

# COMP90007 Internet Technologies

## Semester 2, 2018

### Assignment 1

**Due date: 5:00pm, 17/08/2018**

This assignment is worth 5% of the total marks for the subject. This assignment has 8 questions. The weighting of each question is shown beside the Question. **Answers must be submitted as a PDF file via the COMP90007 Assignment 1 submission form in the LMS by 5:00pm, 17/08/2018. Late submissions will attract a penalty of 10% per day (or part thereof). Please ensure your name and user name are clearly presented. Submission should only contain the question number and the answer (*do not repeat the text of questions in your submission*).** Please present all steps for questions involving calculations and/or derivations otherwise relevant penalties will be imposed.

Each 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 can 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.

#### **Question 1** (0.5 mark)

A digital signal is transmitted using an 64-level modulation scheme, corresponding to 0, 1, 2, ... , 63 volts. If the baud rate (number of symbols transmitted per second) of the channel is 4800 baud, what is the bit-rate of the channel using this modulation scheme?

#### **Question 2** (0.5 mark)

In a system with 3-layer protocol hierarchy, applications generate messages of length  $M$  bytes. Assuming each layer has a different header size: 150-byte, 100-byte, and 50-bytes for Layers 1, 2, and 3, respectively. What fraction of the network bandwidth is filled with headers?

#### **Question 3** (0.5 mark)

An image is  $1280 \times 720$  pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 1-Mbps cable modem? Over a 100 Mbps Ethernet? Over gigabit Ethernet?

#### **Question 4** (0.5 mark)

A stop-and-wait protocol is used on a 100 Mbits/s link. The round-trip propagation time on the link is 300 microseconds. 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.

**Question 5** (0.5 mark)

Provide a snapshot or a print screen of a Wireshark trace (with a TCP HTTP filter) of your own and explain how do you determine and verify the IP address of the destination and source from it?

**Question 6** (0.5 mark)

Consider any TCP stream in your Wireshark trace and provide its Flow graph diagram. Also, provide a print screen of your trace and explain what information can you gather from the graph in conjunction with the trace?

**Question 7** (1 mark)

To transfer a large file across the network between two computers, an acknowledgement scheme needs to be used to ensure the entire file is received. A possible acknowledgement scheme is for the receiver to send an acknowledgement when it receives the entire file. Is this a good approach to use when the packet loss of the network is high? Explain why or why not. If not, then what other scheme would help avoid the pitfalls of this scheme?

**Question 8** (1 mark)

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).

Identify the requirements of the following applications in terms of bandwidth and latency, and then give an example of a specific network technology (not media nor LAN, MAN and WAN) that is suitable for each of these applications:

- i) File transfers between Melbourne and Japan
- ii) Bandwidth intensive interactive gaming using smartphone
- iii) Internet connections for remote areas
- iv) Connecting a large number of real-time low data transmissions sensors for critical event notification
- v) Transferring a large file from local computer to a local server