HW 6

CCN

Final hw

1. Answer below

Jacobson algorithm:

• Jacobson algorithm is proposed to protect the congestion in the network.

• It dynamically adjusts timeout interval.

• TCP (Transmission Control Protocol) maintains variable and smooth round trip time for each connection.

• If a segment is sent, then the timer started and will check the time required to receive the acknowledgement; if it takes a longer time then the algorithm triggers retransmission.

• If the acknowledgement gets back before the timer expires, then the TCP measures the time taken for the acknowledgement (R) and updates the smooth round trip time (RTT).

Formula to update the smooth round trip time (RTT) is,

$$RTT = \alpha \times RTT + (1 - \alpha)R \quad \ldots\ldots (1)$$

Where,

RTT – Round Trip Time

α - Smoothing factor

R – Time to receive the acknowledgement

The new round trip time estimation:

• The TCP round trip time RTT is 30 msec.

• The acknowledgements come after 26, 32 and 24 msec.

• Smoothing factor $\alpha = 0.9$.

The new round trip time RTT for each as follows:

When the acknowledgement comes after 26 msec (R):

Substitute the value "0.9" for " α ", the value "30" for "RTT", and "26" for "R" in equation (1).

$$\begin{aligned} RTT1 &= 0.9 \times 30 + (1 - 0.9) \times 26 \\ &= 27 + 0.1 \times 26 \\ &= 27 + 2.6 \\ &= 29.6 \end{aligned}$$

Therefore, the round trip time when the acknowledgement is received after 26 msec is "29.6".

Substitute the value "0.9" for " α ", the value "29.6" for "RTT", and "32" for "R" in Equation (1).

$$\begin{aligned} RTT2 &= 0.9 \times 29.6 + (1-0.9) \times 32 \\ &= 26.64 + 0.1 \times 32 \\ &= 26.64 + 3.2 \\ &= 29.84 \end{aligned}$$

Therefore, the round trip time when the acknowledgement is received after 32 msec is "29.84".

When the acknowledgement come after 24 msec (R).

Substitute the value "0.9" for " α ", the value "29.84" for "RTT", and "24" for "R" in Equation (1).

$$\begin{aligned} RTT3 &= 0.9 \times 29.84 + (1-0.9) \times 24 \\ &= 26.856 + 0.1 \times 24 \\ &= 26.856 + 2.4 \\ &= 29.256 \end{aligned}$$

Therefore, the round trip time when the acknowledgement is received after 24 msec is "29.256".

Therefore, the successive estimates using Jacobson algorithm are $\boxed{29.6,\ 29.84,\ 29.256}$ and there are no timeouts.

Hope that is enough information in my calculations, thank you.

2. One window can be sent every 20 msec. This would give 50 windows/sec and a maximum data rate of about 3.3 million bytes/sec. So, the line efficiency would be 26.4 Mbps/1000 Mbps or 2.6 percent.

3. So we are trying to send 232 bytes in 120 sec or 35,791,394 payload bytes/sec,which would be 23,860 1500-byte frames/sec. The TCP and IP overhead are 20 bytes.While Ethernet overhead is 26 bytes(all given). This means that for 1500 bytes of payload, 1566 bytes must be sent. If we are to send 23,860 frames of 1566 bytes every second, we need a line of 299 Mbps. We will run the risk of two different TCP segments having the same sequence number at the same time if we run anything faster.

4. A sender cannot send more than 255 segments, 255 × 128 × 8 bits, in 30 sec. The data rate cannot exceed (255x128x8/30) 8.704 kbps.