

QUIZ 1 (12/02/2024): CLOSED BOOK

Total Marks:

Name:

ID:

[Total Marks: 15] Consider a scenario with a sender and a receiver. There is a one-way propagation delay of 10 ms and a transmission rate of 500 Kbps. Assuming that the stop and wait protocol is used and the transmission time of the acknowledgment is negligible, answer the following questions:

Note: MARKS WILL BE GIVEN ONLY WHEN THE UNITS ARE CORRECT. SO IF THE ANSWER IS ASKED IN MILLISECONDS AND YOU HAVE ANSWERED in SECONDS, IT WILL BE CONSIDERED AS INCORRECT.

(i) **[Marks: 5]** What is the minimum value of packet length L (in bytes) such that the utilization is more than 50%.

YOUR ANSWER (IN BYTES):

(ii) **[Marks: 5]** Using the packet length identified above, what will be the transmission delay (in milliseconds) ?

YOUR ANSWER (IN milliseconds):

(iii) **[Marks: 5]** What is the length (in bits) of the sequence number used in stop-and-wait ?

YOUR ANSWER (IN bits):

Solution

Let us assume a packet length of L (*in bytes*).

$$\text{Transmission Delay} = \text{Packet_Size} / \text{Transmission_Rate} = (L * 8) / (500 * 10^3) \text{ s}$$

$$\text{RTT} = 20 * 10^{-3} \text{ s}$$

$$\text{Utilization} = \text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT})$$

$$\text{Utilization} \geq 50\%$$

$$\text{Utilization} \geq \frac{1}{2}$$

$$\text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT}) \geq \frac{1}{2}$$

$$2 * \text{Transmission Delay} \geq \text{Transmission Delay} + \text{RTT}$$

$$\text{Transmission Delay} \geq \text{RTT}$$

$$(L * 8) / (500 * 10^3) \geq 20 * 10^{-3}$$

$$L \geq (\text{RTT} * \text{Transmission_Rate}) / 8$$

$$L \geq (500 * 10^3 * 20 * 10^{-3}) / 8$$

$$L \geq 1250$$

(a) Minimum $L = 1250$ bytes.

(b) Transmission Delay = $(L * 8) / (500 * 10^3) = (1250 * 8) / (500 * 10^3) = 20 \text{ ms}$

(c) 1 bit

QUIZ 1 (12/02/2024): CLOSED BOOK

Total Marks:

Name:

ID:

[Total Marks: 15] Consider a scenario with a sender and a receiver. There is a one-way propagation delay of 15 ms and a transmission rate of 500 Kbps. Assuming that the stop and wait protocol is used and the transmission time of the acknowledgment is negligible, answer the following questions:

Note: MARKS WILL BE GIVEN ONLY WHEN THE UNITS ARE CORRECT. SO IF THE ANSWER IS ASKED IN MILLISECONDS AND YOU HAVE ANSWERED in SECONDS, IT WILL BE CONSIDERED AS INCORRECT.

(i) **[Marks: 5]** What is the minimum value of packet length L (in bytes) such that the utilization is more than 25%.

YOUR ANSWER (IN BYTES):

(ii) **[Marks: 5]** Using the packet length identified above, what will be the transmission delay (in milliseconds) ?

YOUR ANSWER (IN milliseconds):

(iii) **[Marks: 5]** What is the length (in bits) of the sequence number used in stop-and-wait ?

YOUR ANSWER (IN bits):

Solution

Let us assume a packet length of L (*in bytes*).

$$\text{Transmission Delay} = \text{Packet_Size} / \text{Transmission_Rate} = (L \cdot 8) / (500 \cdot 10^3) \text{ s}$$

$$\text{RTT} = 2 \cdot 15 \cdot 10^{-3} \text{ s (2 times the propagation delay)}$$

$$\text{Utilization} = \text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT})$$

$$\text{Utilization} \geq 25\%$$

$$\text{Utilization} \geq \frac{1}{4}$$

$$\text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT}) \geq \frac{1}{4}$$

$$4 \cdot \text{Transmission Delay} \geq \text{Transmission Delay} + \text{RTT}$$

$$\text{Transmission Delay} \geq \text{RTT} / 3$$

$$(L \cdot 8) / (500 \cdot 10^3) \geq 30 \cdot 10^{-3} / 3$$

$$L \geq (\text{RTT} \cdot \text{Transmission_Rate}) / (8 \cdot 3)$$

$$L \geq (500 \cdot 10^3 \cdot 30 \cdot 10^{-3}) / 8$$

$$L \geq 625$$

(d) Minimum $L = 625$ bytes.

