

IP Queuing Analysis

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1. Abstract

The internet hosts different kind of services like email, ftp, video and database applications. As databases are very important for storing confidential information, it very important that networks provide the minimum requirement during a database transaction. The objective of this paper is to present a simulation study on importance of queuing mechanisms for a heavy database traffic.

2. Introduction

There is a huge demand for the Internet as the number of services keeps increasing. One common service is database transaction processing. Currently most confidential information is maintained in a database, and whenever users want to access the information, the information is retrieved from the database over the network. In order to complete this transaction process successfully the network should maintain a good QoS (Quality of Service) to provide satisfactory results to the user. QoS must be efficient to differentiate the traffic and satisfy their specific requirements. The router allots some resources and queuing techniques govern how packets are buffered while waiting to be transmitted or processed. There are various queuing disciplines that can be used to transmit packets, and the two queuing techniques discussed in this paper are Weighted-Factor-Queuing (WFQ) and First-In-First-Out (FIFO). The simulation model consists of heavy database traffic flowing through the network's bottleneck link.

3. Queuing Techniques

FIFO (First In First Out) is a very common queuing technique. For FIFO, the first packet in the queue is the first one to be processed, and the buffer size in the router is finite. When the buffer is full there is a possibility for congestion and packets can be dropped and a delay can occur.

For WFQ, quality of service is accomplished by providing some weights to the queue, in order to give a higher priority. With this mechanism the bandwidth is equally shared and all queues are serviced. The data is prioritized based on the information available in the

header, and port number. Traffic is weighed in such a way so that there is equal priority for the traffic with respect to bandwidth.

4. Simulation Study

OPNET's ITGuru provides a virtual network environment for network simulation, and performance analysis of network communication. The simulation environment can also model the behavior of network components like routers, switches, servers and applications. ITGuru provides flexibility in both modeling and analysis.

The simulation environment consisted of work stations communicating with database servers, with two routers connected in between. Both the routers were connected to each other with a PPP DS1 link. The workstations and servers were connected to the routers with a 10 Base-T link and switch. The model included the application configuration module, defined the various types of applications needing to be simulated. The model included the profile configuration which included the different user profiles, and each profile maps to the application included in the application configuration. Since the study focused on QoS, a QoS profile was also included in the simulation environment where the weighted factor queuing and FIFO parameters were set for the simulation study.

A layout of the simulation setup is shown below.

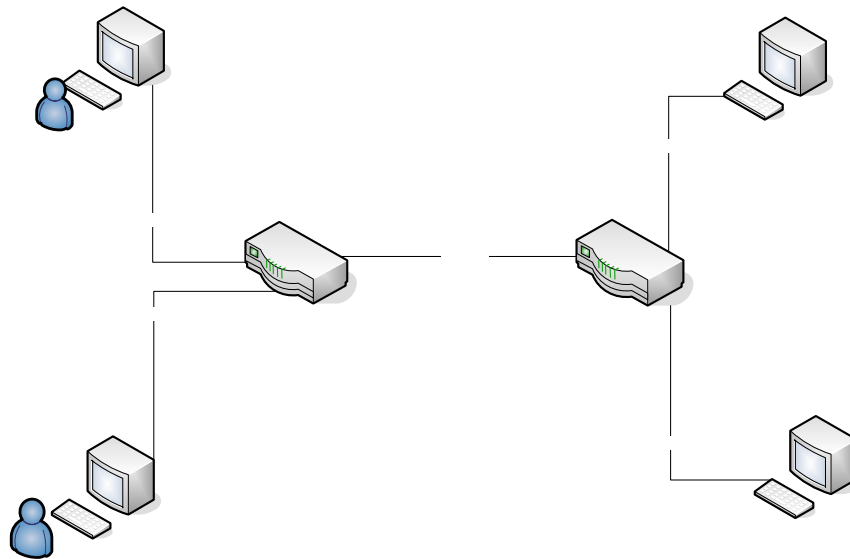


Figure 1: General Network Layout

4.1 Simulation Analysis

The actual ITGuru simulation model is illustrated in figure 2 below.

