CPEG 572 Data and Computer Communications

Report No. 9

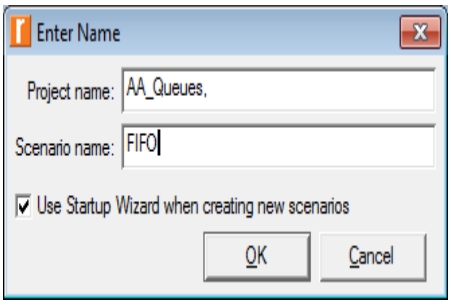
Summary:

The objective of this lab is to examine the effect of different queuing disciplines on packet delivery and delay for different services

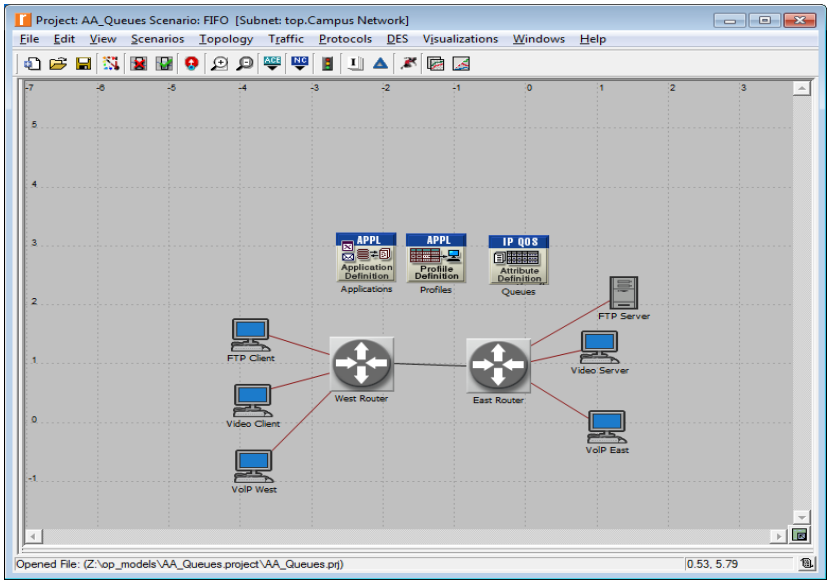
Implementation:

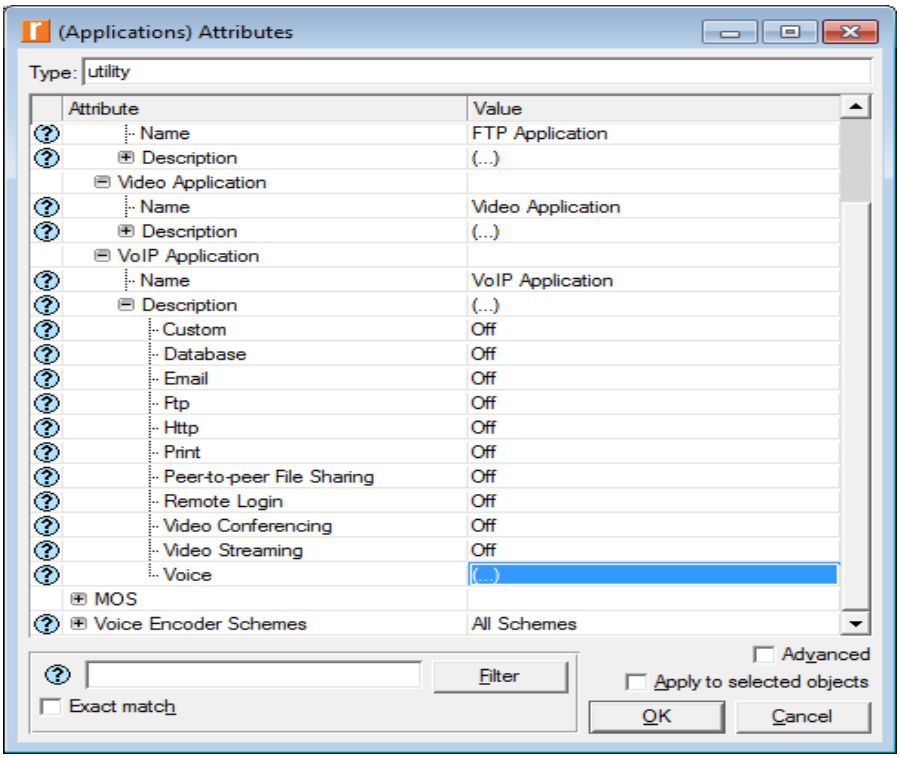
The implementing of queues show the control and illustrate how the packets are buffered and they wait to be transmitted. The queuing shows the affects the latency of transmitting the packets, and how time they will wait to be transferred. For instance, the common queuing disciplines are first-in- first-out (FIFO) queuing, priority queuing (PQ), and weighted-fair queuing (WFQ) which we will create in this lab. In addition, the idea of FIFO queue is the first packet that arrives at a router is the first packet to be transmitted. PQ is a simple variation of the basic FIFO queuing. The idea is to mark each packet with a priority; the mark could be carried. Finally, the idea of the fair queuing (FQ) discipline is to maintain a separate queue for each flow currently being handled by the router.

We have done steps to implement the network which has Application Config, Profile Config, QoS Attribute Config, five ethernet_wkstn, one ethernet_server, and two ethernet4_slip8_gtwy routers.

