

Internet Architectures and Protocols (Netw_II)

Homework: Buffer Management

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General remarks

- Do the homework alone
- Return the homework by the date indicated on the course Web page into the box outside of office 0 15

1 Buffer Sizing for a transport protocol with window flow control

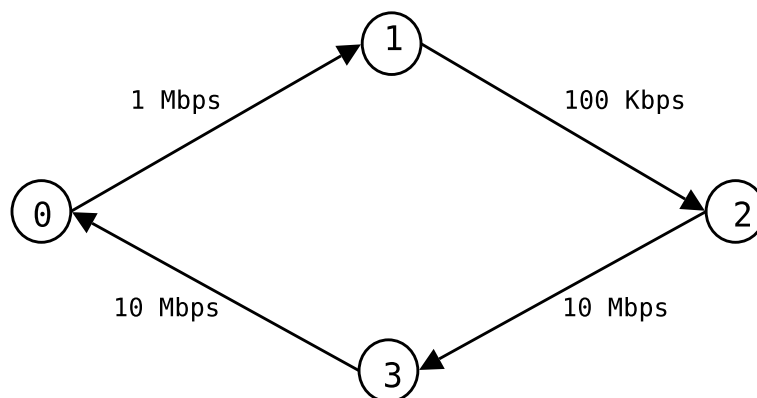


Figure 1: Topology one

Consider the simple network topology depicted in the figure 1 :

- The transport protocol uses a sliding window flow control with a fixed window size where the receiver sends back for each data packet received a PERMIT that advances the sliding window. (we do NOT use TCP!)
 - Every link is a simplex link.
 - Every data packet has a size $|pkt| = 9000$ bit).
 - The window size is W packets.
 - The only buffer is at node 1 to store packets before transmission over the link 1–2. Its size is B packets. Otherwise there are no buffers.
 - The propagation delay d is constant for every link.
 - The *transmission* time of PERMITs can be assumed to be 0.
 - A single transport connection is established from node 0 to node 2.
1. Assume $d = 200ms$. (2 points)
What should be the minimal value for B and W to assure that the link 1–2 is fully utilized all the time.
 2. Assume $d = 200ms$, $W = \infty$, and $B = 5$. (2 points)
Show the transmission behavior of the first 12 packets. Use the following table to indicate how the packets are forwarded over the link 0–1 and the link 1–2.

2 TCP synchronization

Consider multiple TCP flows sharing the same bottleneck. Answer briefly the following questions:

1. What is the meaning of TCP synchronization? (1 point)
2. How does this phenomenon affect the overall throughput? (1 point)
3. Which of the two buffer management policies, RED or Drop Tail suffers more from this phenomenon? Why? (1 point)

3 RED parameters

The RED policy is based on the computation of the average queue size \hat{k} , using an exponential weighted moving average:

$$\hat{k} \leftarrow (1 - w)\hat{k} + wk$$

where k is the instantaneous queue size.

1. What is the meaning of the parameter w ? (1 point)
2. What is the trade off in the choice of w ? (1 point)

4 Flow Isolation

Consider multiple flows sharing the same bottleneck.

1. Compare the Longest Queue Drop and the Random Early Drop policies in terms of flow isolation with respect of TCP and UDP flows. (1 point)