ECET 4840 Advanced Telecommunications
Laboratory Exercise 6

Purpose: The objective of this exercise is to use two common diagnostic tools, ping and a network analyzer, to determine basic network performance. Ping uses ICMP (Internet Control Message Protocol, a TCP/IP sub-protocol) to send an ECHO_REQUEST message to a specific host. If successfully received, the host, in turn, returns an ECHO_RESPONSE message. The network analyzer is used to perform many diagnostic-related performance tests, including verification of ping requests and responses.

Procedures:

1. Ensure that the Cisco Intranet cloud configuration shown in Figure 1 is setup. ***Note:*** Always save previous router configurations prior to making new configuration changes.
2. Divide the class into two groups.
3. Boot four (4) workstations into the Linux operating system, preferably two (2) on each side of the lab. Configure (IP and cabling) two (2) stations to "talk" to the Washington router and two (2) to "talk" to the Paris router (refer to Figure 1). ***Note 2:*** If the routers in the figure are not available, then other Cisco 2621s may be used.
4. Verify that each of the station's IP configuration allows access to its respective router. Also, verify that each station can ping all of the four other stations.
5. Now insert an Ethernet hub between two (2) of the stations and their associated router. In other words, router → etherswitch → hub → two stations.
6. Start up the program WireShark on one of the two hubbed stations.
7. Test your setup by having one of your colleagues from one of the non-hubbed stations ping a hubbed station. Use WireShark to verify the ping request and response.
8. Again have one of your non-hubbed colleagues ping the same station. However, ask him/her to fix the test packet length to 100 bytes. Q1: Can you verify the packet length using the network analyzer? Now have him/her transmit an 800 byte packet. Q2: Can you verify the packet length?
9. Now have one of your hubbed colleagues do the reverse process; i.e. ping one of your non-hubbed colleagues while determining packet length.
10. Telnet into the router associated with the hubbed stations. Simultaneously, have a hubbed and non-hubbed station ping each other. Determine the following information:

    Capacity of Ethernet port_____

    Capacity of Serial port attached to other router_____

    Average frame size at Ethernet port_____

    Average frame size at Serial port_____

    Arrival rate in fps_____

    Service rate in fps_____

Note – you may not be able to get the exact frame size, but the statistics saved by the router should give you a reasonable guesstimate.
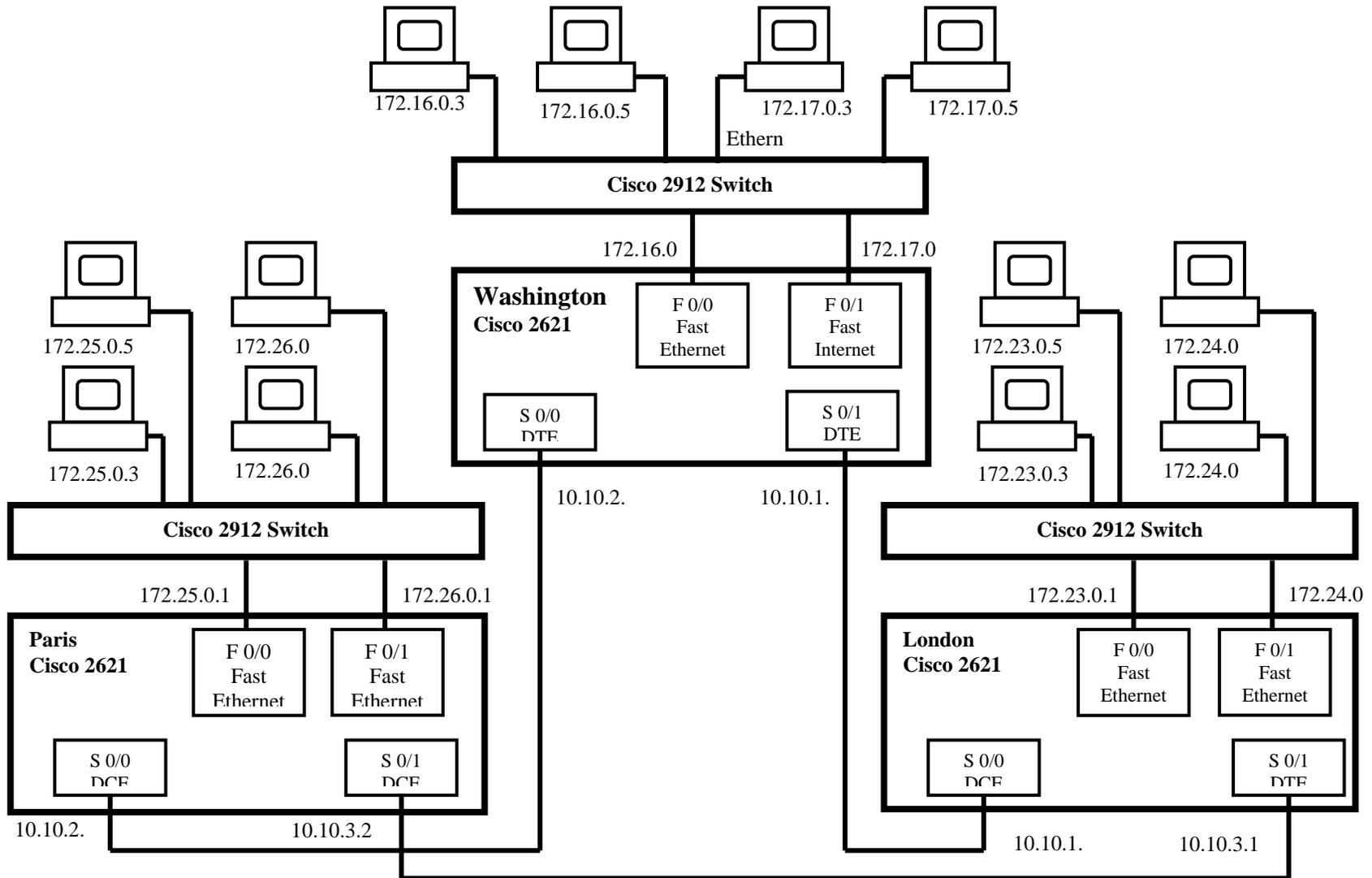
11. Use the "sh int" command on the routers to view the input and output port statistics. Determine the "packets received" (mean arrival rate) on the input port and the "packets transmitted" (mean service rate) on the output port. These values shown are the average "packets per second" and "bytes per second".

12. Now that you know how to gather the appropriate information, begin ping flooding (ping –f IP) one of the non-hubbed stations from a hubbed station. Keep the packet size fixed at 100 bytes. Rerecord the arrival rate, **and** the service rate. Fill in the following table:

Number of non-hubbed stations doing Ping flooding	Arrival rate in fps
1	
2	
3	

13. Repeat step 9, but add traffic from the other direction as well. Q: How does this affect our queuing results?

Turn in: All of the required data, XY graph showing P_{util} (Percent Utilization ~ how busy the router is) vs. arrival rate and a summary of your results. Each report must be an individual effort. Note: $P_{util} = \lambda * T_s$, where λ means number of arrivals per second and T_s equals service time for each arrival = $1/M$. M equals the link capacity in bps.

Note: A **formal** laboratory report is required for this experiment. Report is due in two weeks.

172.16.0.3   172.16.0.5   172.17.0.3   172.17.0.5

Ethern

Cisco 2912 Switch

172.16.0   172.17.0

Washington
Cisco 2621

| F 0/0 Fast Ethernet | F 0/1 Fast Internet |

| S 0/0 DTE | S 0/1 DTE |

172.25.0.5   172.26.0

172.25.0.3   172.26.0

Cisco 2912 Switch

172.25.0.1   172.26.0.1

Paris
Cisco 2621

| F 0/0 Fast Ethernet | F 0/1 Fast Ethernet |

| S 0/0 DCE | S 0/1 DCE |

10.10.2.   10.10.3.2

10.10.2.   10.10.1.

172.23.0.5   172.24.0

172.23.0.3   172.24.0

Cisco 2912 Switch

172.23.0.1   172.24.0

London
Cisco 2621

| F 0/0 Fast Ethernet | F 0/1 Fast Ethernet |

| S 0/0 DCE | S 0/1 DTE |

10.10.1.   10.10.3.1

WAN network subnet mask: 255.255.255.0
LAN network subnet mask: 255.255.0.0

Fig. 1. Cisco 2621 Router Intranet Configuration