Traffic Generators for Internet Traffic

- Henning's web page on traffic generators.

- D-ITG's web page on traffic generators.

- **Polly Huang's traffic generator in NS**:
  Anja Feldmann, Anna C. Gilbert, Polly Huang and Walter Willinger. Dynamics of IP Traffic: A Study of the Role of Variability and the Impact of Control, SIGCOMM'99, Boston, MA, Sep 1999.
  "During a Web session, a user usually requests several Web pages and each page may contain several web objects. To capture this hierarchical structure and its inherent variability, we allow for different probability distributions for the following user/session attributes: inter-session time, pages per session, inter-page time, objects per page, inter-object time, and object size... We base our choice of distributions on the work surrounding SURGE... and upon [Feldman99, Mogel97]."

- **The NSWEB traffic generator for NS-2.29**.

- **The PackMime-HTTP traffic generator in NS:**
  J. Cao, W.S. Cleveland, Y. Gao, K. Jeffay, F.D. Smith, and M.C. Weigle, **Stochastic Models for Generating Synthetic HTTP Source Traffic**, IEEE INFOCOM, March 2004.
  ``New source-level models for aggregated HTTP traffic ... are built and validated using two large-scale collections of TCP/IP packet header traces." The TCP connections are modeled ``in terms of connection establishment rates and the sizes and timing of exchanges of request and response data."
  The PackMime-HTTP traffic generator requires the use of Full-TCP in NS.

- **The tmix traffic generator.**
  M. Weigle, P. Adurthi, F. Hernandez-Campos, K. Jeffay and F. D. Smith, Tmix: A Tool for Generating Realistic TCP Application Workloads in ns-2, CCR, July 2006.
  "The system takes as input a packet header trace taken from a network link of interest. The trace is reverse compiled into a source-level characterization of each TCP connection present in the trace."

- NETI@home:
  NETI@home collects network performance statistics from end-systems. The related work includes models of user behavior.

- [Ostinato](#):
  Ostinato is an open-source, cross-platform network packet/traffic generator and analyzer.

- **The [Swing](#) traffic generator:**
  K. Viashwanath and A. Vahdat, Realistic and Responsive Network Traffic Generation, SIGCOMM 2006.
  "Starting from observed traffic at a single point in the network, Swing automatically extracts distributions for user, application, and network behavior."

- **[D-ITG](#), Distributed Internet Traffic Generator for testbeds:**
  D-ITG produces traffic "accurately replicating appropriate stochastic processes for both IDT (Inter Departure Time) and PS (Packet Size)", and is capable of generating traffic at the network, transport, and application layers. Includes DCCP support. Updated 2006.

- **The [Harpoon](#) traffic generator for testbeds:**
  J. Sommers and P. Barford, [Self-Configuring Network Traffic Generation](#), IMC 2004.
  Harpoon is an application-independent tool for generating representative packet traffic at the IP flow level. Harpoon can also self-configure from Netflow logs. December 2005.

- **The Surge traffic generator for testbeds:**
  Paul Barford and Mark Crovella. [Generating Representative Web Workloads for Network and Server Performance Evaluation](#). In Proceedings of the ACM SIGMETRICS, pages 151-160, Madison WI, November 1998. ACM.

- [RAMP](#):
  Kun-chan Lan and John Heidemann, [Rapid Model Parameterization from Traffic Measurements](#), ISI-RF-561, August 2002.
  "We describe approaches and tools that support rapid parameterization of traffic models from live network measurements."

- **IPB**:
  B. Mah, P. Sholander, L. Martinez, and L. Tolendino. [IPB; an Internet Protocol Benchmark using Simulated Traffic](#). Proceedings of MASCOTS '98, Montreal, Canada, August 1998. IEEE.
  "We have developed an IP Benchmark (IPB), which uses synthetic, simulated traffic to measure the peformance across an IP network or internetwork."

