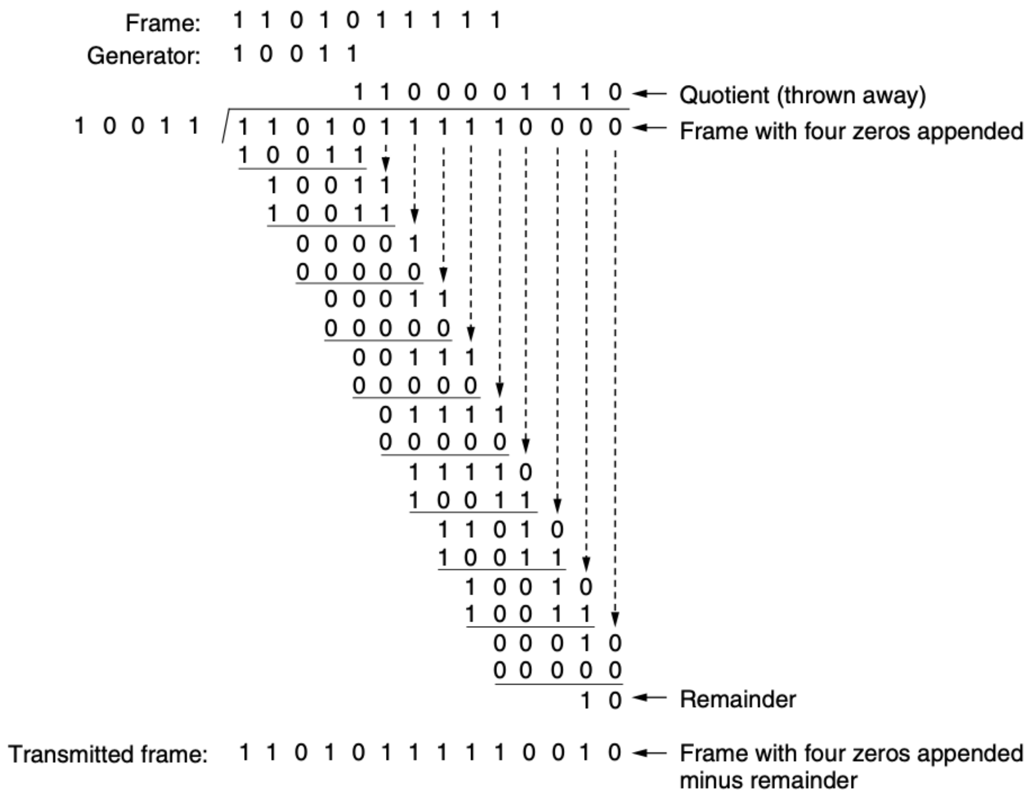
COMP90007 Internet Technologies
Week 6 Workshop

Semester 2, 2020

Suggested solutions

Question 1

Using the polynomial code method, compute the CRC for the frame: 1101011111 having a generator polynomial G(x) as $x^4 + x + 1$



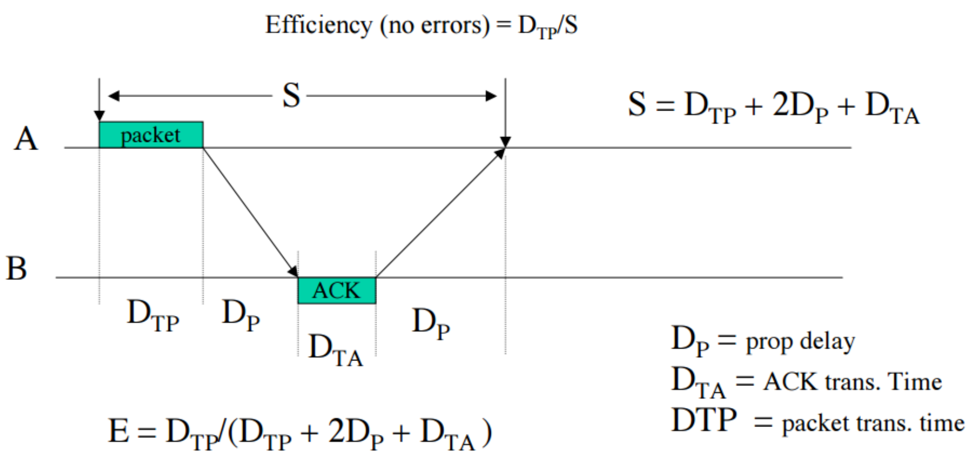
Question 2

A channel has a bit rate of 4 kbps and a propagation delay of 20 ms. For what range of frame sizes does stop-and-wait give an efficiency of at least 50 percent?