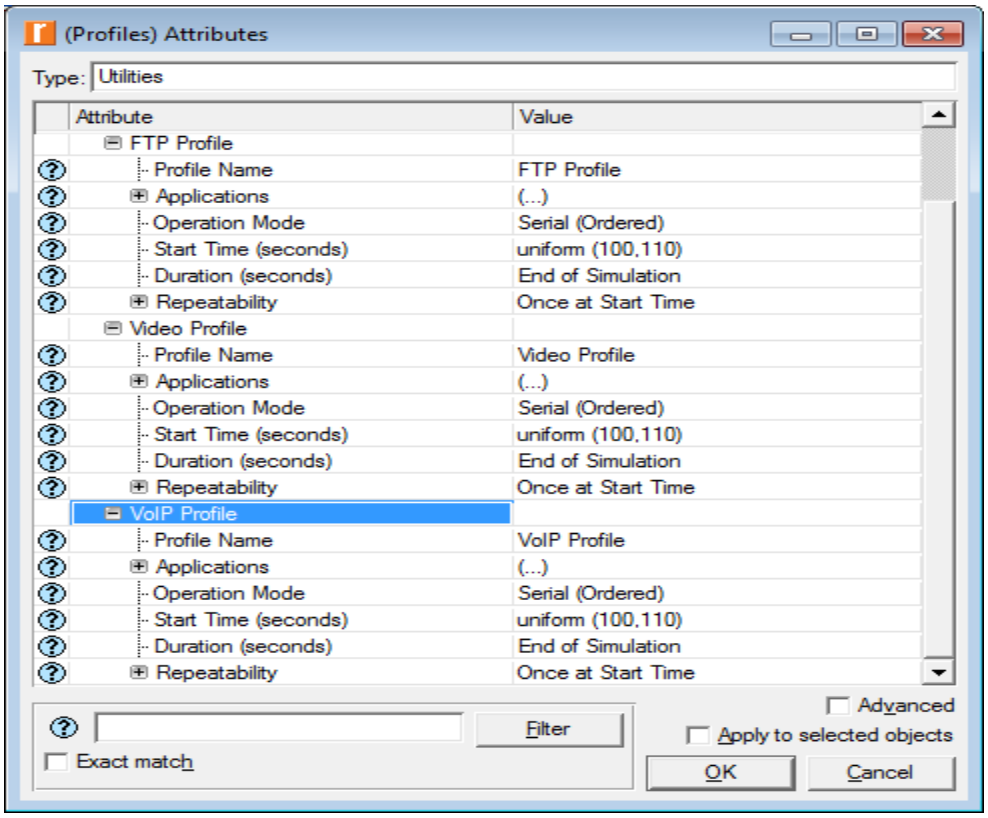


Project

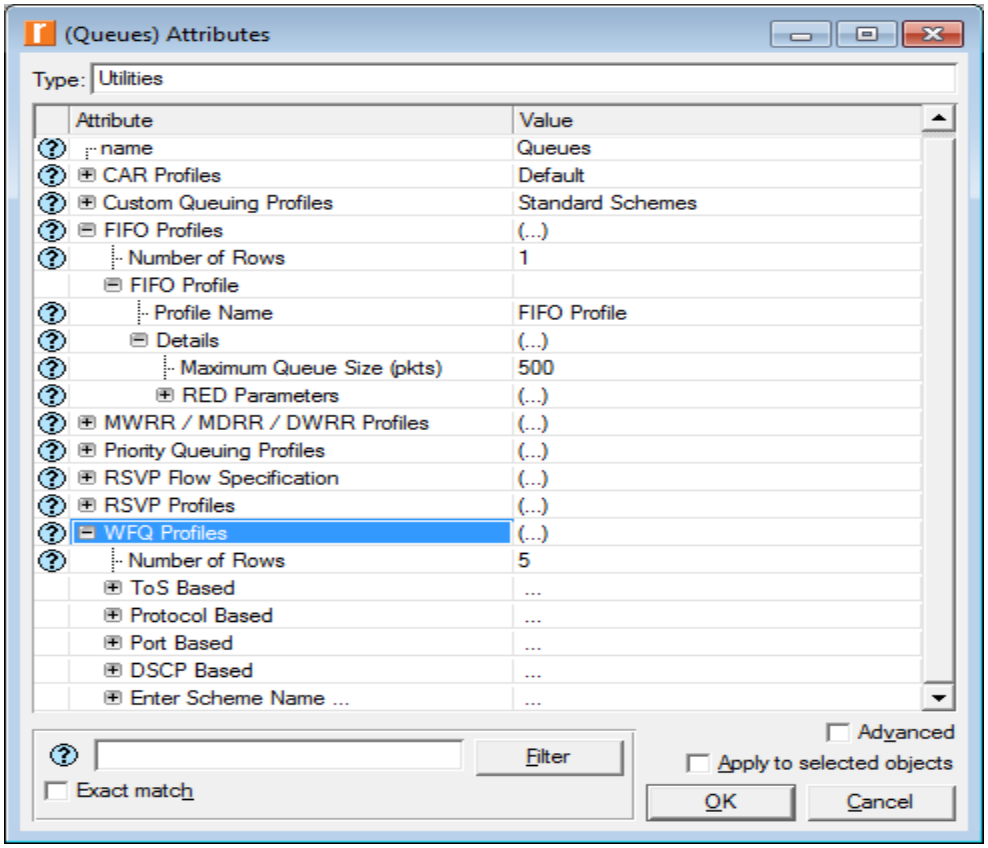




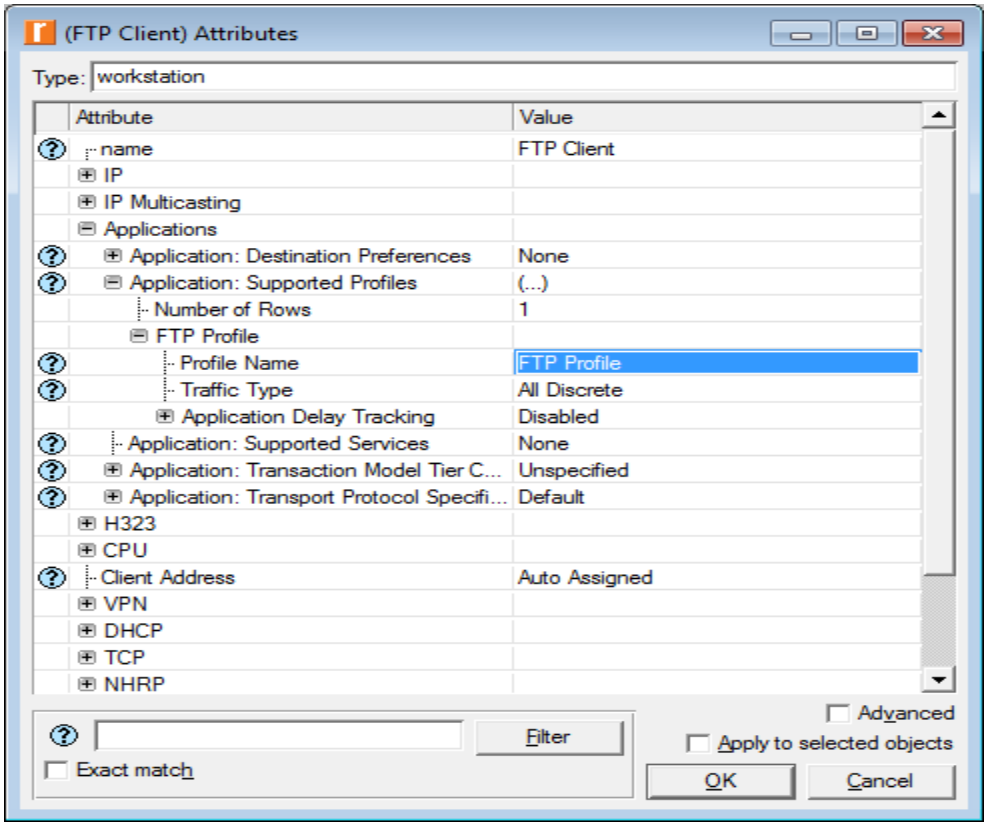
Configuration: Application



