EECS 863
Spring 2022
Active Queue Management
Project 3

Provide your results in the form of a technical report using the provided format.
See: **Technical Report Format**
http://www.ittc.ku.edu/~frost/EECS_563/Technical%20Report%20Format-2019.pdf
Also see this paper for advice on writing technical reports.
See: **Paper on writing technical reports**
http://www.ittc.ku.edu/~frost/EECS_563/Writing%20Technical%20Reports.pdf
Do not pad your reports, all figures and tables must be discussed in the text.

There are three types of traffic, 3D HD video, video and general data. When service preference is used 3D HD video has the highest preference, followed by video then followed by data. In this project four service disciplines will be considered: 1) FIFO, 2) non-preemptive priority, 3) WRR with equal weights, and 4) WRR with 3D HD video having a weight of 1, video having a weight of 0.5 and general data has a weight of 0.1. The last three service disciplines are associated with active queue management (AQM) in the Internet.

An example of a WRR model along with traffic sources can be found at http://www.ittc.ku.edu/~frost/EECS_563/LOCAL/Extend_Models_2019-v10/WRR_Model-3_classes-ES10.mox

Traffic Models

- Data traffic per source: Assume exponential message lengths with an average of 5000 bytes and exponential interarrival times with an average rate of 150 Mb/s per source.
- 3D HD Video traffic per source: Assume fixed message lengths with an average of 2500 bytes and exponential interarrival times with an average rate of 15 Mb/s per source.
- Video traffic per source: Assume fixed length messages, 1200 bytes and exponential interarrival times at average rate of 1.5 Mb/s per source.

Compare your results to theory where possible. Also, clearly discuss how your simulation models were verified and validated.

1. The queue in the Figure 1 represents an output port of a router that provides for using different service disciplines (using the ToS byte in the IPv4 header); the port (link speed) is C_1 Mb/s. Consider C_1 = 900Mb/s, 475 Mb/s, 350Mb/s.

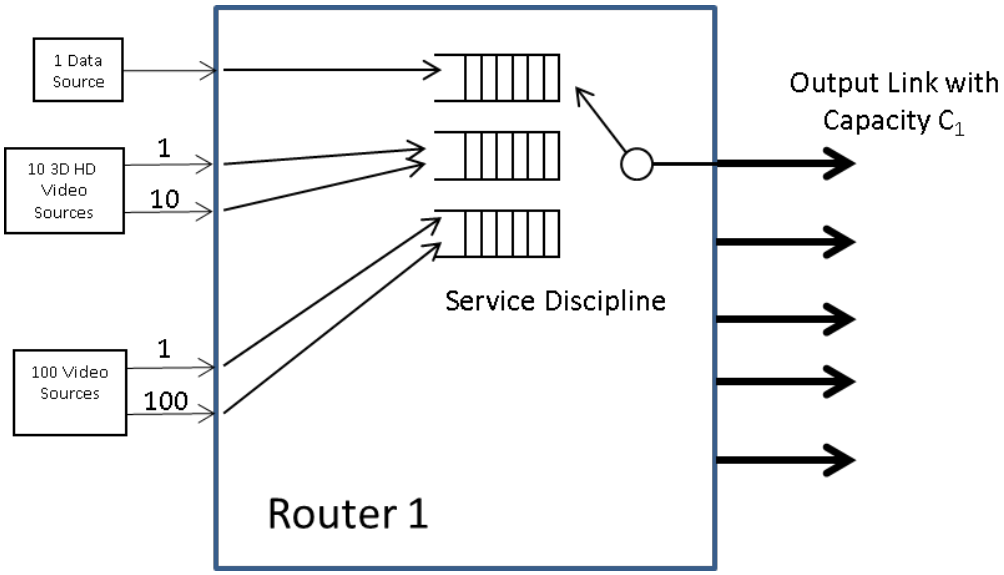

Figure 1

For link speeds given above use simulation to estimate the throughput in b/s, average end-to-end delay, average wait time (average delay-service time), and normalized average wait time (average wait time/average service time). Report the results for all classes taken as an aggregate and for each class of traffic separately. The measurements should be taken from the source to the destination. Compare the system performance for 1) FIFO, 2) non-preemptive priority, 3) WRR such that the number of arrivals in a weight time is equal to 20 packets for all three traffic classes, and 4) WRR such that the number of arrivals in a weight time is equal to 40 packets for 3D HD, 30 packets for video and, 20 packets for general data. Indicate if the link is overloaded with respect to any of the traffic classes in any of these cases and discuss the validity and nature of the results for the overloaded cases.

