Computer Networks Design – Lab 3

For this lab, turn off the switch's flooding functionality.

Scheduling

This part focuses on selecting which message is *put to transmission*. In other words, how does the Switch select which message to transmit on each output port?

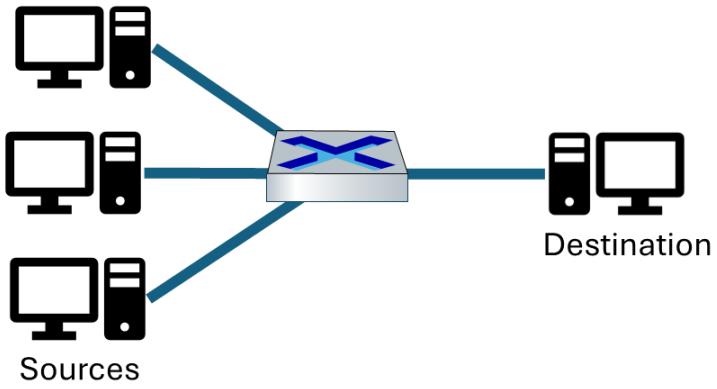
We assume no preemptions, i.e., messages transmitted cannot be stopped in the middle and must be complete before transmitting the following message.

You are asked to implement the following scheduling disciplines:

1. **First-In-First-Out (FIFO)** – the default scheduling discipline. The queue top is selected according to when the Switch received the message. Ties are broken by the highest Object ID.
2. **Priority** – Each Host is given a priority (you may choose to implement the priority yourselves – by Object ID, or statically configure them inside the Switch). The next message selected for transmission is always of the highest priority. If there are none of those, the *earliest* message from the next priority is selected for transmission (and so on). Ties for messages with the same priority and arrival times are broken by the highest Object ID.
3. **Packetized Generalized Processor Sharing (PGPS)** – packets are scheduled according to the earliest departure time according to the (causal) Generalized Processor Sharing (GPS) scheduling discipline. In particular, the scheduler computes the departure times of the messages currently inside the queue (assuming a fluid model), schedules them, and updates the departure times when needed.
    - ❖ When is “when needed”? **Hint:** the number of messages in the departing message’s flow.
    - ❖ What is updated “when needed”?
    - ❖ Is it always necessary to re-compute the GPS when a new message arrives?

Testing

Test 1 – Checking GPS Reference



Construct the above topology. Assign the Switch **output queues**. Let each Host create a flow of **3** L2 Messages and set the scheduling discipline to PGPS. Print the arrival and departure times of the L2 Messages into and out of the Switch. Compare your results *with theoretical calculations*.

We recommend fixing the random seed and putting "convenient" inter-arrival times to ease the calculations. If your calculations fit the simulation results, proceed to the next test.

Test 2 – Comparing Finishing Times

Run the above topology with flows of 100 L2 Messages with output queues under each scheduling discipline (for a total of 3 simulations) and maintain all finishing times.

Plot the finishing times in a single plot and compare the departure times under each scheduling discipline:

- Do the scheduling discipline affect the last departure time in each queue?
- Do the scheduling discipline affect the first departure time in each queue?

Plot 3 figures with the finishing times of flows #1, #2, and #3 (the finishing times of flow #i under FIFO, Priority, and PGPS). What can be said about the fairness of the scheduling disciplines according to these figures?