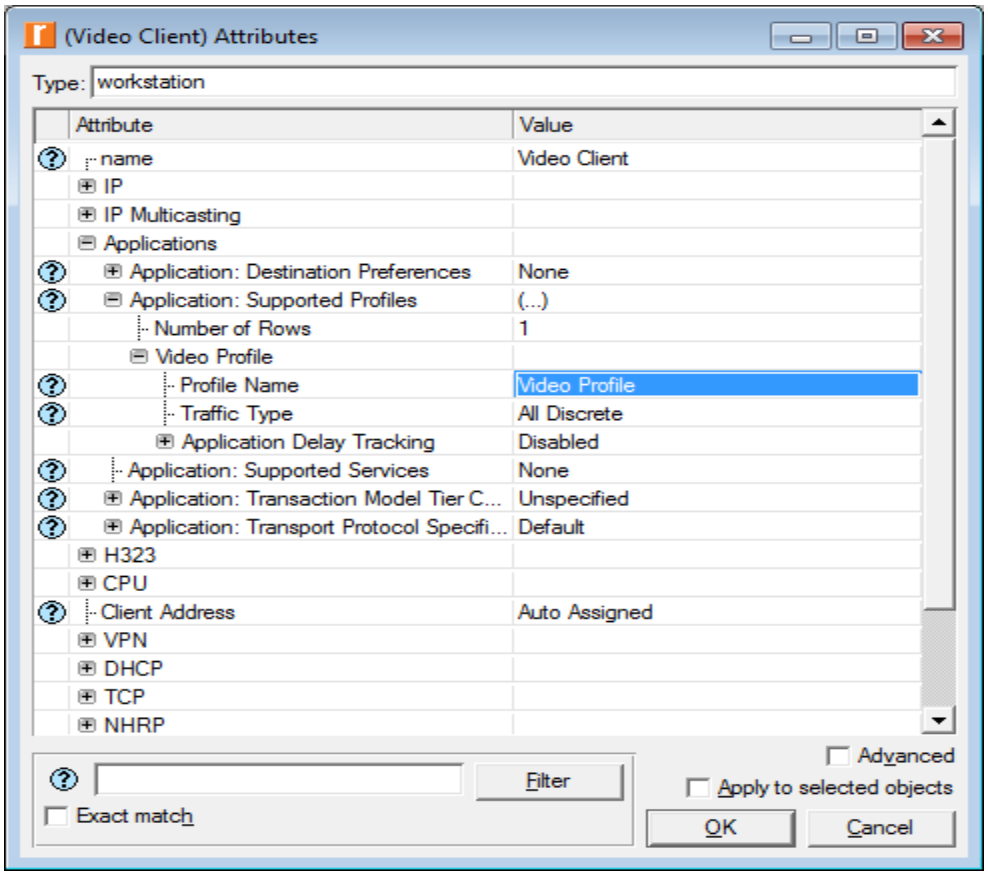
Configuration: Profile



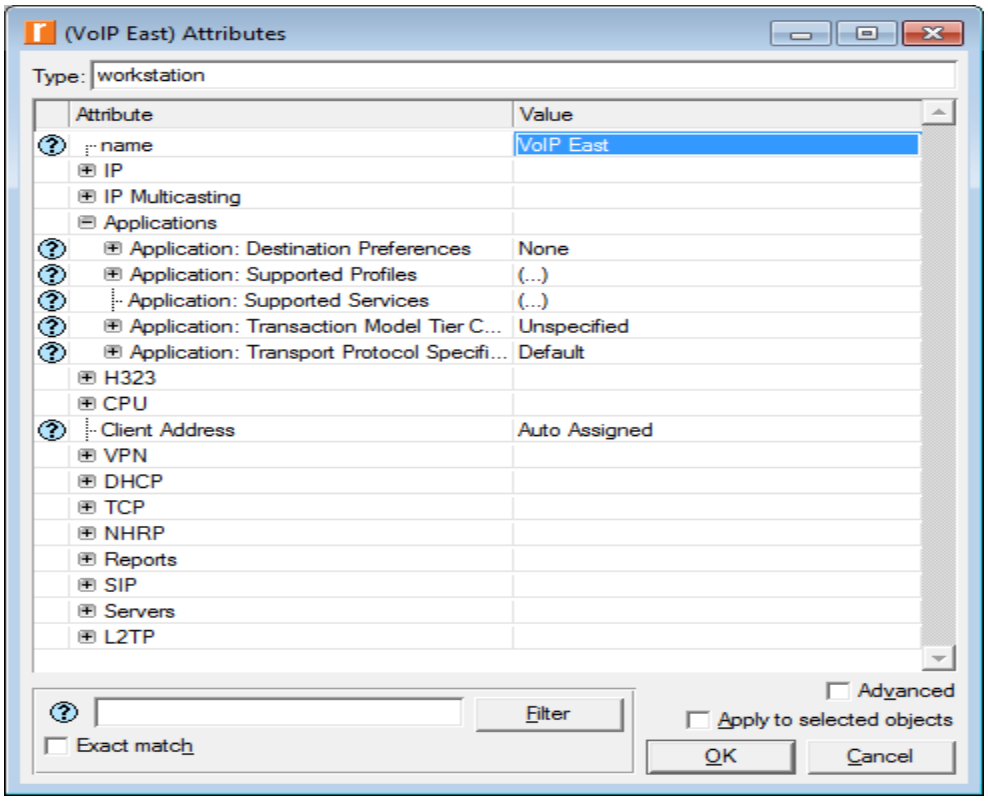
Configuration: Queues



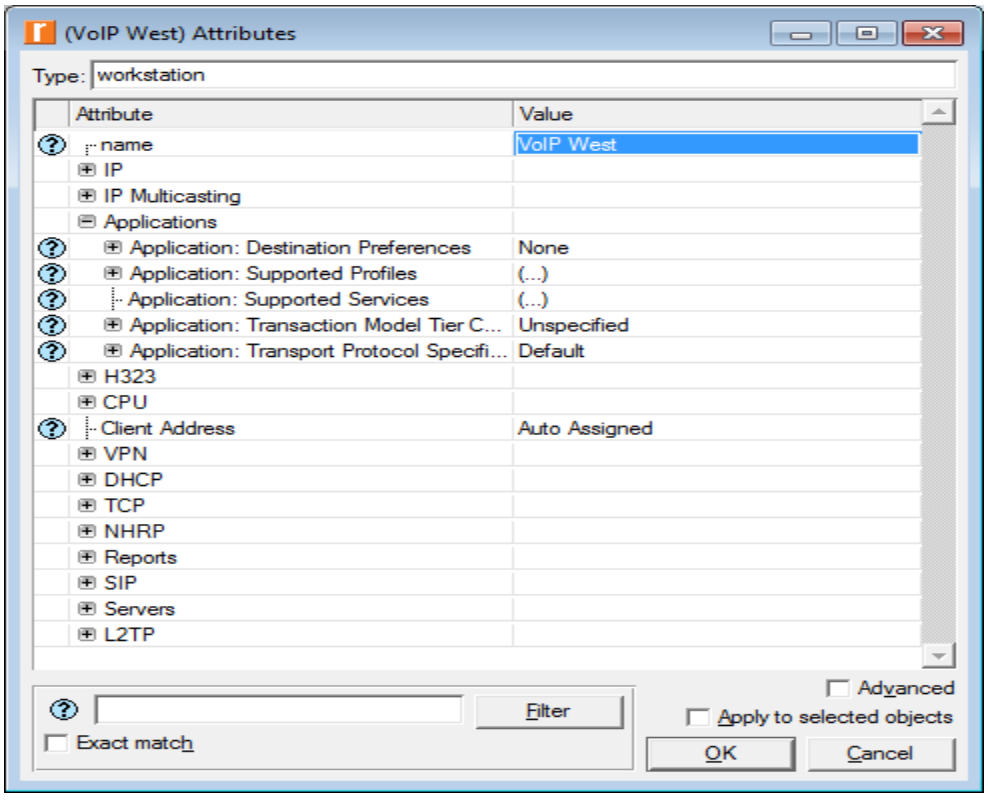
