COMP90007 Internet Technologies
Week 5 Workshop

Semester 2, 2018

Suggested solutions

Question 1

What is the minimum overhead in bytes to send an IP packet using PPP?

Answer:

Note that you do not need to consider the length of the IP packet or its header.

Minimum bytes in PPP frame: 1 byte for leading flag, 0 bytes for address and control, 1 byte for protocol, 2 bytes for checksum, 1 byte for trailing flag, giving a total of 5 bytes.

The address and control fields can be omitted via LCP negotiation when the connection begins. (See Ch 3.5.1 Tanenbaum)

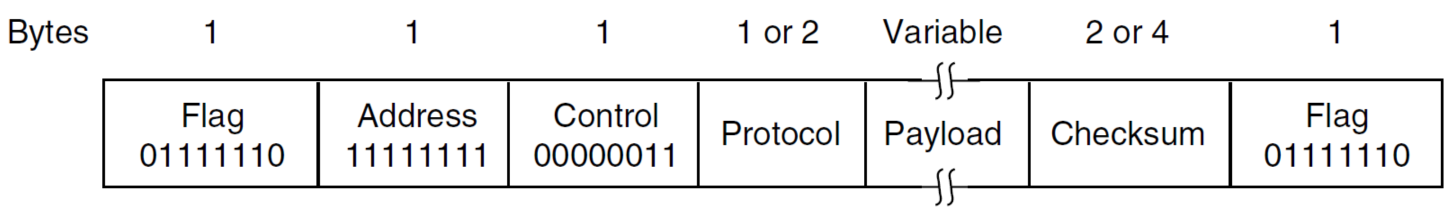
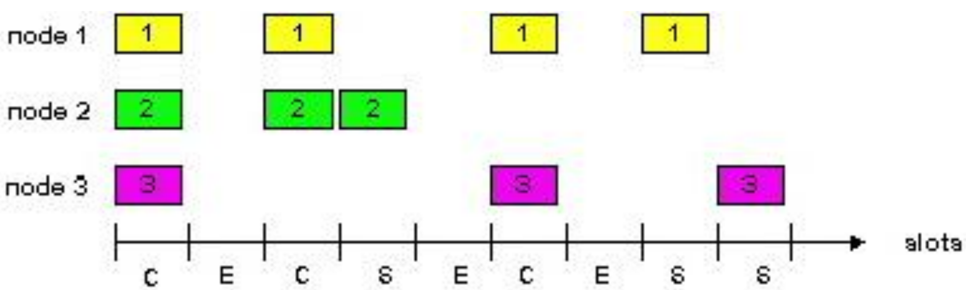


Figure 3-24. The PPP full frame format for unnumbered mode operation.

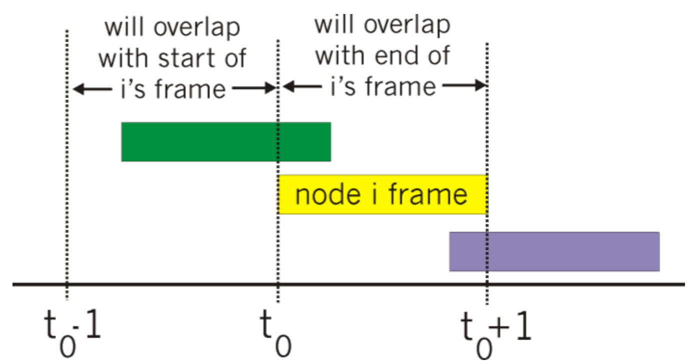
Question 2

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

Slotted ALOHA



Unslotted ALOHA



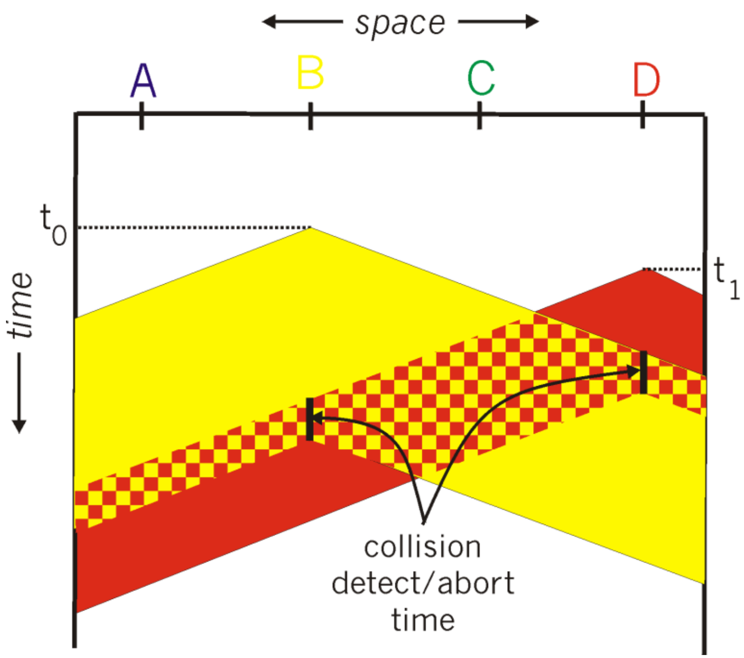
Answer:

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 3

The wireless LANs that we studied used protocols such as MACA instead of using CSMA/CD. Under what conditions, if any, would it be possible to use CSMA/CD instead?



Answer:
Radios cannot receive and transmit on the same frequency at the same time. In wireless systems, the received signal can be 1,000,000 smaller than the transmitting signal. Therefore detecting the received signal superimposed on the transmitted signal is near impossible.

There is also the problem of not all stations being within radio range of each other, and therefore will not detect the collision.

Question 4

Eight stations, numbered 1 through 8, are contending for the use of a shared channel by using the adaptive tree walk protocol. If all the stations whose addresses are prime numbers suddenly became ready at once, how many bit slots are needed to resolve the contention?

Answer:

Stations 2,3,5,7 want to send. 7 slots are needed, with the contents of each slot being as follows:

slot 1: 2, 3, 5, 7 (collision)
slot 2: 2, 3 (collision)
slot 3: 2 (success)
slot 4: 3 (success)
slot 5: 5, 7 (collision)
slot 6: 5 (success)
slot 7: 7 (success)

Question 5

Six stations, A through F, communicate using the MACA protocol. Is it possible that two transmissions take place simultaneously? Explain your answer.

Answer:
Yes. Imagine that they are in a straight line and that each station can reach only its nearest neighbours. Then A can send to B while E is sending to F.

Question 6

Give two reasons why networks might use an error-correcting code instead of error detection and retransmission.

Answer:
One reason is the need for real-time quality of service. If an error is discovered, there is no time to get a retransmission. The show must go on. Forward error correction can be used here. Another reason is that on very low quality lines (e.g. wireless channels), the error rate can be so high that practically all frames would have to be retransmitted, and the retransmissions would probably be damaged as well. To avoid this, forward error correction is used to increase the fraction of frames that arrive correctly.

Question 7

- Ans 1: **log16 to the base2=4**
- Ans 2: **In the contention period stations transmit their addresses bit by bit starting from the most significant bit. The bits from all stations are ORed in the channel. At any point of time, if a station with “0” bit in its address detects “1” in the channel, it backs out. Others continue to transmit. Only the channel that does not see any conflict with its address will win the right to send its frame at the end of the contention period.**
- Ans 3: **12**
- Ans 4: **d/(d+log n)**
- Ans 5: **Lesser overhead**