Answer:

Efficiency will be 50% when the time to transmit the frame equals the round trip propagation delay.

At a transmission rate of 4 kbps, 40 ms will transfer 160 bits. For frame sizes greater than 160 bits, stop-and-wait is reasonably efficient.



Question 3

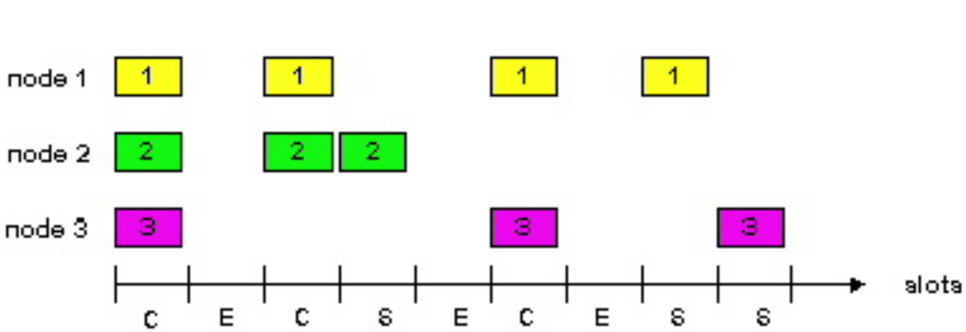
Why would anyone like to use the Go-Back-N protocol if we already introduced a superior protocol that can repeat only the missing frames, i.e., the Selective Repeat protocol?

Answer:
This is a standard case of speed vs memory in computing. Yes, Selective Repeat would be fast in recovering frames as the receiver does not throw away frames that come out of sequence but this comes with the cost that the receiver now has to have a larger than single frame size as its buffer, i.e. more memory needed.

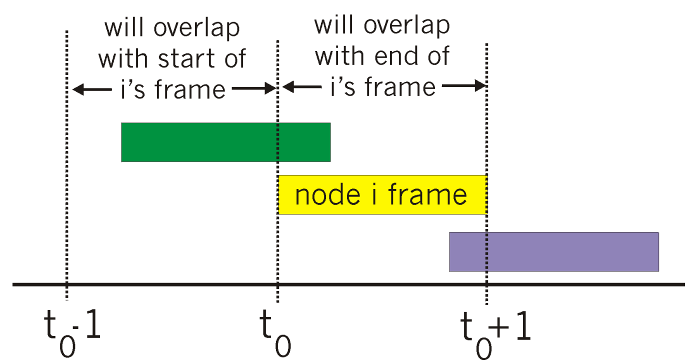
Question 4

Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less? Explain your answer.

Slotted ALOHA



Unslotted ALOHA



Answer:

With slotted ALOHA, it has to wait for the next slot. This introduces half a slot time of delay. With pure ALOHA, transmission can start instantly. At low load with minimal collisions, pure ALOHA will have less delay.

However, at higher loads, there is more probability for collisions in pure ALOHA compared to slotted ALOHA. This is because frames can collide in midway. By enforcing synchronisation, slotted ALOHA is able to achieve much greater efficiency.

Question 5

For medium access control one can use dynamic allocation of channels in comparison to static allocation. Dynamic allocation is far more adaptive. Thus, why would anyone use static allocation mechanisms?

Ans. Static allocation is still useful when the number of senders are known and fairly stable. In such a case, one does not need to deal with collision resolution etc through complex algorithms. Especially if all senders are in need of the channel regularly, why would we bother trying to allocate channels dynamically. A good example is FM radio where all channels are regularly used and fairly stable in terms of number of them and a fair static allocation would suffice.