Configuration: FTP Client



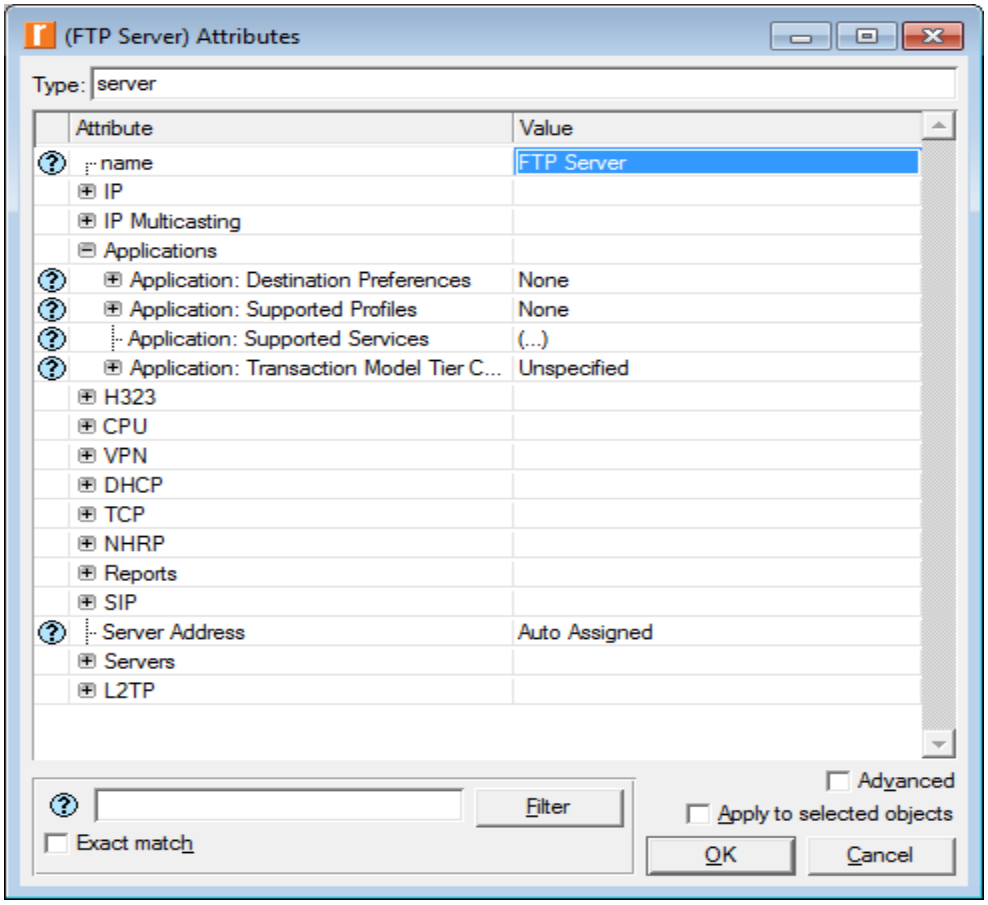
Configuration: Video Client



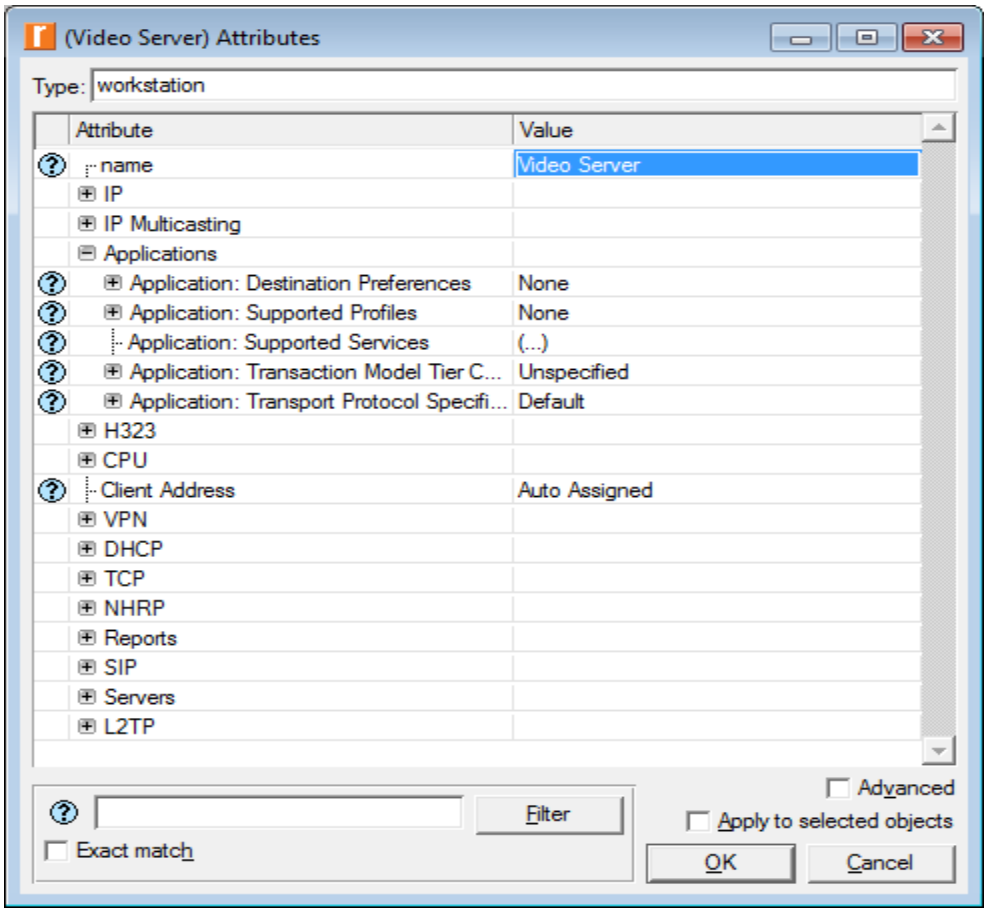
Configuration: VoIP East



