COMP90007 Internet Technologies

Semester 1, 2016

Assignment 1

Due Date: 11pm, 24th March 2016

This assignment has 10 questions of equal weight and is worth 5% of the total marks for the subject. Answers must be submitted as a PDF file via the COMP90007 Assignment 1 submission form in the LMS by **11 pm 24th March 2016***. Late submissions will attract a penalty of 10% per day (or part thereof). Please ensure your name and login name are clearly presented.*

Each question or sub question can be answered in a few sentences. Excessively long answers will be penalized.

All questions can be answered by studying the material from the textbook. You may discuss the assignment topics with your friends, however, all work presented should be your original work. There will be a discussion forum thread for the assignment and any instructions provided in the forum are also part of the specification.

1 a. The performance of a network application is influenced by two major network characteristics: the bandwidth of the network (number of bits per second that the network can transport) and the latency (the delay experienced by each bit transported).

Give:

i. an example of a network that exhibits high bandwidth but also high latency,
ii. an example of a network that exhibits low bandwidth and low latency.

b. A digital signal is transmitted using an 32-level modulation scheme, corresponding to 0, 1, 2, ... , 31 volts. If the baud rate (number of symbols transmitted per second) of the channel is 9600 baud, what is the bit-rate of the channel using this modulation scheme?

2 a. List two ways in which the OSI reference model and the TCP/IP reference model are the same. Now list two ways in which they differ.

b. In a system with n-layer protocol hierarchy, applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers?

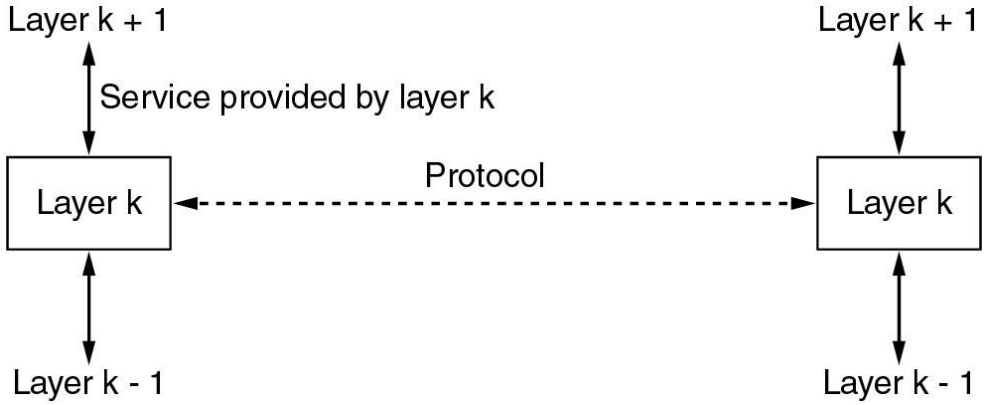
3 a. You have a choice of making a telephone call between Melbourne and Sydney via either a coaxial cable link or a geostationary satellite link. Which would you choose? Briefly explain why.

b. An image is 640 × 480 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over 56-kbps model channel? Over a 1-Mbps cable modem? Over a 100 Mbps Ethernet? Over gigabit Ethernet?

4. When a large file is transferred across the network between two computers, two different possible acknowledgement schemes can be used. In the first, the file is divided into smaller packets, which are then individually acknowledged by the receiver as they are received, but the file transfer as a whole is not acknowledged. In the second scheme, the packets are not acknowledged individually, but the entire file is when it arrives at its destination. Discuss

these two approaches, also relating to what you may have observed in your Wireshark trace in Lab 1.

5 a. Consider the following figure:



In the above figure, a service is shown. Are any other services implicit in the figure? If so, where? If not why not?

b. Suppose the algorithms used to implement the operations at layer k is changed. How does these impact operations at layers *k – 1* and *k + 1*?

6.a Describe the functions of each layer in OSI reference model using not more than two sentences.

b. Give two disadvantages of using layered protocols.

7. Companies who operate and maintain mobile phone networks need to know where the mobile phones of their users are located. Explain different reasons why this may be bad and why this may be good for users.

8. What are the 3 main functions of the Data Link layer? What is a checksum? What is its role in the Data Link layer?

9 Which protocol requires more buffer space at the receiver – Go-Back-N or Selective Repeat? Briefly explain why.

10. A stop-and-wait protocol is used on a 100 Mbits/s link. The round-trip propagation time on the link is 300 *micro*seconds. What is the minimum frame size required (in bits) in order to guarantee that the maximum utilization of the link is at least 40%? Assume that transmission is error free, and the length of an acknowledgement frame is negligible.