CS 525M Mobile Computing

Emmanuel Agu

Wireless Systems

- Wireless systems for ubiquitous computing
  - Digital: can transmit data (bits) as well as voice, video
  - Internetworking: TCP/IP networking
- Cellular networks (1G, 2G, 3G, 4G)
- Wireless LANs: IEEE 802.11 and ETSI HiperLAN2 (Europe)
  - 802.11 Sub-groups:
    - 802.11i – security
    - 802.11e – QoS, RT traffic
    - 802.11f: handover while roaming
- Wireless data (ARDIS, tetra, GPRS)
- Wireless Personal Area Networks (WPANs): (Bluetooth, 802.15)
- Satellite Systems (teledesic, iridium, etc)
- Wireless broadband (802.16, LMDS)

Performance Evaluation

- Main categories for performance evaluation of computer systems, protocols, etc:
  - **Analytic/mathematical models:**
    - Queuing theory, markov chains, etc
    - Advantages: where possible, just plug numbers to give answers
    - Disadvantages: real system is too complex to model (e.g. traffic pattern), so simplify too much??
  - **Measurement:**
    - Build actual network or system
    - Stress test under various scenarios and measure
    - Advantage: captures real system attributes
    - Disadvantages: expensive and takes time to build

Simulation

- Third option is **simulation**
  - Write computer program that abstracts most relevant aspects of protocol
  - Maintain event queue (insert, remove, action, etc) of activities
  - More subtle events we add, more realistic results
  - Combines more accuracy of real system with speed of evaluation
  - Advantages: more accurate than analytic model
  - Disadvantages: Less accurate than real system measurement

Simulation

- Maybe 90% of networking papers use simulation
- Researchers used to write all their simulations from scratch
- Now, 3 main simulators for networking research:
  - Network Simulator 2 (NS2) (ISI at USC) (free)
  - GlomoSim (UCLA) (free)
  - OPNET (commercial)
- Maybe 90% of all published wireless networking papers use one of these 3 simulators
- The latest version of NS2 is installed on the CS machines
- Straightforward project: simulate a network protocol
- NS2: learning curve, may start going through tutorials at by Marc Greis at http://www.isi.edu/nsnam/ns/tutorial/index.html