- **The [trafgen](#) traffic generator:**
  Rigoberto Chinchilla, John Hoag, David Koonce, Hans Kruse, Shawn Ostermann, and Yufei Wang, [Characterization of Internet Traffic and User Classification: Foundations for the Next Generation of Network](#)

Emulation, Proceedings of the 10th International Conference on Telecommunication Systems, Modeling and Analysis (ICTSM10), 2002. "Currently, we model traffic based on applications, such as a web browser or a file transfer application. In the present upgrade, we are modeling the way users utilize multiple applications."

- **Web servers**:
  Benchmarking of Web-Server Systems:
  Michele Colajanni, Mauro Andreolini, and Valeria Cardellini, Benchmarking of Locally and Geographically Distributed Web-Server Systems, Half-day tutorial at 12th International World Wide Web Conference (WWW2003), Budapest, Hungary, May 20th, 2003.

- **GenSyn** is a Java-based, traffic generator generating TCP connections and UDP streams. From 2000.

- **httperf** "provides a flexible facility for generating various HTTP workloads and for measuring server performance." From 1998.

- **Modeling Peer-to-Peer Traffic**.

- **Modeling Traffic from Online Games**.

- **Modeling DDoS Attacks**.

- **Methodologies**:
  - M. Yuksel, B. Sikdar, K. S. Vastola, and B. Szymanski. Workload Generation for NS Simulations of Wide Area Networks and the Internet. Proceedings of Communication Networks and Distributed Systems Modeling and Simulation Conference (CNDS) part of Western Multi-Conference (WMC), pages 93-98, San Diego, CA, 2000.
    "We introduce methodologies for implementing realistic workload generators for wide area networks which (1) maintain the proper composition of the aggregate traffic resulting from the mix of various applications supported by the network and (2) are capable of generating long range dependent or self-similar traffic."

  - F. Hernandez Campos, K. Jeffay, F.D. Smith, S. Marron, and A. Nobel, Methodology For Developing Empirical Models of TCP-Based Applications, 2001.
    "We report on a large-scale empirical study to create application-level models for TCP traffic generation in simulations and network test-beds."

  - F. Hernandez-Campos, K. Jeffay, and F. Donelson Smith, Tracking the Evolution of Web Traffic: 1995-2003, MASCOTS 2003.
    "These results demonstrate that usage of the web by both consumers and content providers has evolved significantly and

make a compelling case for continual monitoring of web traffic and updating of models of web traffic."

- **Why Traffic Models Matter**:
  Y. Joo, V. Ribeiro, A. Feldmann, A. C. Gilbert, and W. Willinger, TCP/IP Traffic Dynamics and Network Performance: A Lesson in Workload Modeling, Flow Control, and Trace-driven Simulations. CCR, April 2001. "The main objective of this paper is to demonstrate in the context of a simple TCP/IP-based network that depending on the underlying assumptions about the inherent nature of the dynamics of network traffic, very different conclusions can be derived for a number of well-studied and apparently well-understood problems in the area of performance evaluation. For example, a traffic workload can either completely ignore the empirically observed high variability at the TCP connection level (i.e., assume "infinite sources") or explicitly account for it with the help of heavy-tailed distributions for TCP connection sizes or durations."

- **Usage Patterns in Wireless Networks**:
  - A. Balachandran, G. Voelker, P. Bahl, and V. Rangan, Characterizing User Behavior and Network Performance in a Public Wireless LAN, SIGMETRICS'02.
  - David Kotz, Kobby Essien, Pablo Stern, Analysis of a Campus-wide Wireless Network, Mobicom 2002.

- Packet replay engines include TCPivo and tcpreplay.

- Commercial traffic generators:
  - BreakingPoint's test equipment generates up to 15 million TCP sessions, with more than four thousand security strikes and seventy application protocols.
  - The LANforge FIRE traffic generator includes SIP, H.323, VoIP, and RTP, along with FTP, HTTP, SMTP, and others.
  - Omnicor, including software IP packet generators.
  - Skaion's Traffic Generation System (TGS) includes malicious traffic, web traffic, email, FTP, IRC.

- Trace libraries:
  - Crawdad, an archive for wireless data.

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