheral) is connected to central node called switch. The switch is the server and the peripherals are the clients. The network does not necessarily have to resemble a star to be classified as a star network, but all of the nodes on the network must be connected to one central device. All traffic that traverses the network passes through the central switch. The star topology is considered the easiest topology to design and implement. An advantage of the star topology is the simplicity of adding additional nodes

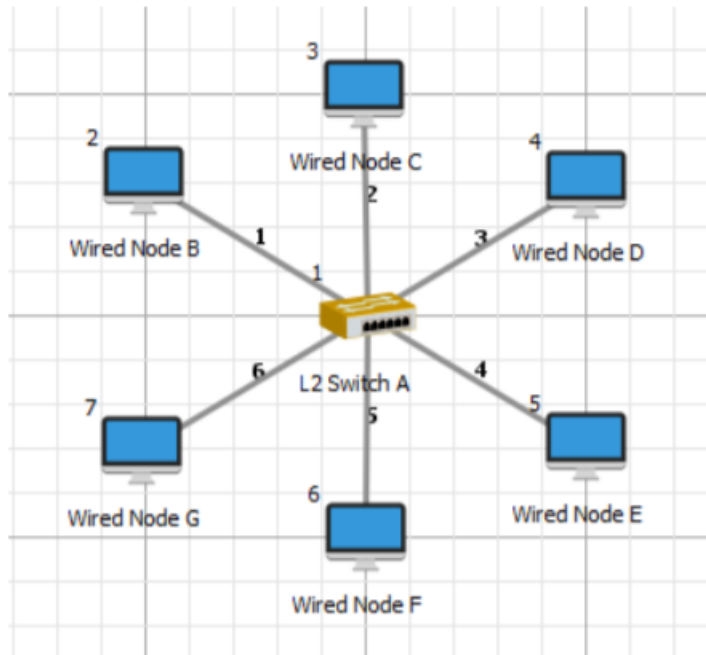
- **Token bus:** The token bus network is a standard in which tokens are passed along a virtual ring. In the token bus network bus topology is used as physical media.

In this, the virtual ring is created with stations and therefore tokens are subsequently passed from a station during a sequence with this virtual ring. Every station or node in token bus network knows the address of its predecessor station and its successor station. A node (station) can transmit the data if and only if it has a token. Its working rule is analogous to the token ring network.

- **Token ring:** It is defined by the IEEE 802.5 standard. In the token ring network the token is passed over a physical ring instead of virtual ring. In this a token is a special frame and a station can transmit the data frame if and only if it has a token. And The tokens are issued on successful receipt of the data frame.

3.1.1 Experiment1

1. Design a star topology
 - New → Internetworks
 - Implement following topology



2. Switch Properties: Accept the default properties of switch
3. Wirednode properties: Disable TCP at transport layer in all wired nodes
4. Link properties: Uplink and downlink speed=100 Mbps, BER=no error

5. Application properties:

Application Properties:

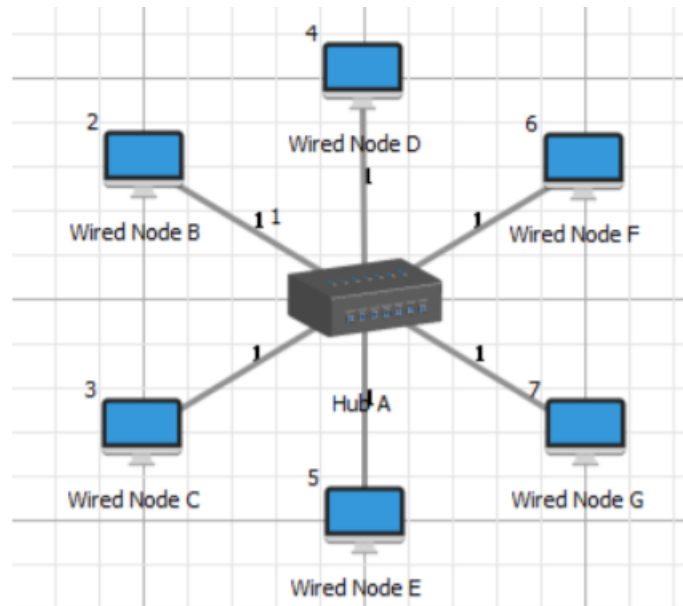
Application Properties	2(Wired Node B)	3(Wired Node C)	4(Wired Node D)	5(Wired Node E)	6(Wired Node F)	7(Wired Node F)
Destination	3(Wired Node C)	4(Wired Node D)	5(Wired Node E)	6(Wired Node F)	7(Wired Node B)	2(Wired Node B)
Application Type	Custom	Custom	Custom	Custom	Custom	Custom
Packet Size						
Distribution	Constant	Constant	Constant	Constant	Constant	Constant
Packet Size (Bytes)	10000	10000	10000	10000	10000	10000
Packet Inter Arrival Time						
Distribution	Constant	Constant	Constant	Constant	Constant	Constant
Packet Inter Arrival Time (µs)	1000	1000	1000	1000	1000	1000

6. Simulation time=10s

7. Note down average throughput of all application

3.1.2 Experiment2

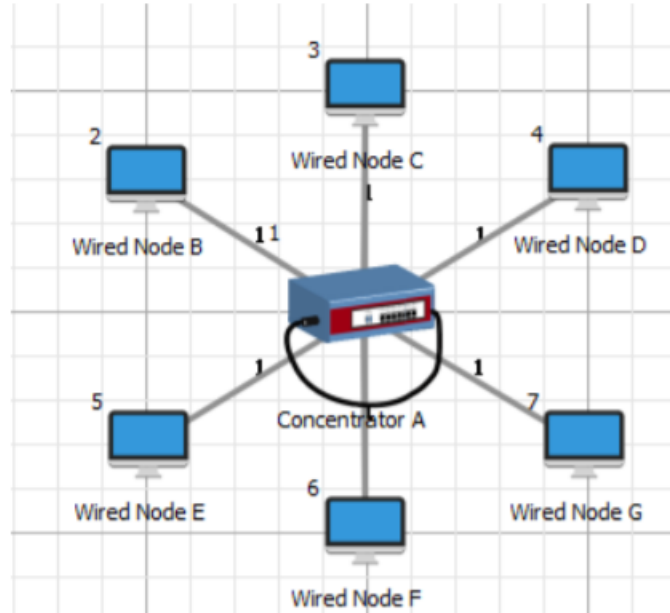
1. New→ Legacy Network →Token Bus
2. Implement following topology



3. Wirednode properties: Disable TCP at transport layer in all wired nodes
4. Link properties: Uplink and downlink speed=10 Mbps, BER=no error
5. Application properties: Same as previous experiment
6. Simulation time=10s
7. Note down average throughput of all application

3.1.3 Experiment 3

1. Create scenario: New → Legacy network → Token ring
2. Implement following topology:



3. Concentrator properties(set by link properties):

Concentrator Properties:

Concentrator Properties	Values to be Selected
Data Rate(Mbps)	16
Error Rate (bit error rate)	No error

Figure 3: Caption

4. Link properties: Uplink and downlink speed=100 Mbps, BER=no error
5. Application properties:As previous experiment
6. Simulation time=10s
7. Note down average throughput of all application

Compare Throughtput of all these three experiment and justify the output.

4 Submission guidelines

Submit a pdf file which contains answer of all exercises.