Internet Architectures and Protocols (Netw_II)
Homework: Buffer management

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 TCP

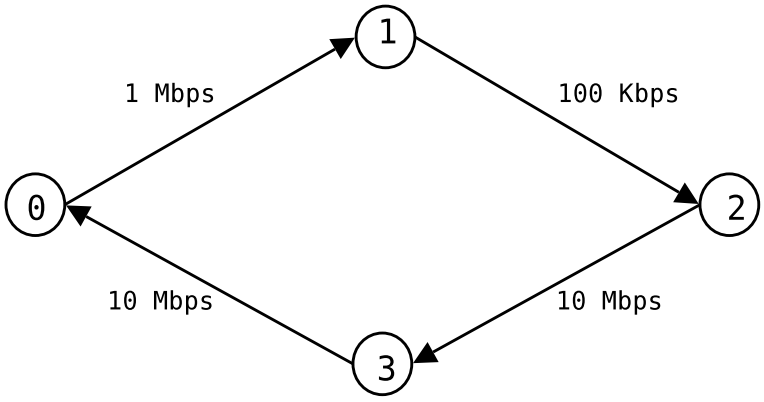

Figure 1: Topology one

Consider the simple network topology depicted in the figure 1 :

- Every link is a simplex link.
- There are no buffers.

- Every data packet has a size $|pkt|$ = 9000 bit).
- The maximum 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
- The propagation delay d is constant for every link.
- ACKs are not delayed
- The *transmission* time of ACKs can be assumed to be 0.
- A single TCP connection is established from node 0 to node 2.

1. Assume $d = 200ms$.
   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 $B = 5$.
   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.

Packet Nb	Start Transm. at node 0	Buffer level	Start Transm. at node 1	Completely received at node 2	Lost (Yes/NO)
1	0				

2 TCP synchronization

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

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

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?
2. What is the trade off in the choice of w? ?

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.