

Welcome

Seminar Series of the Department of Computer Science Electrical Engineering Presents

Analytic Models of TCP Performance Over Multi-hop Wireless Links with Correlated Channel Fading

October 12, 2007. Time 2:00-3:00PM. FH 557.



Prof. Ken Mitchell

Computer Science Electrical Engineering, University of Missouri-Kansas City, Kansas City, MO.

Abstract

The Transmission Control Protocol (TCP) has evolved over the last two or so decades to be quite efficient over wireline links. However, over error prone wireless links, the TCP congestion control mechanism tends to misinterpret segment loss as congestion in the network. The result is that TCP unnecessarily throttles the transmission rate of the sender, resulting in degraded throughput. Given the pervasive use of wireless communications, TCP performance over wireless links has been a very active area of research. For this presentation, we develop an analytic model for TCP performance over wireless channels with highly correlated fading characteristics. The wireless channel TCP segment loss process is modeled using a Linear Algebraic Queueing Theory representation of a hidden Markov chain that can incorporate autocorrelations in successive segment losses. The segment loss model is then used in the development of a discrete time Markov chain representation of the evolution of the TCP congestion window. Variability in the round-trip time distribution and sub-linear congestion window growth is also incorporated into the model. We derive transient and steady-state performance measures such as the mean and variance of the congestion window size and throughput for various error autocorrelation and round-trip times.

Bio: Ken Mitchell is an Associate Professor in the Computer Science Electrical Engineering Department at the University of Missouri–Kansas City (UMKC). He received his M.S. and Ph.D. degrees from UMKC in 1994 and 1997 respectively and has a Bachelors and a Masters degree in music performance from Indiana University. His research has been funded through NSF and the University of Missouri Research Board. His research interests and projects include: Network performance modeling using Linear Algebraic Queueing Theory, developing probabilistic guarantees of connectivity in sensor networks based on spatial distributions of nodes, modeling QoS in wireless mesh networks based on node interference patterns and routing, and assessing the effects of mobility on resource allocation in cellular networks using space-time modeling.