ECE 315 Assignment #4

ECE 315 - Computer Interfacing

Assignment #4

Due: In the ECE 315 assignment box at 15:45 on Wednesday, Apr. 8, 2020

1. Both the Boostrap Protocol (BOOTP) and the Dynamic Host Configuration Protocol (DHCP) use UDP, which has no guarantee of delivery, instead of TCP, which does guarantee that the data payload will be delivered to the destination node. BOOTP and DHCP have the important role of assigning IP addresses to nodes on a subnetwork. So why would one use UDP over TCP at the transport layer for such an important function? (Recall that TCP sets up point-to-point connections between nodes that have IP addresses.) How do BOOTP and DHCP work when the client does not know what its IP address is?

2. Briefly explain the similarities and differences between server-side scripting and client-side scripting in the design of dynamic webpages. What do you think are major advantages and disadvantages, with respect to each other, of these two types of scripting when used to create dynamic webpages?

3. Briefly explain how the design choices that were made in the architecture and implementation of the lightweight IP (lwIP) stack have enhanced its portability and efficiency across different microcomputers and operating system environments.

4. It is standard recommended design practice to use data buffers and flow control mechanisms to decouple the operation of digital systems that are processing a stream of data. Briefly explain the different and complementary roles played by FIFO buffers and flow control mechanisms in ensuring that those digitial systems are well decoupled. What problems would occur if only data buffers, or only flow control mechanisms, were to be used?

5. Lecture slide 9-26 illustrates the flow of datagrams coming into and flowing from the lwIP. Briefly explain how the sequence numbers and acknowledgement numbers are processed in the both the receive and transmit directions.

6. Briefly explain what a ping-pong buffer is. Also briefly explain the possible advantages that it brings in some applications. Give at least two different illustrative examples of data processing applications where one can benefit from the use of a ping-pong buffer.

7. In your own words, briefly explain how TCP/IP detects and recovers from the situation where IP datagrams that are received out of order because of the different routes that were taken by different datagrams travelling through the network from the source node to the destination node.

8. Briefly explain how the four direct memory access controllers (DMACs) in the MCF5234 microcontroller unit support circular buffers in either the source or destination buffers. What constraints are imposed by this feature on the size and base addresses of those buffers when they are used as circular buffers?