


Modeling Wireless Data Networks

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Problem definition



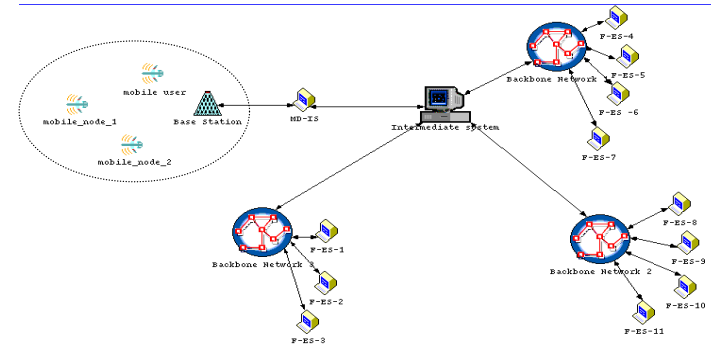
Why such a poor performance?!

I did everything correctly to design this wireless network! I used Poisson models for the network traffic. This traditional model has been used to characterize voice traffic for decades.



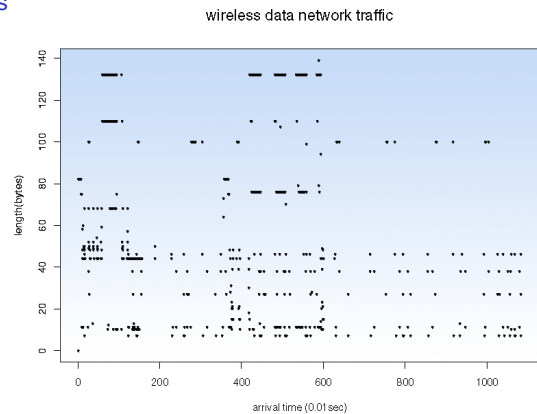
Hey! Traffic generated by new services (voice, data, image, and video) in current data networks differs from traffic patterns observed in circuit switched voice networks. Have you ever heard of long-range dependency (LRD)? Let's do some analysis!

OPNET model of simulated BC Tel Mobility wireless data network



Let's build a wireless data network and perform trace driven simulations to test the impact of LRD on the performance of wireless data networks.

Traffic analysis

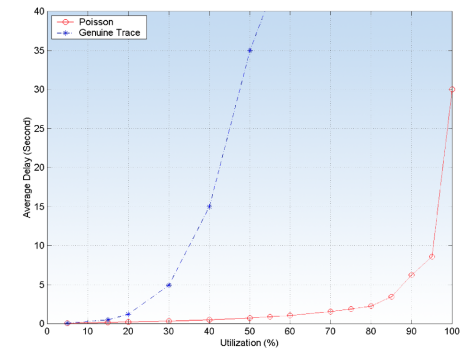
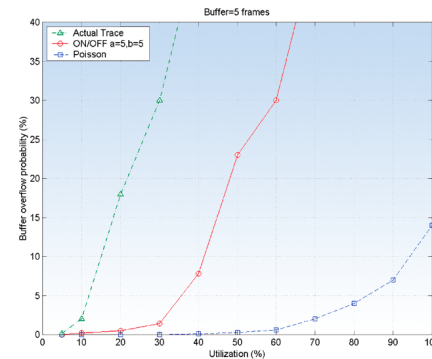


Hurst Parameter $0.5 < H < 1$ implies LRD.

- R/S plot of our trace indicates $H = 0.73$
- Variance-time plot of our trace indicates $H = 0.91$

Hence, the measured wireless traffic tends to be LRD.

Performance measures, loss and delay



Traffic with LRD characteristics produces large packet loss and delay than traffic modeled with Poisson process. Therefore, new models that capture long range dependency are needed. Traditional traffic models are not adequate for wireless data networks.



References:

- W. E. Leland, M. S. Taqqu, W. Willinger, and D. V. Wilson, "On the self-similar nature of Ethernet traffic (extended version)," *IEEE/ACM Trans. on Networking*, vol. 2, no. 1, pp. 1-15, Feb. 1994.
- OPNET Documentation V.6.0.L, MIL3 Inc., Washington D.C.