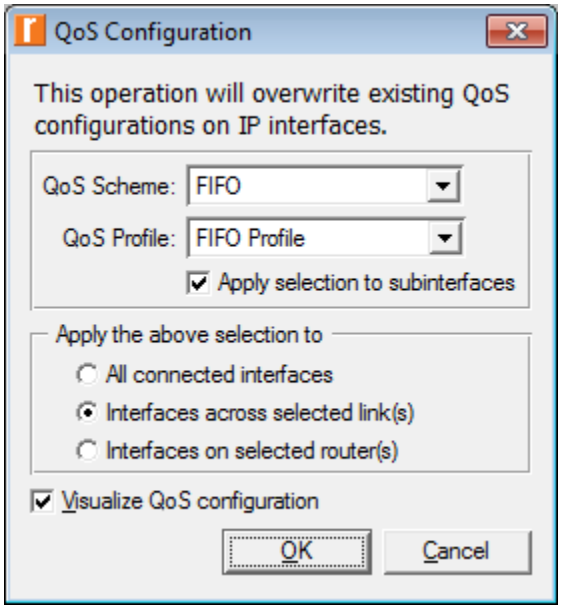
Configuration: VoIP West



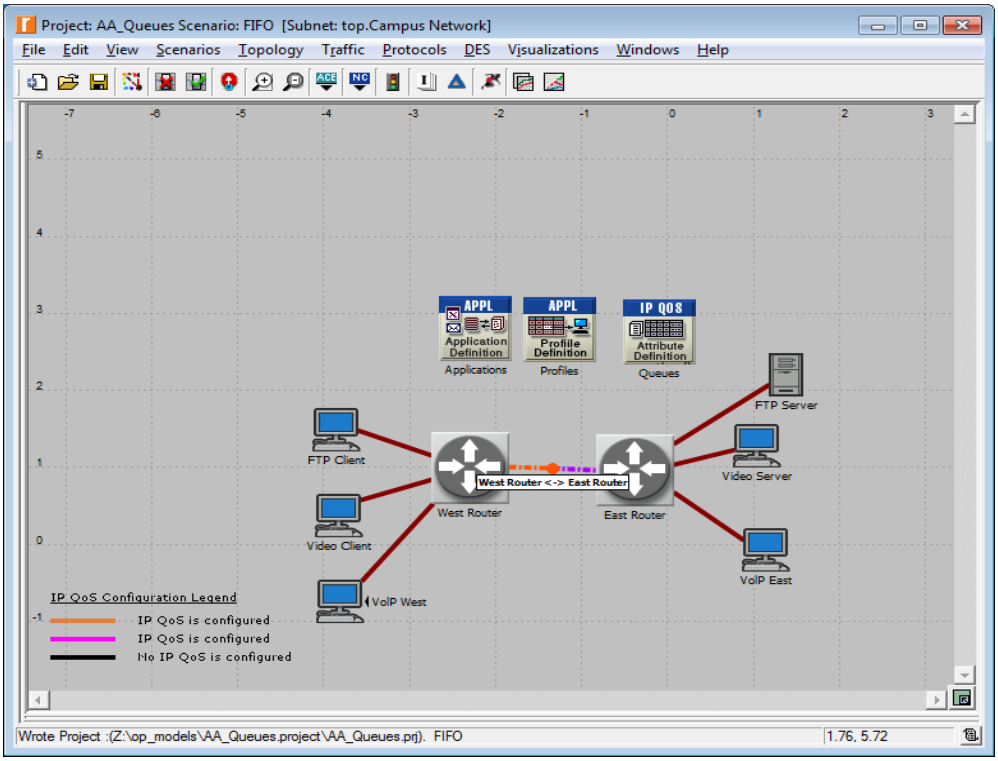
Configuration: FTP Server



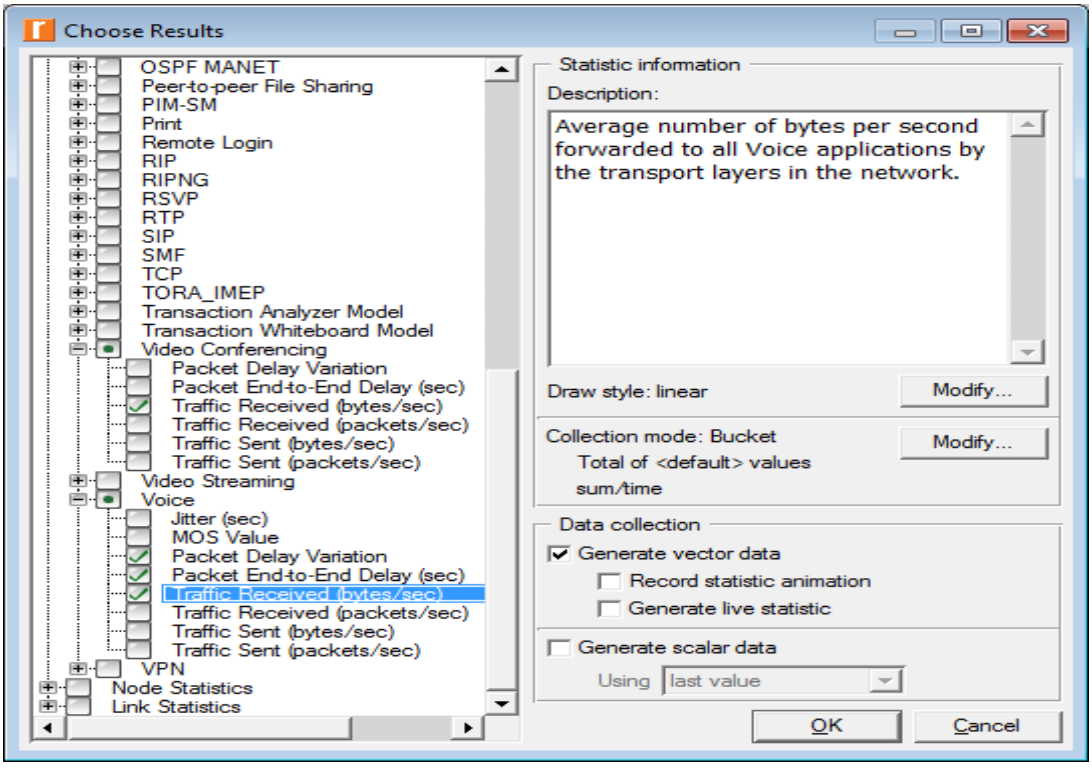
Configuration: Video Server



