Electrical, Computer, and Systems Engineering
ECSE-6600: Internet Protocols
Spring 2000

Problem Set 1- Due Wednesday, February 2nd 2000

Your Name	

Notes:

1. Be brief.
2. A significant part of the homework credit is given to reading. Reading assignments will be quizzed in both informal and formal quizzes
3. Please write your answers on separate sheets and staple it along with the questions to facilitate easy grading.

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1	2	3	4	Total
30	30	20	20	100

TA Signature :_____

1. *Reading assignment*:
   - Read the man pages for the commands tcpdump, ifconfig(8), netstat(1) commands, and appendix A (tcpdump) in the text. Test out these commands on your home linux machine or from an RPI machine. Summarize your understanding and observation briefly in a bulletized format.
   - Read RFC 791 (IP) in conjunction with chapter 3. Summarize the <u>central</u> points in the RFC in a bulletized format within a page.

2. *Addressing*:
   - Analyze and comment on the structure of the following two MAC addresses:
     80:01:43:00:04:00
     40:01:44:00:00:01
   - What are the network number, subnet number and host number for addresses 135.104.192.100, mask 255.255.128.0? Which class does this address belong to?
   - Why does the telephone network not have names and address resolution protocols like ARP?
   - An organization has been assigned the network number 140.25.0.0 and it needs to create a set of subnets that supports upto 25 hosts on each subnet.
     A) What is a subnet mask you would use to do this ?
     B) How many such subnets are possible ?
     C) Given that you have 25 hosts on each subnet, how much of the address space is being wasted ?

3. *Internetworking* has two fundamental problems: ***heterogeneity and scaling.***
   - IP (and any similar network layer protocol) splits its address into two parts – a network prefix and a host part. This is done so that identification of directly connected or indirectly connected hosts becomes easy and is a fundamental mechanism to scale the performance of interconnected networks. Why does this mechanism allow performance scaling? Explain why bridges failed to solve the scaling problem without this mechanism (hint: think about filtering and broadcast).
   - The split of address into a prefix and host part has a price: it introduces address allocation, configuration and mapping issues. List and briefly explain at least three address allocation issues, two configuration issues and two mapping issues which arise as a result.

- We saw what IP does to address the scaling problem: address structure and hop-by-hop forwarding rather than direct forwarding. Describe briefly the concepts introduced by IP (and related protocols like ARP) to solve the heterogeneity problem.

4. Design/Performance:
   - Code-division multiplexing (CDMA) design for wireless multiple access involves a mobile unit using an entire frequency spectrum but hopping from one frequency to another in a predefined/arranged sequence. The alternatives are frequency division (FDMA) and time division (TDMA) where the frequency band is split up statically or time slots are assigned statically for the entire duration of the call. Broadly, what are the design tradeoffs made in each of these three designs in terms of the basic resource constraints (space, time, computation, money, labor) ?
   - My program runs on a machine in 100s. Multiplication instructions are $= 75\%$ of the program. Designer M can improve speedup of multiply operations. I would like my program to run four times faster? How much speedup of multiply instructions should M achieve to allow me to reach my overall speedup goal?