

CS348 Computer Networks
Lab Exercises 1
Indian Institute of Technology, Patna
January 11, 2016

Instructions: You have to upload the code along with the output graphs for this assignment in a tar file using the lab submission website on or before 17.01.2016.

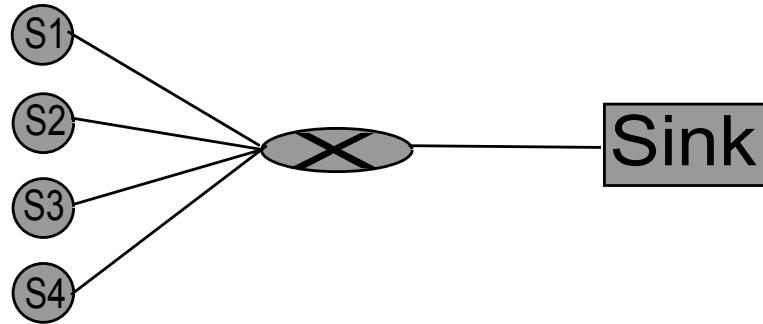


Figure 1: A switching network

Write a program to simulate the functioning of a switching network consisting of n number of sources (denoted by S in the figure 1) that are connected to a $Sink$ through a switch. The number of sources can vary as desired by the user. You have to create the following objects:

1. **Source:** Every source must have an *id* that is automatically assigned. It must have a *packet sending rate* that is either fixed or bursty. If the packet arrival is bursty, then additionally the burst size (i.e. number of packets sent in each burst) and the time difference between 2 consecutive bursts must be taken as input. Each source will be connected to the switch through a link that must have a given *bandwidth*. Finally, every source must use a *queue* that enqueues the packets from the source before dispatching them to the switch.
2. **Switch:** The task of the switch is to service the arriving packets from the sources and dispatch the same to the sink. The link to the sink has a given *bandwidth*. The switch can operate using both TDM based circuit switching as well as a packet switched technology. If the switch operates in circuit switching mode then the switch must use an incoming queue for each source. A packet from each queue is selected in a round robin fashion and dispatched to the sink. In packet switched mode, the switch uses a single *queue*. Packets arriving from the sources are inserted in the queue in order of their arrival and dispatched to the sink by dequeuing one at a time.
3. **Packets:** Each packet must have a source id and a time stamp when it is generated. The packets have same given size that is provided by the user.

You are free to create additional objects if you want. Assume that all queues are finite sized and all components follow a common global time. The simulation will run for a fixed given duration of time.

You have to record the following as output:

1. The average queuing delay of the packets in packet switching with respect to
 - (a) Queue size
 - (b) Packet Sending rate
 - (c) Burst Size
 - (d) Burst Interval

2. The variation in size of the outgoing queues at each source and switch with respect to time for
 - (a) Low packet sending rate and low burst size(consider any fixed low value)
 - (b) High packet sending rate and high burst size (consider any fixed low value)
3. The packet loss rate at any source and switch with respect to queue size for
 - (a) Low packet sending rate and low burst size(consider any fixed low value)
 - (b) High packet sending rate and high burst size (consider any fixed low value)
4. The average throughput at the switch (for both packet switch and circuit switch) for
 - (a) various link speed to the sink
 - (b) packet sending rate of the sources (both high and low burst sizes)
 - (c) Number of sources