Configuration: QoS

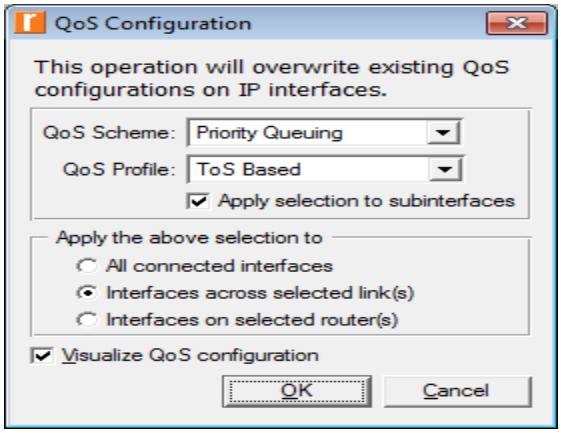


Queues

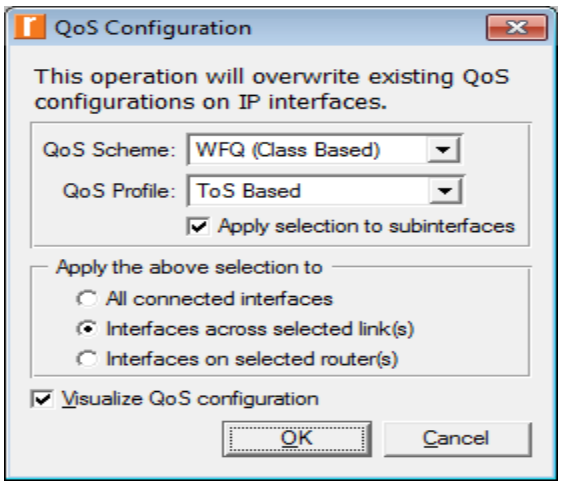


Statistics

Duplication of Scenario

