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# QUEUEING PROPERTY FOR DIFFERENT TYPE OF SELF-SIMILAR TRAFFICS

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Abstract. *Queueing behavior with long-range dependence input is important to determine the queue resource on the intermediate bottleneck nodes. The end-to-end performance especially depends on the provisioning of queue resources and link bandwidth. The purpose of this research is to explore queueing properties for self-similar traffic using the network simulator. In various ways to generate the self-similar traffic such as the transferring traffic of files with self-similar distribution, we adopt the on/off traffic over TCP and UDP on the ns-2 network simulator. The simulation traffic is subject to the Pareto distribution, and queue sizes and other performance parameters of the traffic are to be observed. We generated the two different types of traffics; "queue-buffering with no full use of bandwidth" and "queue-buffering with full use of bandwidth", and extracted the following results. Firstly, the property of long-range dependence is preserved for UDP traffics contrary to TCP traffics under "queue-buffering with no full use of bandwidth" traffics. Secondly, the behavior of queue length is sensitive to the small increase of TCP or UDP flows. UDP traffics with the long-range dependency consumes much more queue resource than short-range dependent traffic contrary to TCP traffics. Thirdly, the increasing pattern of average queue length in terms of the maximum queue capacity is sensitive to the bandwidth and the number of flows for TCP traffics. Finally, the well-known property for the increase of the average queue length appears in the limited condition for UDP traffics.*

**Keywords:** Quality of service, Queueing property, Self-similar traffic, Queue length, Transport protocol

1. **Introduction.** To provide QoS (Quality of Service) for application users, the definition and the evaluation of network and system parameters are required. The performance of the network based applications especially depends on the network parameters such as the time variant bandwidth, delay and the end-to-end throughput. Since the network congestions on the sending/receiving path directly affect the performance of the end-to-end application, the queueing control on the intermediate router is the most important factor to guarantee the QoS. Chu et al. [2] applied the new control mechanism to the active queue management (AQM) on the intermediate routers using the time-delay affine takagi-sugeno fuzzy model. The proposed design approach was presented as the effective and useful mechanism in numerical simulations. This mathematical modeling is accurate in a high degree, and making it a quite attractive approach. The assumption of the input traffic distribution, however, is limited to the Poisson process.

Not only the revision of the queue control mechanism on the intermediate routers but also the enhancements of the flow control and congestion control mechanism of TCP are important for the provisioning of QoS. To provide the QoS in the MAC layer is the challenging work especially in wireless network. Zhou et al. [1] developed the cross-layer