2 Computer Networking (awm22)

ISP ShinyNet connects customers to the Internet with a symmetric 40 Mbit/s link. The ISP gateway router/modem has a single buffer shared by all senders with a capacity of 1000 packets. You may assume all packets are of the same length and that packet-arrivals are not bursty.

A popular application uses three UDP flows each concurrently sharing the link. The three flows send at rates of 10 Mbit/s, 20 Mbit/s and 30 Mbit/s respectively.

(*a*) What is the data rate successfully traversing the buffer and the fraction of packets for each flow dropped by the buffer? [3 marks]

ShinyNet upgrades the customer gateway router/modem. The upgraded device employs one queue per flow (three queues in total for this case); each queue can holds a maximum number of packets in proportion to the flow count (333 packets per flow), the queues are scheduled using simple per-flow fair queueing with an equal weight for each queue.

(*b*) What is the packet loss rate for each flow when using the upgraded gateway? [3 marks]

(*c*) Approximately how many packets does each flow have in its queue? [3 marks]

ShinyNet updates the gateway routers/switch to now use weighted-fair queueing. Using an unknown patented technology (or poor configuration); the following weights are assigned to the flows as follows: 0.2, 0.6, and 0.2 for each flow respectively.

(*d*) What is the packet loss rate for each flow when using this gateway with weighted fair-queueing? [3 marks]

(*e*) Approximately how many packets does each flow have in its queue? [3 marks]

(*f*) Throughout this question we have assumed packets are of equal length; this is not a valid assumption for the vast majority of Internet traffic. Presuming that over the long term we wish for the queue discipline to retain the desired weighted-fairness properties, discuss the issues variable length packets raise, and propose an approach to maintain the desired weighted-fairness outcome. [5 marks]