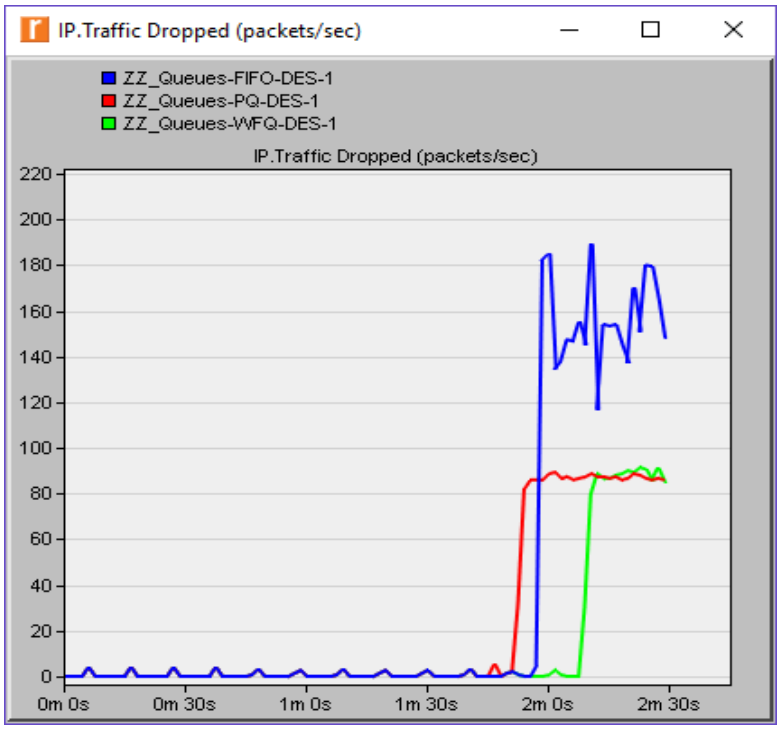


Configuration: PQ: QoS

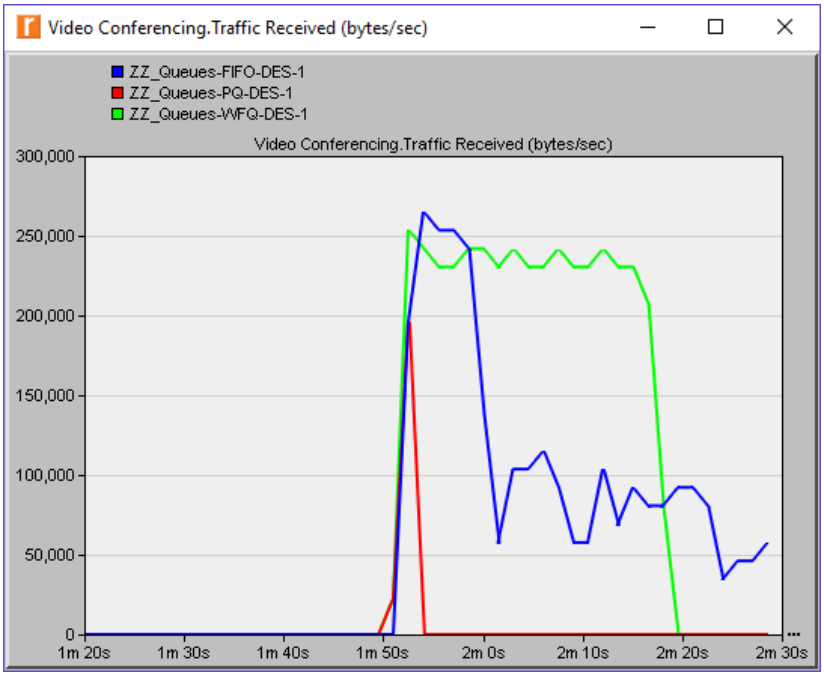


Configuration: WFQ: QoS

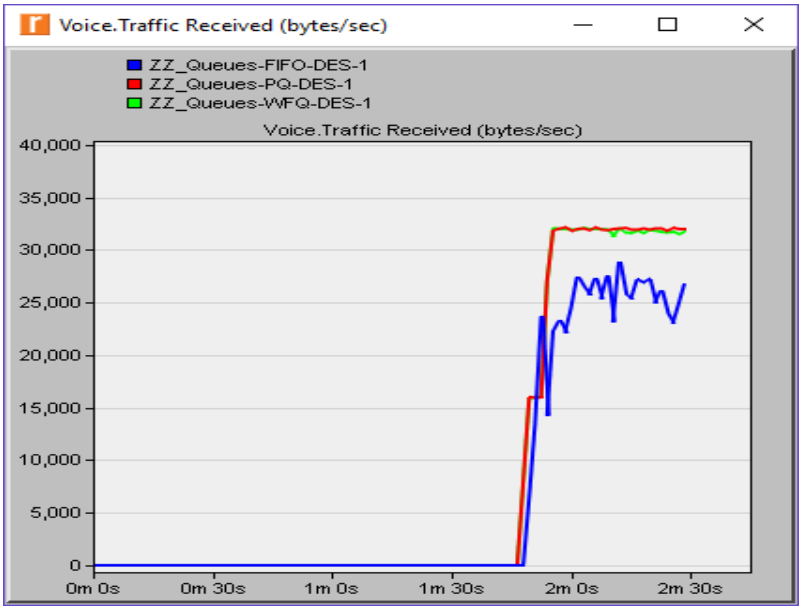
Results:



