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PROPAGATION PROPERTY OF JITTER WITH SELF-SIMILARITY

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Abstract. *QoS provisioning for user application requires not only the evaluation of performance on end-station but also the evaluation of network parameters on intermediate routers. These network parameters were observed under the condition of self-similarity, and evaluated focusing on first-order performance measures. Second-order performance measures such as jitter are of importance to multimedia data transport and QoS provisioning. In this paper, we present the experimental analysis of jitter propagation properties with self-similarity using our IP performance active measurement method. This method sends ICMP TIMESTAMP messages and receives reply messages to and from each node along the path. After collecting the delay and jitter fluctuations, we present the following results relating to the jitter properties. We found our method can detect the propagation property of jitter along the path. We also report log-log form of the complementary cumulative distribution is linear in LAN, while it has a heavy-tailed distribution in WAN. Packet flows go through routers with power-low behavior and are distributed to each queue on router, finally queuing delays; jitters, behave the hyperbolic distribution in LAN. On the other hand, packet flows in WAN are multiplexed and generated queuing delay in queuing system, finally compose heavy-tailed distribution. The heavy-tailedness was caused by load on the edge router between LAN and WAN, making Hurst parameter up to approximately 0.75.*

Keywords: Jitter, Self-similarity, Propagation Property, Heavy-tailedness, Path based Measurement

1. **Introduction.** QoS provisioning for user application requires not only the evaluation of performance on end-station but also the evaluation of network parameters on intermediate routers. Since user application can estimate the performance of their own station, main QoS models [1] at present are oriented network parameters such as bandwidth, delay and jitter, targeting to provide transparent management to upper applications. Estimation of network parameters should stand on the network model to approach the real network behavior. The Poisson Process model had been applied to theoretically explain the behavior of Internet traffic in the previous days. Recently, however, evidence of self-similarity has been observed in local-area and wide-area network traffic and the property of self-similarity has been shown in wide time scales. Since the seminal study of Leland, et al. [2], self-similarity of network traffic has been widely adopted in the modeling and analysis of network performance.

Relations between self-similarity and network and/or system parameter is mainly discussed in the context of end-to-end data transmission environment. For example, Crovella