FIT3165 Computer Networks

Assignment-1
Semester 1, 2018

Introduction

This assignment is due by Friday of **Week-7, 4:00 PM semester 1 2018**. It is worth **15%** of the marks for your final assessment in this unit. **A penalty of 10% per day, including each day of a weekend, will apply for late submission**. Refer to the FIT3165 Unit Guide for the policy on extensions. (Total Marks for this assignment is **100** = Part-A=70 + Part-B=30)

This is an individual assignment and must be your own work. Please note the section on plagiarism, cheating and collusion in this document.

Part – A Theory and Conceptual Questions covering Computer Networks concepts, TCP/IP communication Architecture, Application, Transport and Network Layers. (5+5+4+4+8+4+4+4+4+4+4+4+4+8+4=70 Marks)

Q.1 Referring to the Figure 1.4 in the prescribed book, we have just one single WAN link between the routers for hosts at the west coast office to communicate with the hosts in the east coast office. Notice that we have switches (layer-2 devices) connected behind the routers. Explain why we need two routers in this internetwork scenario? Give a detailed explanation in your answer referring to Layer-2 & Layer-3 functionality. **(5 Marks)**

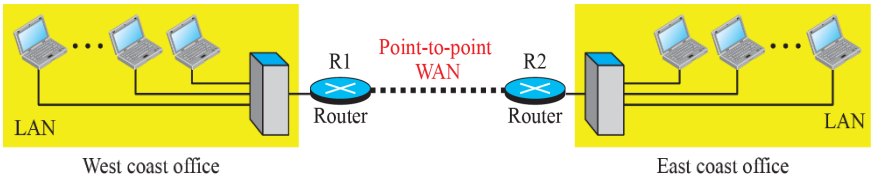


Figure 1 An internetwork made of two LANs and one WAN (Figure 1.4)

Q.2 In the internet architecture, if we change the LAN technology to a new one. Which layers in the TCP/IP protocol architecture suite need to be changed? **(5 Marks)**

Q.3 Assume a system uses five-layer TCP/IP protocol architecture. If the application program creates a message of 100 bytes and the top four layers, adds a header of 10 bytes to the data unit, what is the efficiency (the ratio of application- layer bytes to the number of bytes transmitted) of the system? **(4 Marks)**

Q.4 FTP uses the services of TCP for *exchanging control information* and *data transfer*. Can FTP use the services of UDP for either of these two connections? Give a detailed explanations for either i.e. yes or No. **(4 Marks)**

Q.5 Imagine a scenario of using an application protocol HTTP; draw a detailed systematic stage of transactions in the figure to show how the application of cookies is used in the scenario in which the server uses cookies for advertisements for tracking purposes. Assume we are using only three sites. **(8 Marks)**

Q.6 In SMTP, a non-ASCII message of 1000 bytes is encoded using base64. How many bytes are in the encoded message? How many bytes are redundant? What is the ratio of redundant bytes to the total message? **(4 Marks)**

Q.7 In the Selective-Repeat protocol, the size of the send and receive windows is the same. Does this mean that there are supposed to be no packets in transit? **(4 Marks)**

Q.8 A client residing on a host with IP address 122.45.12.7 sends a message to the corresponding server residing on a host with IP address 200.112.45.90. If the well -known port is 161 and a random ephemeral port range number are chosen; describe what are the socket addresses used in this communication? **(4 Marks)**

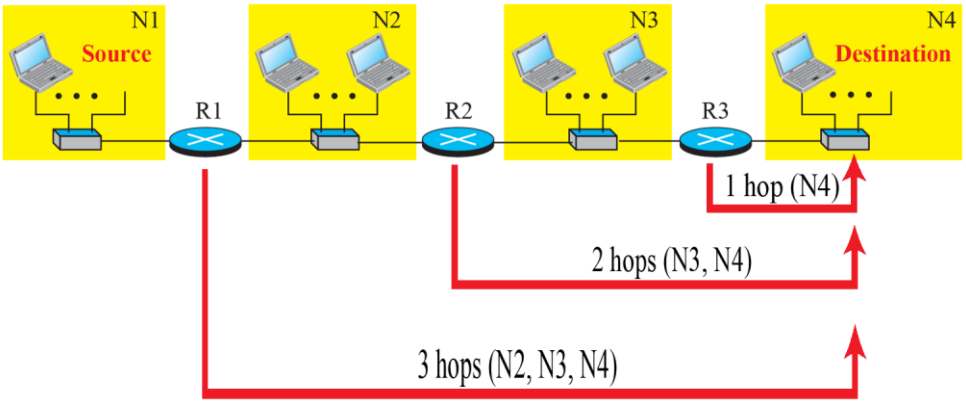
Q.9 Can you explain why ICANN has divided the port numbers into three groups i.e. well-known, registered, and dynamic? **(4 Marks)**