2. For FIFO and non-preemptive priority systems, repeat the analysis for the tandem routers given in Figure 2. Here C_1= 475 Mb/s and C_2= 1.8 Gb/s, 820 Mb/s, 610 Mb/s, 310Mb/s.

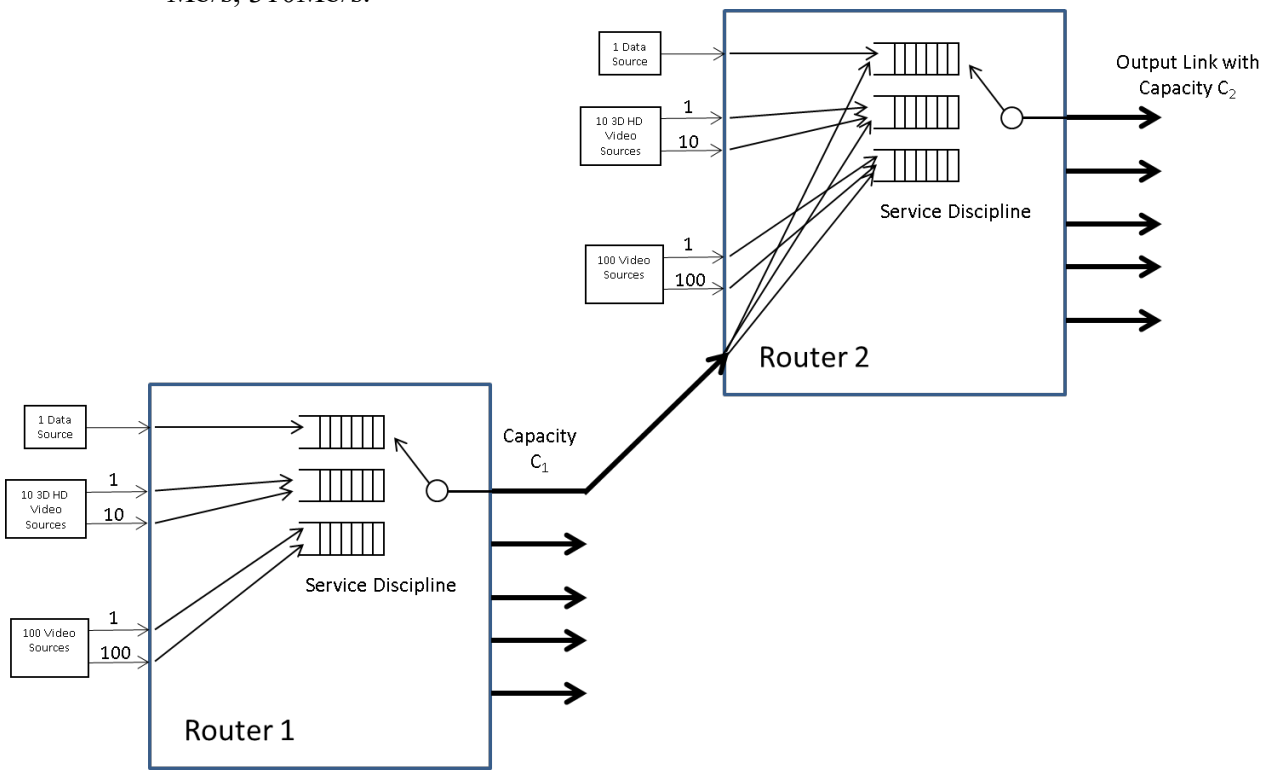

Figure 2

3. Discuss the impact of the different service disciplines on the system performance as the port capacity changes.
4. Comment on the differences between using non-preemptive priority and WRR.