ITS323 – Quiz 4

Introduction to Data Communications, Semester 1, 2010

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Question 1 [2 marks]

(a) Circuit switching requires data to be divided into packets before transmission. True or False.

Answer. *False. Data is transmitted as analog or digital signals—there is no need for packetization in circuit switching.*

(b) All links coming into a circuit switch must use the same technology and speed. True or False.

Answer. *False. The links (or the network interfaces of the switch) must be different speeds/technologies, e.g. multiplexing could be used by a switch*

(c) In circuit switching the establishment of a new circuit will be rejected by a switch if insufficient resources are available. True or False.

Answer. *True. The switch rejects or blocks the circuit if it cannot provide sufficient resources if that circuit were to be established.*

(d) Circuit switching was developed for the original telephone networks, and is no longer used today. True or False.

Answer. *False. Telephone networks still use circuit switching*

(e) Circuit switching requires special request/response signals (or messages) to be sent between source and destination before any data can be delivered. True or False.

Answer. *True. The signals are sent to establish the circuit.*

(f) Circuit switching can be inefficient if most of the resources reserved for a circuit are not used by the source/destination. True or False.

Answer. *True. If resources are reserved but not used, then in circuit switching no other circuits can make use of those resources.*

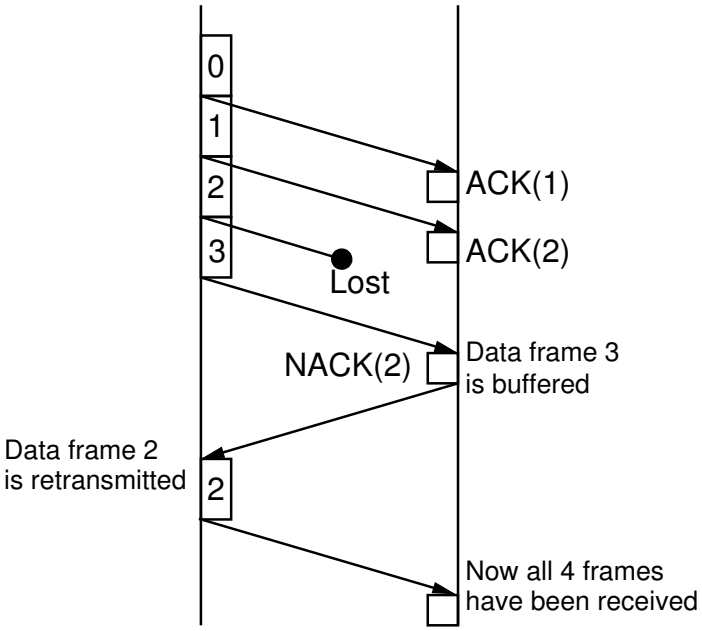
(g) Datagram packet switching is the most common form of switching used in landline telephone networks. True or False.

Answer. *False. Circuit switching is the most common form used in telephone networks.*

Question 2 [4 marks]

Consider selective reject ARQ being used on a link with one way propagation delay of [200 | 300 | - | -]ms. Data frames have a transmission time of [10 | 20 | - | -]ms, ACK frames (including selective reject or NACK frames) have a transmission time of [2 | 3 | - | -]ms, and a maximum window size of 4 is available. Assume 0 processing or queuing delay. If the source has 4 original data frames to transmit, but the third data frame sent is lost, at what time is all of the data successfully received by the destination?

Answer. *In selective reject ARQ if a frame is lost then the destination will send a negative acknowledgement indicating so. Then the source will retransmit that frame. The figure below illustrates the operation in this case.*



Therefore the time at which all data is received at the destination is:

(a) $4 \times 10 + 200 + 2 + 200 + 10 + 200 = 652ms$

(b) $4 \times 20 + 300 + 3 + 300 + 20 + 300 = 1003ms$

Question 3 [4 marks]

(a) When an error is detected by the source computer, explain the difference between the operation of selective reject ARQ and go-back-N ARQ. [2 marks]

Answer. *In selective reject ARQ, when a frame error is detected and indicated to the source, the source only needs to re-transmit the frame indicated. In go-back-N ARQ, the source needs to re-transmit the frame indicated, as well as all subsequent frames transmitted and not yet acknowledged.*

(b) Explain an [- | - | advantage | disadvantage] of selective reject ARQ (compared to go-back-N ARQ). [2 marks]

Answer. *The advantage of selective reject (compared to go-back-N) is that less frames are retransmitted, leading to higher network utilisation or efficiency. The disadvantages of selective reject are that the receive is more complex (must keep track of received frames) and requires more memory (to store the received frames).*

Question 4 [4 marks]

Consider a link with a one way propagation delay of [10 | 20 | 15 | 17]ms. Each data frame has a transmission time of [9 | 12 | 20 | 30]ms, while the acknowledgement transmission time is [1 | 2 | 1 | 3]ms. Assume other processing and queuing delays are 0. If the source computer starts its timer after completing the transmission of the data frame, what is the minimum timeout interval that a source computer should use if stop-and-wait ARQ is applied across the link?

Answer. *With stop-and-wait ARQ, a single data frame is transmitted, then the source waits for the acknowledgement. The data frame propagates to the destination, which then transmits the acknowledgement, which propagates back to the source. The minimum time from after the data frame is transmitted until when the acknowledgement is full received is:*

$$Prop_{data} + Trans_{ack} + Prop_{ack} \quad (1)$$

The source should wait at least this time before re-transmitting. (If it didn't wait for this long, then the source would always re-transmit before the acknowledgement was received, even if not frames were lost).

Therefore the minimum timeout value should be:

(a) 10 + 1 + 10 = 21ms

(b) 20 + 2 + 20 = 42ms

(c) 15 + 1 + 15 = 31ms

(d) 17 + 3 + 17 = 37ms