Q.10 Why is the routing the responsibility of the network layer ? In other words, why can 't the routing be done at the transport layer or the data-link layer? Explain for both the layers. **(4 Marks)**

Q.11 Identify which field(s) in the datagram is(are) responsible for gluing together a fragments belonging to an original datagram? Explain those field(s)? **(4 Marks)**

Q.12 Explain the concept of hop count in RIP. Can you explain why there is no hop is counted between Nl and Rl in Figure 4.70? **(4 Marks)**

Figure 4.70: Hop counts in RIP



Q.13 Compare NAT and DHCP. Both can solve the problem of a shortage of IP addresses in an organization, but by using different strategies. **(4 Marks)**

Q.14 Assume we have an internet with a 12-bit address space. The addresses are equally divided between eight networks (N_0 to N_7). The internetwork communication is done through a router with eight interfaces (m_0 to m_7). Show the internet outline and the forwarding table (with two columns: prefix in binary and the interface number) for the only router that connects the networks. Draw a neat diagram of those eight networks and assign a network address to each network. **(8 Marks)**

Q.15 Explain why we can have different intra-domain routing protocol s in different ASs autonomous system, but we need only one inter-domain routing protocol in the whole Internet ? **(4 Marks)**

Part-B: Exercise using Wireshark protocol analyser (2+2+2+2+2+2+5+6+2+5 = 30 Marks)

Wireshark http://www.wireshark.org/ (https://www.wireshark.org/download.html) is a useful tool for network traffic analysis. In this assignment exercise, you will be using Wireshark tool to analyse packet traces from a TCP connection, and answer a few questions. Download from Moodle the previously captures traffic trace called ("**`tcp-trace.pcap`**") file. Then using Wireshark on your PC, open the traffic trace file and answer the following questions.

1) Click and select the first packet. You will see the details of the packet. What protocol headers are included in this packet? **(2 Marks)**
2) What TCP flags are set in the first packet? **(2 Marks)**
3) What TCP options are included in the first packet? **(2 Marks)**
4) Which host does the active open? **(2 Marks)**
5) Why does the sender send packet 96? **(2 Marks)**
6) Select packet 119. What might cause the sender to send this packet? **(2 Marks)**
7) Select packet number 425. Which host does an active close? **(5 Marks)**
8) Go to the "Statistics" menu, and follow the sub-menu "TCP Stream Graph." Click the "Time-Sequence Graph (Downloaded file "**`tcp-trace.pcap`**")." Zoom this graph so that you can see 1-second time ticks. From this graph, can you tell how many times the TCP sender does slow start, and when each slow start phase finishes? **(6 Marks)**
9) How many packets are likely to be lost between time 2s and 7s? Circle the correct answer. **(2 Marks)**
   a. One
   b. Two
   c. Three
   d. Greater than three(> 3)
10) Click the "Round Trip Time Graph." Can you explain why the measured RTT values fluctuate so much over time from what you learned from the Time-Sequence graph? **(5 Marks)**
11) Similarly, Click the "Throughput Graph." Can you explain why the TCP throughput fluctuates a lot between 5-10 second, but stabilizes afterwards? **(5 Marks)**

Plagiarism, cheating and collusion

Students should consult University materials on this matter at:

http://www.infotech.monash.edu.au/units/appendix.html#plagiarism

The following excerpt is from the aforementioned URL:

Plagiarism and cheating are regarded as very serious offences. In cases where cheating has been confirmed, students have been severely penalized, from losing all marks for an assignment, to facing disciplinary action at the Faculty level. While we would wish that all our students adhere to sound ethical conduct and honesty, I will ask you to acquaint yourself with the University's Plagiarism policy and procedure. In past students have submitted an old version of assignment work as theirs; this has been detected by the turnitin anti-plagiarism software tool. Turnitin is an Internet-based plagiarism-prevention service, which checks the documents for unoriginal content.

(http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html) which applies to students detected plagiarizing.

It is your responsibility to make yourself familiar with the contents of these documents.