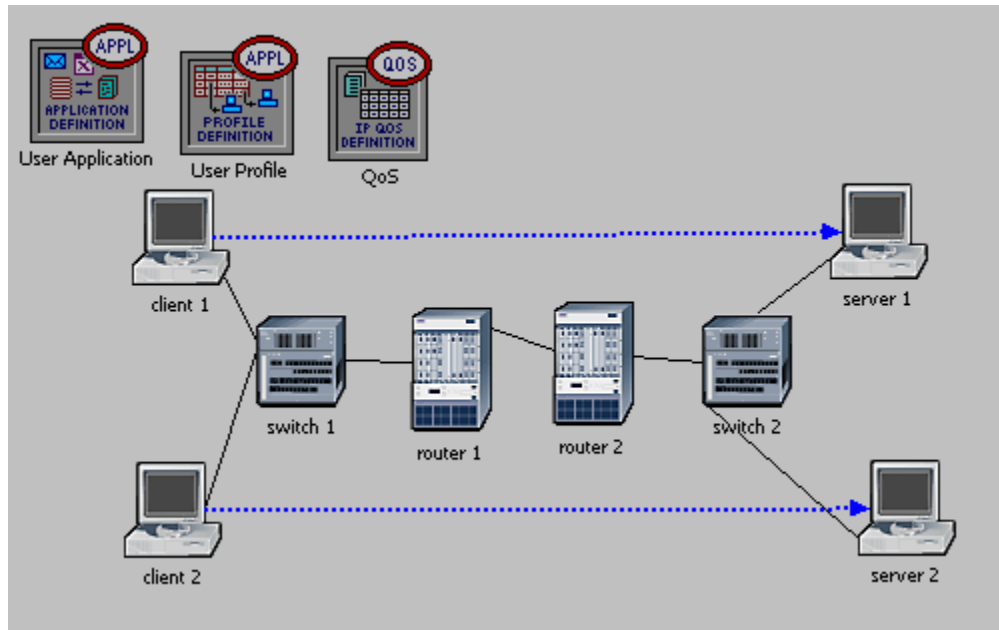


Figure 2: Actual Simulation Model

The simulation model consisted on two scenarios. The baseline scenario implemented the FIFO queuing approach. The second scenario implemented the WFQ queuing approach.

4.2 Results

The following average queuing delay was realized for the FIFO queuing approach. See figure 3. As shown, starting around 1 minute and 45 second time frame, the queuing delay reaches 3 seconds around the 3 minute time frame.

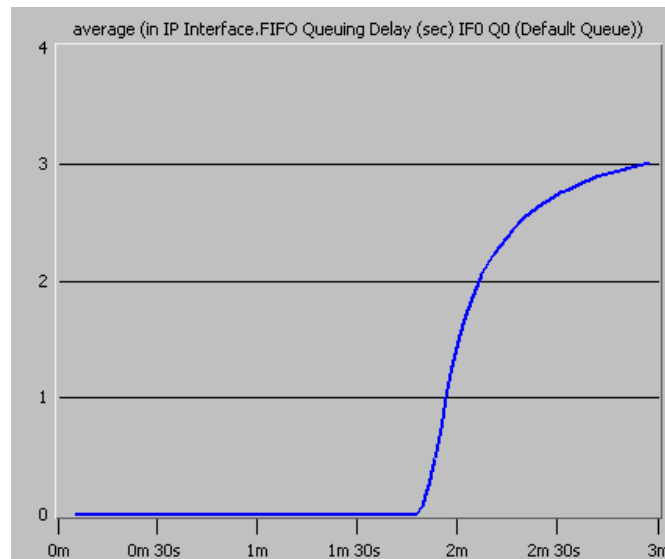


Figure 3: FIFO Queuing Delay Results

The following average queuing delay was realized for the WFQ queuing approach. See figure 4. As shown, starting around 1 minute and 45 second time frame, the queuing delay reaches 15 seconds around the 3 minute time frame.

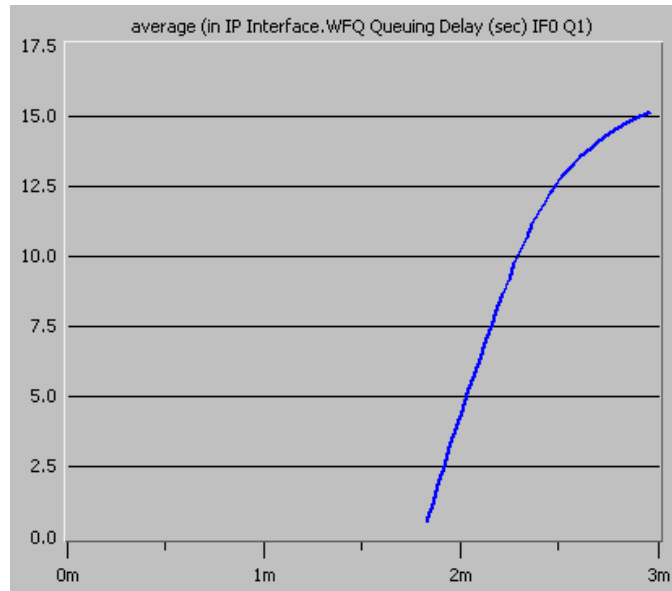


Figure 4: WFQ Queuing Delay Results

5. Conclusion

From the simulations results and analysis, we were able to conclude that the FIFO queuing approach is recommended over the weighted fair queuing approach for heavy database traffic. From the illustrated graphs, the WFQ queuing delay was approximately 5 times greater than the FIFO queuing delay.

6. References

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