National University of Singapore
School of Computing
CS2105: Introduction to Computer Networks
Semester 1, 2018/2019

Tutorial 8
Link Layer

These questions will be discussed during the next week's discussion group meetings. Please be prepared to answer these questions during the session in class. Some of the questions are taken from the textbook, so please bring it along for reference.

1. **[KR, Chapter 5, R2]** If all the links in the Internet were to provide reliable delivery service, would the TCP reliable delivery service be redundant? Why or why not?

2. **[KR, Chapter 5, P5 & 6]** Consider a 4-bit generator G with value `1001`, what is the CRC checksum R if data D has the following value?

   (a) `11000111010`
   (b) `01101010101`
   (c) `11111010101`
   (d) `10001100001`

3. Consider the following 2D parity matrix.

   ```
   0  1  0  1
   1  0  1  0
   0  1  0  1
   1  0  1  0
   ```

   (a) Give an example of a 1-bit error that can be detected and corrected.
   (b) Give an example where 2 error bits can be detected but cannot be corrected.
   (c) Give an example where 4 error bits cannot be detected.

4. There are many nodes in a shared medium network and most nodes are likely to transmit frequently. Which of the following multiple access protocol(s) is (are) suitable? (1) TDMA; (2) CSMA; or (3) Token passing.

5. Nodes A and B are accessing a shared medium using CSMA/CD protocol, with propagation delay of 245 bit-time between them (i.e., propagation delay equals to the amount of time to transmit 245 bits onto the link). The minimum frame size is 64 bytes.

   Suppose node A begins transmitting a frame at $t = 0$ bit-time. Before A finishes, node B begins transmitting a frame. Assume no other nodes are active.

   Answer the following questions in terms of bit-time.

   (a) When is the latest time, by which B can begin its transmission?
   (b) Supposed B begin transmission at the time computed in part a), is it possible for A to finish transmission before it detects that B has also transmitted?