

Traffic Modeling in the TeleLearning Environment

Velibor Markovski & Ljiljana Trajkovic
Simon Fraser University

TeleLearning environment produces:

- complex traffic patterns
- statistically multiplexed:
 - data
 - voice
 - image
 - video

These traffic patterns are very bursty and impose high loads on network elements.

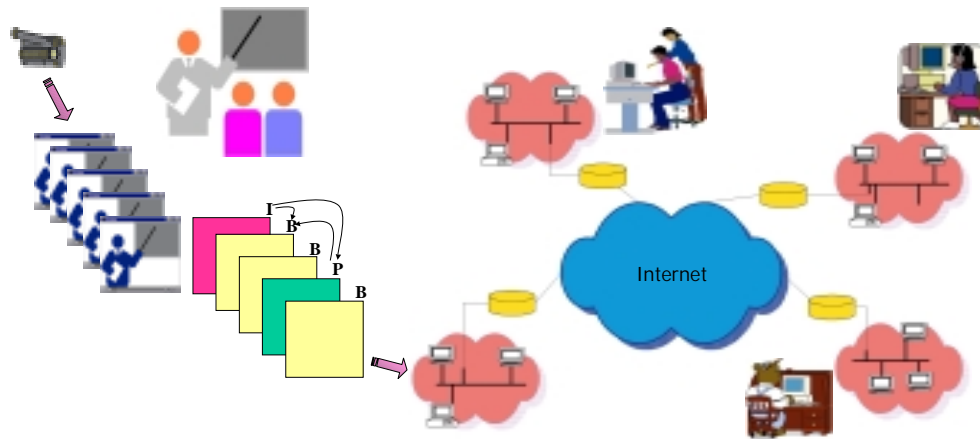
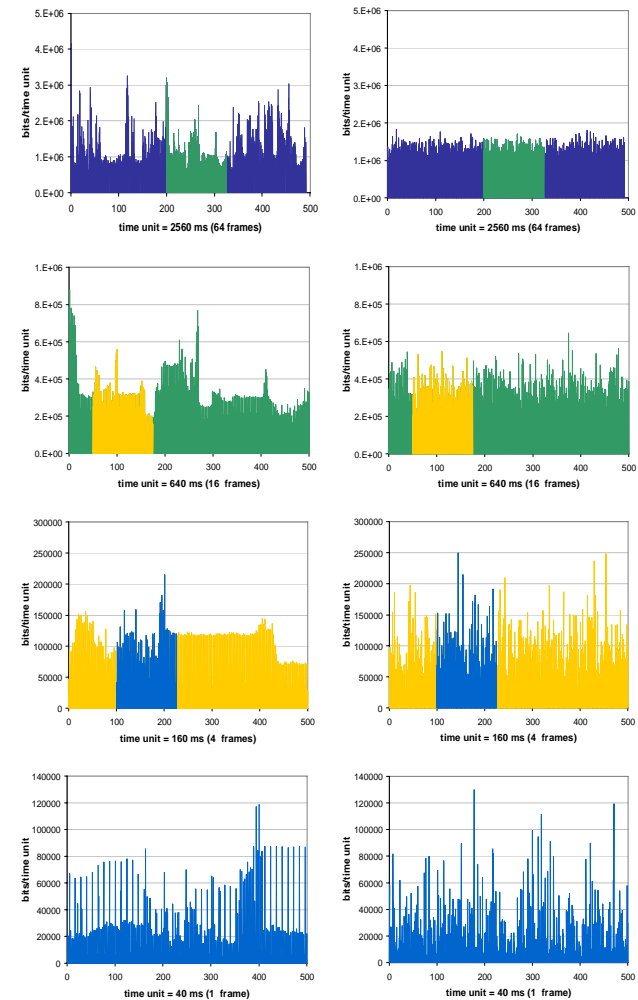
The aim of traffic modeling is to:

- describe characteristics of the traffic data
- help in designing an appropriate network architecture
- design protocols for video applications

Developing traffic models from a real-life TeleLearning network requires:

- data collection
- data analysis
- traffic characterization and modeling

Real MPEG traffic trace (left) and a synthetically generated Poisson model with the same mean (right):

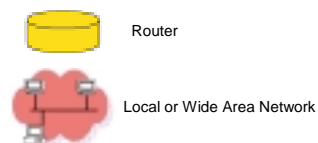


MPEG traces consist of:

- Intraframes **I**: coded as a still image
- Predicted frames **P**: predicted from the most recent I or P frames
- Bidirectional frames **B**: predicted from the closest I and P frames

Conclusions:

- Poisson models are not adequate for multimedia applications.
- New traffic models capture:
 - fractal nature
 - long range dependency
 - heavy-tailed distributions
- There is no replacement for genuine traffic traces.
- Traffic models are essential for engineering, control, and performance analysis of high-speed TeleLearning networks.



References:

- M. Ariitt and C. Williamson, "Internet Web Servers: Workload Characterization and Performance Implications," *IEEE/ACM Trans. on Networking*, vol. 5, no. 5, Oct. 1997.
- M. E. Crovella and A. Bestavros, "Self-Similarity in World-Wide Web Traffic: Evidence and Possible Causes," *IEEE/ACM Trans. on Networking*, vol. 5, no. 6, Dec. 1997.
- M. W. Garrett and W. Willinger, "Analysis, Modeling and Generation of Self-Similar VBR Video Traffic," *Proc. ACM SIGCOMM '94*, London, UK, Aug. 1994.
- 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, Feb. 1994.
- Traffic traces from <http://www-info3.informatik.uni-wuerzburg.de/pub/MPEG/traces/>.