

A network consists of 4 nodes (n0, n1, n2, n3). The duplex links between n0 and n2, and n1 and n2 have 2 Mbps of bandwidth and 10 ms of delay. The duplex link between n2 and n3 has 1.7 Mbps of bandwidth and 20 ms of delay. Each node uses a DropTail queue, of which the maximum size is 10.

The link between n0 and n2 is to be aligned in right down direction, that between n1 and n2 in right up direction and that between n2 and n3 in the right direction.

A "tcp" agent is attached to n0, and a connection is established to a tcp "sink" agent attached to n3. As default, the maximum size of a packet that a "tcp" agent can generate is 1KByte. A tcp "sink" agent generates and sends ACK packets to the sender (tcp agent) and frees the received packets.

An "udp" agent that is attached to n1 is connected to a "null" agent attached to n3. A "null" agent just frees the packets received. A "ftp" and a "cbr" traffic generators are attached to "tcp" and "udp" agents respectively, and the "cbr" is configured to generate 1 KByte packets at the rate of 1 Mbps.

The "cbr" is set to start at 0.5 sec and stop at 4.5 sec, and "ftp" is set to start at 1.0 sec and stop at 4.0 sec.

The "finish" procedure is set to be called at 5.0 sec.

Write NS2 script to simulate this network scenario and answer the following questions using **separate awk scripts**:

- 1: Find the total number of packets dropped at node n2?
- 2: Change the bandwidth of the link between n2 and n3 to 2.0Mbps, 2.5Mbps, 3Mbps and 5 Mbps and recalculate the total number of packets dropped at node n2 in each case. What is your observation?
- 3: Change the queue size at node n2 to 20 and recalculate the packets dropped at node n2 in all the cases mentioned in question 1 and question 2. What is your observation?
- 4: What is the average RTT of packets between node n2 and node n3. Is the average RTT

of packets between node n_0 and node n_2 is nearly half that of between node n_2 and node n_3 ? What is your observation?