(e) Transmission Delay = $(L \cdot 8) / (500 \cdot 10^3) = (625 \cdot 8) / (500 \cdot 10^3) = 10 \text{ ms}$

(f) 1 bit

QUIZ 1 (12/02/2024): CLOSED BOOK

Total Marks:

Name:

ID:

[Total Marks: 15] Consider a scenario with a sender and a receiver. There is a one-way propagation delay of 90 ms and a transmission rate of 1000 Kbps. Assuming that the stop and wait protocol is used and the transmission time of the acknowledgment is negligible, answer the following questions:

Note: MARKS WILL BE GIVEN ONLY WHEN THE UNITS ARE CORRECT. SO IF THE ANSWER IS ASKED IN MILLISECONDS AND YOU HAVE ANSWERED in SECONDS, IT WILL BE CONSIDERED AS INCORRECT.

(i) **[Marks: 5]** What is the minimum value of packet length L (in bytes) such that the utilization is more than 10%.

YOUR ANSWER (IN BYTES):

(ii) **[Marks: 5]** Using the packet length identified above, what will be the transmission delay (in milliseconds) ?

YOUR ANSWER (IN milliseconds):

(iii) **[Marks: 5]** What is the length (in bits) of the sequence number used in stop-and-wait ?

YOUR ANSWER (IN bits):

Solution

Let us assume a packet length of L (*in bytes*).

$$\text{Transmission Delay} = \text{Packet_Size} / \text{Transmission_Rate} = (L * 8) / (1000 * 10^3) \text{ s}$$

$$\text{RTT} = 180 * 10^{-3} \text{ s}$$

$$\text{Utilization} = \text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT})$$

$$\text{Utilization} \geq 10\%$$

$$\text{Utilization} \geq 1/10$$

$$\text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT}) \geq 1/10$$

$$10 * \text{Transmission Delay} \geq \text{Transmission Delay} + \text{RTT}$$

$$\text{Transmission Delay} \geq \text{RTT}/9$$

$$(L * 8) / (1000 * 10^3) \geq 20 * 10^{-3}$$

$$L \geq (\text{RTT} * \text{Transmission_Rate}) / 8$$

$$L \geq (1000 * 10^3 * 20 * 10^{-3}) / 8$$

$$L \geq 2500$$

(g) Minimum $L = 2500$ bytes.

(h) $\text{Transmission Delay} = (L * 8) / (500 * 10^3) = (2500 * 8) / (500 * 10^3) = 40 \text{ ms}$

(i) 1 bit

QUIZ 1 (12/02/2024): CLOSED BOOK

Total Marks:

Name:

ID:

[Total Marks: 15] Consider a scenario with a sender and a receiver. There is a one-way propagation delay of 20 ms and a transmission rate of 500 Kbps. Assuming that the stop and wait protocol is used and the transmission time of the acknowledgment is negligible, answer the following questions:

Note: MARKS WILL BE GIVEN ONLY WHEN THE UNITS ARE CORRECT. SO IF THE ANSWER IS ASKED IN MILLISECONDS AND YOU HAVE ANSWERED in SECONDS, IT WILL BE CONSIDERED AS INCORRECT.

(i) **[Marks: 5]** What is the minimum value of packet length L (in bytes) such that the utilization is more than 80%.

YOUR ANSWER (IN BYTES):

(ii) **[Marks: 5]** Using the packet length identified above, what will be the transmission delay (in milliseconds) ?

YOUR ANSWER (IN milliseconds):

(iii) **[Marks: 5]** What is the length (in bits) of the sequence number used in stop-and-wait ?

YOUR ANSWER (IN bits):

Solution

Let us assume a packet length of L (in bytes).

$$\text{Transmission Delay} = \text{Packet_Size} / \text{Transmission_Rate} = (L \cdot 8) / (500 \cdot 10^3) \text{ s}$$

$$\text{RTT} = 40 \cdot 10^{-3} \text{ s}$$

$$\text{Utilization} = \text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT})$$

$$\text{Utilization} \geq 80\%$$

$$\text{Utilization} \geq 4/5$$

$$\text{Transmission Delay} / (\text{Transmission Delay} + \text{RTT}) \geq 4/5$$

$$5 \cdot \text{Transmission Delay} \geq 4 \cdot \text{Transmission Delay} + 4 \cdot \text{RTT}$$

$$\text{Transmission Delay} \geq 4 \cdot \text{RTT}$$

$$(L \cdot 8) / (500 \cdot 10^3) \geq 4 \cdot 40 \cdot 10^{-3}$$

$$L \geq (\text{RTT} \cdot \text{Transmission_Rate}) / 8$$

$$L \geq (500 \cdot 10^3 \cdot 4 \cdot 40 \cdot 10^{-3}) / 8$$

$$L \geq 10000$$

(j) Minimum $L = 10000$ bytes.

(k) $\text{Transmission Delay} = (L \cdot 8) / (500 \cdot 10^3) = (10000 \cdot 8) / (500 \cdot 10^3) = 160 \text{ ms}$

(l) 1 bit