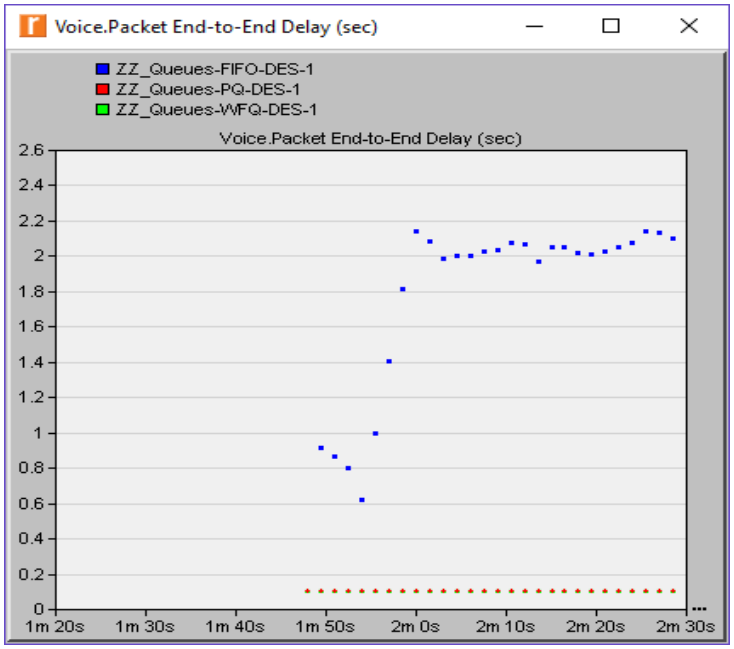
Traffic Statistics



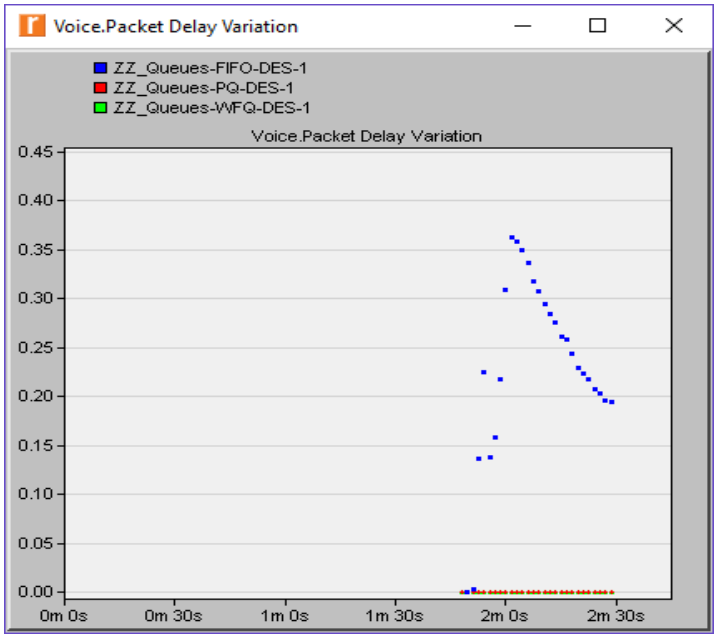
Video Conferencing Traffic



Video Conferencing received



End-to-End dely in video packets



Variation in video packet delay

Answers:

1. Analyze the graphs we obtained and verify the overlap of the Voice Packet Endto-End Delay and Voice Packet Delay Variation graphs. Compare the three queuing disciplines and explain their effect on the performance of the three applications.
   For all the cases, the transmission is starting at 1 min and 45 sec, and the profiles start at 100 sec. Also, the offset for each application from start of profile is 5 sec. in addition, Voice client/server rate = 500 packets/sec, Video client/server: 130 packets/sec, and FTP Client/server: 1 - 33 packets/sec, and FTP, TOS=0, Video TOS=4, and Voice TOS=6.

   In case of FIFO, there is no advance to any type of traffic while more packets arrive and transmit which are stored in a queue. In PQ cases, there are queue profile setting depending on TOS of income traffic. Eventually, in WFQ case, WFQ uses shared buffer it allows queue size to increase even after 500 packets, and the buffer will be full. In Traffic Received for Video Conferencing we can observe the FIFO is higher as compared to PQ and WFQ. The all channel is occupied by the packets of packets in PQ case, and WFQ uses shared buffer of 1000 packets size. As compared to 500 packets buffer of FIFO. In traffic received for VoIP graph, it is easy the traffic received of the voice is less than in case of FIFO as compared to PQ and WFQ. In voice traffic received, there are small difference in the lines of PQ and WFQ for the voice.

2. In the implemented project, edit the Queues object and check the profiles assigned to the FIFO, PQ, and WFQ disciplines. For each profile answer the following questions
   a. How many queues are associated with each discipline?
      FIFO has 1 queue, PQ has 4 queues, and WFQ has 8 queues respectively

   b. In this lab, we used ToS to identify the priority and weight for the PQ and WFQ disciplines respectively. What are the other parameters that can be used to identify the priority and weight?
      It can be done by Protocol, Port and DSCP parameters.

c. In PQ, how are queues configured to serve different ToS values?
Best Effort 0, Background 1 are 80 and 1 respectively

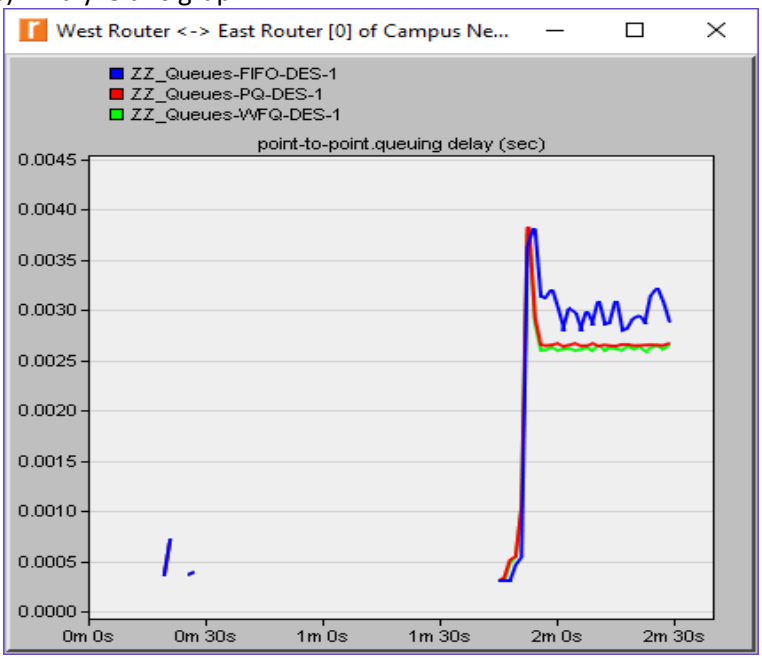
Normal:
Standard 2, Excellent 3 are 40 and 2 respectively

Medium:
Steaming Multimedia 4, Interactive Multimedia 5 are 60 and 3 respectively

High:
Interactive Voice 6, Reserved 7 are 20 each

d. In WFQ, how are queues configured to serve different ToS values?
Best Effort 1 and 10
Background 2 and 20
Standard 3 and 30
Excellent Effort 4 and 40
Streaming Multimedia 5 and 50
Interactive Multimedia 6 and 60
Interactive Voice 7 and 70

3. For all scenarios, choose the "queuing delay <--"statistic for the link that connects East Router and West Router. Rerun the simulation and generate the graph that compares that queuing delay for all queuing disciplines (scenarios). Analyze this graph.



Notice the all lines are almost same from 0.0010 to 0.0037 after that point the queuing delay is changed differently specially FIFO queuing system more than the others.

Conclusions:

We used three kind of traffic, we analyzed the results of the queuing system on network. In FIFO, it doesn't use the priority scheme, and it's based on first come first serve. In PQ uses the priority to define the type of traffic. In WFQ, it is considered as combination of FIFO and PQ. Moreover, we noticed the PQ and WFQ have small end-to-end latency and variation that is needed in actual time for the application when the traffic time will be very sensitive.