Critical Evaluation and Analysis of Effects of Different Queuing Disciplines on Packets Delivery and Delay for Different Applications

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Abstract : Communication network is a process of exchanging data between two or more devices via some forms of transmission medium using communication protocols. The data could be in form of text, images, audio, video or numbers which can be grouped into FTP, Email, HTTP, VOIP or Video applications. The effectiveness of such data exchange will be proved if they are accurately delivered within specified time. While some senders will not really mind when the data is actually received by the receiving device, inasmuch as it is acknowledged to have been received by the receiver. The time a data takes to get to a receiver could be very important to another sender, as any delay could cause serious problem or even in some cases rendered the data useless. The validity or invalidity of a data after delay will therefore definitely depend on the type of data (information). It is therefore imperative for the network device (such as router) to be able to differentiate among the packets which are time sensitive and those that are not, when they are passing through the same network. So, here is where the queuing disciplines comes to play, to handle network resources when such network is designed to service widely varying types of traffics and manage the available resources according to the configured policies. Therefore, as part of the resources allocation mechanisms, a router within the network must implement some queuing discipline that governs how packets (data) are buffered while waiting to be transmitted. The implementation of the queuing discipline will regulate how the packets are buffered while waiting to be transmitted. In achieving this, various queuing disciplines are being used to control the transmission of these packets, by determining which of the packets get the highest priority, less priority and which packets are dropped. The queuing discipline will therefore control the packets latency by determining how long a packet can wait to be transmitted or dropped. The common queuing disciplines are first-in-first-out queuing, Priority queuing and Weighted-fair queuing (FIFO, PQ and WFQ). This paper critically evaluates and analyse through the use of Optimized Network Evaluation Tool (OPNET) Modeller, Version 14.5 the effects of three queuing disciplines (FIFO, PQ and WFQ) on the performance of 5 different applications (FTP, HTTP, E-Mail, Voice and Video) within specified parameters using packets sent, packets received and transmission delay as performance metrics. The paper finally suggests some ways in which networks can be designed to provide better transmission performance while using these queuing disciplines.

Keywords : applications, first-in-first-out queuing (FIFO), optimised network evaluation tool (OPNET), packets, priority queuing (PQ), queuing discipline, weighted-fair queuing (WFQ)

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