CSC 101 - Spring 2013
Lab 6 - Networks: Protocols and Routing

Protocols

1. NAT
   (a) What does the acronym "NAT" stand for ?
   (b) What is the purpose of "NAT" ?
   (c) Under what circumstances is "NAT" essential to Internet access ?
2. DHCP
   (a) What does the acronym "DHCP" stand for ?
   (b) What is the purpose of "DHCP" ?
3. ARP
   (a) What does the acronym "ARP" stand for ?
   (b) What is the purpose of "ARP" ?

Concepts

4. What is an IP address ? How many bytes long is it ?
5. In the standard seven layer network model, to which layer does the concept of IP address belong ?
6. What is a Netmask ?
7. What is a MAC (hardware) address ? How many bytes long is it ?
8. In the standard seven layer network model, to which layer does the concept of MAC address belong ?

Routing Tables

Each network enabled device has one or more network interfaces and each interface is assigned a distinct IP address. Each device has its own **routing table** to control how it sends information to other devices. All devices act independently, but must do so in a globally coherent manner so that information goes to the correct destinations throughout the network.

Communication between devices connected to the same local area network occurs by allowing each device to put the information on a shared communication media.

In the late 1980's and early 1990's, the shared media was often a single shared coaxial cable to which each device connected. The advantage of a single shared coaxial cable is low cost and simplicity. The disadvantage is that two conversations between two distinct pairs of devices can not occur simultaneously. I.e., only one device "talks" on the shared cable at a time.

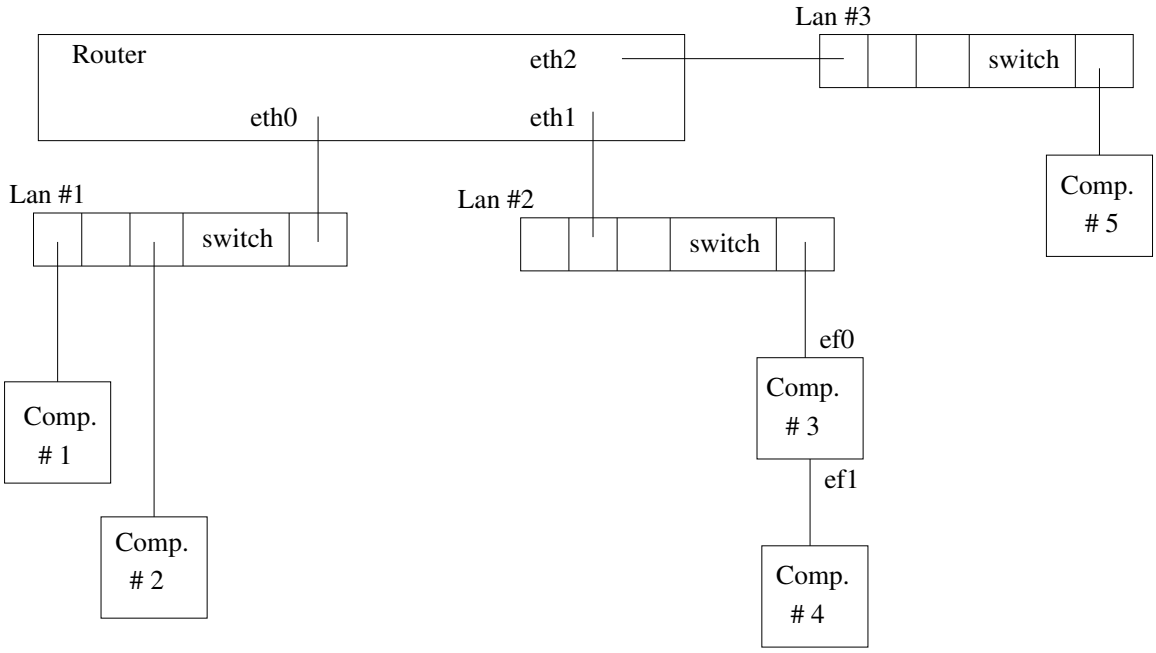
Since the mid-1990's shared coaxial cables have been replaced by network switches. A network switch has an internal crossbar circuit which allows any of its network ports to be (temporarily) directly connected to any other of its network ports. More than one "conversation" can occur simultaneously between multiple pairs of devices.

The term **half duplex** refers to an arrangement in which data can flow in only one direction at a time. The term **full duplex** refers to an arrangement in which data can flow in both directions simultaneously. Most modern switches support full duplex operation.

Communication between devices which are not on the same local area network requires sending the information to a **gateway** device (usually a **router**). Information is forwarded from router to router along a sequence of "hops" to its final destination. Each gateway device must have a network interface configured to (locally) communicate in each of the networks to which it is connected.

Your task: You are to assign IP addresses, netmasks, and routing tables for each of the computers and routers in the diagram below. The intention here is to build a private network that is not connected to the outside Internet. While that limits e-mail and web-browsing, it is one certain way to secure the secret information which is contained on the network. LAN #1, LAN #2, and LAN #3 must be private networks with IP addresses starting with either "192.68." or "10.". Notice that computer #3 has two network interfaces named `ef0` and `ef1`. These two interfaces should be connected to different LANs, so technically the connection between computer #3 and computer #4 is a one-wire LAN.

Your choice of IP addresses, netmasks and tables must be consistent with coherent communication within each local area network, and across networks.



- IP address for Computer # 1 _____
- IP address for Computer # 2 _____
- IP address for Computer # 3, `ef0` _____
- IP address for Computer # 3, `ef1` _____
- Netmask for Computer # 3, `ef1` _____
- IP address for Computer # 4 _____
- Netmask for Computer # 4 _____
- IP address for Computer # 5 _____

- IP address for LAN # 1 _____
- Netmask for LAN # 1 _____
- IP address for LAN # 2 _____
- Netmask for LAN # 2 _____
- IP address for LAN # 3 _____
- Netmask for LAN # 3 _____

- IP address for Router, eth0 _____
- IP address for Router, eth1 _____
- IP address for Router, eth2 _____

- Routing table for the Router

- Routing table for Computer # 1

- Routing table for Computer # 3

- Routing table for Computer # 4

- Routing table for Computer # 5