Massachusetts Institute of Technology
Department of Electrical Engineering and Computer Science

6.829 Fall 2002 | **Problem Set 3** | November 4 2002

This problem set has **three** questions. Please work with your project partners on this problem set. Turn in only one set of solutions per project group.

If you don't have a project partner, find another student who does not have a partner to answer questions 2 and 3. Or join a two-member group.

Turn in answers to the first question *separately* from the answers to the other two. Question 1 is due Thursday, 11/14/02, in class, per the schedule. Questions 2 and 3 are due Thursday, 11/21/02, in class.

Answers to questions 2 and 3 will be graded based on how clearly written the answers are and how creative and well-defined the ideas are. Think of them as "design" questions, and you have to convince the reader that you have something interesting and thoughtful to say. These questions are intentionally under-specified to see how you think.

Follow the page limits mentioned for questions 2 (2 pages) and 3 (one page). Your answers can be shorter in length. They should be in a font no smaller than 10pt.

Please turn in two-sided printouts of your answers to all questions. Trees aren't free.

1 Project progress: Due 11/14/02 in class

Write up a summary of the progress on your project so far. This summary is to help you get a start on your final paper and to give us a chance to assess progress. Structure it as you would your final paper in terms of its section organization. Eventually, you should be able to add on to this progress report to produce your final paper.

Your introduction should clearly state the set of one or more research questions your work addresses. Be as precise as you can in that statement. If possible, motivate what you're working on. Explain what the problems are. Give us an idea of the solution. Tell us what you've found (briefly) or what you expect or don't expect to find.

Make sure you have an essentially complete related work section that summarizes previous work on your project and clarifies how your work and findings may be different. It's OK to have a project that tries to validate a previous work.

Your paper should also have a convincing section/subsection organization with some material filled in (even in bulleted form is quite fine) that shows what experiments/analysis/algorithms you are working on. If you have hypotheses, state them. Expand on what you've found so far, or expect to find. Negative results are fine.

Depending on how far you've gotten, a bulleted list of what you've done so far may be useful to have.

Use your judgement to decide what this summary should contain and what it shouldn't. We're not going to tell you how many pages it should be; what matters is what it contains!

Structure the paper similar to the several technical papers in the readings. Use the same style for references (detailed citations at the end of the paper, with numbers or alphabetical cross-references in the text).

2 DNS attacks: Due 11/21/02, in class

Recently, there were some much-publicized DDoS attacks on the DNS root name servers. Other than the publicity, perhaps the most notable thing about these attacks is that no user seemed to notice degraded performance, compared to, say, the attacks that took down popular Web portals in the past.

1. Using the data from the Jung et al. DNS paper (or some other reasonably correct source), carefully explain why most of us didn't notice the attacks when they were happening.
2. If you did in fact want to cripple the DNS, what would your detailed attack strategy be? Think in fundamental terms about the different components of DNS and how they interact with each other. *We suggest thinking through the issues in detail and describing them, but not carrying out an attack to see if your ideas work!*
3. For the attack(s) you list, can you conjure up defenses? For example, you might think in terms of routing issues, using DHTs, using overlays, etc.

Your answers to all these questions should be less than 2 pages long (total), in font size at least 10pt. Be precise and to the point.

3 Many, many, many overlays: Due 11/21/02, in class

We have seen two kinds of overlay networks in class. An example of the first kind is RON; examples of the second kind are systems built on Distributed Hash Tables (DHTs).

The goal of this question is to explore *scalability* in overlay networks. Suppose the future Internet has many, many overlay networks concurrently running for various applications. Explain what inefficiencies and problems can arise as a consequence this? You can address this in the context of a specific overlay (e.g., many RONs concurrently running, or many Chord-based systems concurrently running), or in more general terms. Sketch out solutions to the problems you raise.

Your answers to all these questions should be less than 1 page long (total), in font size at least 10pt. Be precise and to the point.