**15-441**
**Homework #2/Spring 2007**

1. *dig* is a tool that, among other things, queries the Domain name System (DNS) for the IP address that corresponds to a DNS name. Pick some wired host on the CMU campus and use dig to find its IP. What is the hostname? The IP address?

2. The *WHOIS* database contains information about various aspects of domain name and AS registration. It can be queried from the command-line using *whois*. For example:
   a. whois -h radb.ra.net ***IPaddr***
   b. whois -h whois.arin.net AS***N***

   Lookup the host by IP address. What is the Autonomous System Number (ASN) associated with this host?

3. Now, lookup your ASN from question #2. What ISP does CMU use?

4. Take a look at *Hermes*, a tool for visualizing BGP. Consider your answer to question #2. Who are the neighbors of CMU's ISP?

   http://tocai.dia.uniroma3.it/~hermes/

5. Now, just for fun, take a look at *BGPlay*, a tool for visualizing BGP *instabilities*, e.g., changes. Watch what happens from 23/2/2007 @ 01:05:00 – 09:05:00. Please explain, in English, what you see change – use no numbers.

   http://bgplay.routeviews.org/bgplay/

6. The program *traceroute* details the path that a trace packet follows to a specific destination. The path provided by *traceroute* identifies the routers along the way, often using DNS names that describe the ISP and other and their role within the ISPs network.

   This problem asks you to consider the following hosts:

   a. www.washington.edu
   b. www.openafs.org
   c. www.cam.ac.uk

   This question asks you to do the following for each of the three hosts:
   a. Use *traceroute* and *whois* to determine the AS number (ASN) associated with each of the routers along each path
   b. Identify the name of the ISPs along the way
   c. Guesstimate if each of the identified ISPS is local, regional, or backbone

7. *Traceroute* several universities or major research labs. Now *traceroute* your favorite major retail organizations (or other purely commercial interests). What is the deal with *ucaid.edu*? Google if you need a hand.

8. In class we discussed fragmentation and reassembly as responsibilities of the network layer, but the MTU is a function of the link layer. Why doesn't the link layer just handle the fragmentation and reassemble itself?

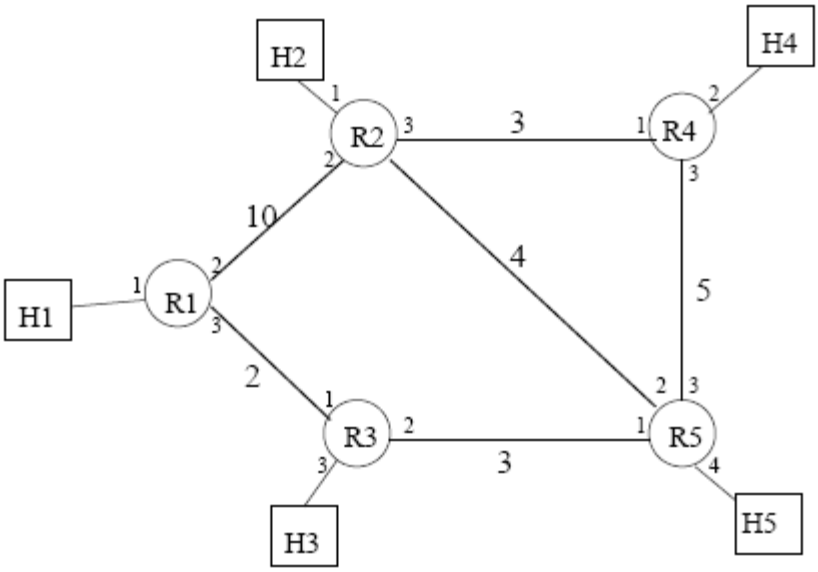
   Based on Question #38 (Page 363) in the Peterson/Davie recommended textbook: Consider the CIDR routing table provided. *Hint*: Please notice that the last three entries cover every address and thuse, in effect, form a default route.

| **Netmask/MaskLength** | **nexthop** |
|---|---|
| C4.50.0.0/12 | A |
| C4.5E.10.0/20 | B |
| C4.60.0.0/12 | C |
| C4.68.0.0/14 | D |
| 80.0.0.0/1 | E |
| 40.0.0.0/2 | F |
| 00.0.0.0/2 | G |

   To which *nexthop* are packets destined for the following addresses delivered?

   a. C4.5E.13.87
   b. C4.5E.22.09
   c. C3.41.80.02
   d. 5E.43.91.12
   e. C4.6D.31.2E
   f. C4.6B.31.2E

9. The figure below shows a network consisting of routers and hosts. Distances between routers are labeled. Interfaces on the routers are also labeled, in a smaller font. Assume that all these routers are running Dijkstra's algorithm. [Credit: Steenkite/Eckhardt]




For router R1, and only for R1, show the following information after *each* iteration of the link-state algorithm:

a. All destinations routable from R1, the best-so-far next-hop, and their best-so-far distance
b. All *known-best* destinations from R1, the known-best next-hop, and the known-best distance.

*Hint:* You might want to refresh your memory about Dijkstra's algorithm. Also, please keep in mind how the advertisement propagate in waves through the network – this is what is meant by "iteration".