

## EE-599 Special Topics: Issues in Internet Protocol Design, Simulation and Testing

### A. Helmy, Fall 2000

#### Description:

This course will cover contemporary issues in protocol design, simulation and testing for the Internet, with emphasis on complex issues introduced by multicast and wireless networks.

Topics covered will include traditional analysis and simulation tools with description of their limitations to deal with new complexities introduced by recent Internet protocols and architectures.

The protocols studied will include multicast routing protocols and architectures (such as, PIM-DM, PIM-SM, DVMRP, BGMP, MSDP), reliable multicast protocols (such as, SRM, RAMP, PGM, RMTP), Mobile IP solutions (such as, Mobile IPv4, Mobile IPv6, cellular IP) among others according to the students interests (which may include queuing disciplines, TCP variants, congestion control for real-time traffic, or web/video caching techniques).

Recent approaches to network simulation will be studied using the network simulator (NS) and the network animator (NAM) in the integrated virtual Internet Testbed (VINT). In addition, algorithms that aid in the synthesis of simulation scenarios and stress test generation will be discussed. These will include protocol verification, robustness and performance analysis tools using finite state machines (FSM), automata theory and search techniques.

#### Initial resources and starting points:

<http://catarina.usc.edu/pim>

<http://catarina.usc.edu/multicast>

<http://catarina.usc.edu/vint>

<http://catarina.usc.edu/stress>

In addition to numerous readings related to the above topics, assigned by the instructor as well as the students.

#### Student duties:

- Attend and participate in class discussions and presentations
- Read and review/summarize papers and publications related to lecture topics
- Choose and carry out a course project with submission of initial proposal, final report and a demo to be presented at the end of the semester

#### Pre-requisites:

- Major/Interest in computer networks, their design, analysis, simulation and testing
- Good background in networking (EE-450)
- At least one of the following: EE-555 or CS-551 with a good standing (i.e., B+ or better)
- Background in probability theory, network modeling using stochastic processes (EE-465 or EE-549 or equivalent)
- Good background in object-oriented programming (preferably in C++ or Tcl/Tk or OTcl, or familiarity with network simulation tools, especially NS) [CS-455 or CS-402]
- Background in algorithms (recommended CS-570), operating systems (recommended CS-555) and automata theory & finite state machines.
- Instructor's approval

#### Grading:

- Class attendance, discussion and participation **15%**
- Presentations, presentation reports, and paper reviews **40%**

(Note: the number of presentations depends on the number of registered students, but in general a student will give a presentation on a lecture topic, and another on the project topic. Every presentation should be accompanied by a more detailed version of the presentation in a 'presentation report', in the student's own words and writing. The students not presenting the topic will have to read at least one paper on the topic being presented and present a review/summary for it).

- Project proposal (due midterm), final report and demo **45%**

**Notes:**

- This is a seminar-like course, where the students get to participate in a significant way in presentations and discussions.
- The presentations, topics and reading schedule will be decided upon based on discussion with the students during the first few lectures. Hence, the first and second lectures attendance is a must.