EE122 Spring 1998
Midterm #2

Problem #1

Answer the following questions in a few *concise* sentences:

a. Project 1

- When writing networking code, when should you call `ntohl()` and why?
- Why didn't we need to call `nthol()` or `htonl()` on the data?

b. Internet Routing

- List TWO limitations on the size of an internetwork using RIP. For each, explain how the limitation is eliminated or reduced in OSPF. (Note: we will only grade your *first two answers*).
- Why was BGP needed to replace EGP?
- List TWO reasons why BGP doesn't attempt to advertise the cost of paths. (Note: we will grade only your *first two answers*).

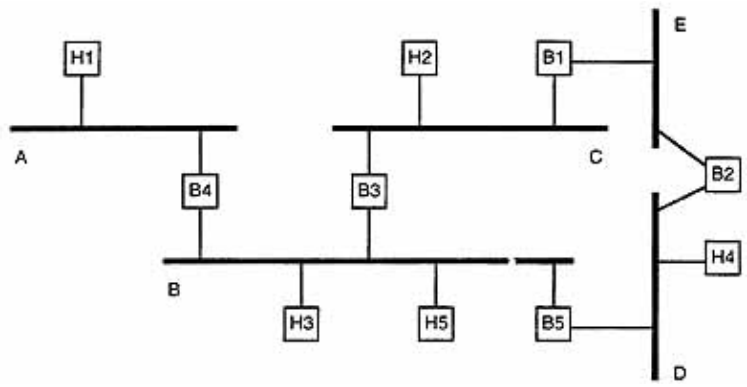
c. List THREE differences between IPv4 and IPv6. For each difference, explain the motivation for the change (i.e., why is it an improvement over IPv4?). We will grade your *first three answers* only.

d. Can you tell from their names whether `computer1.company.com` and `computer2.school.edu` are in the same *autonomous system* (routing domain)? If so, how can you tell? If not why not?

e. Give three scenarios in which a host sends an IGMP Host Membership Report for group G, but still doesn't receive any multicast packets. Assume the routing algorithm does *not* use prune messages (Truncated Reverse Path Broadcast).

Problem #2

The following diagram depicts an extended LAN of hosts and bridges. You can assume that bridge B1 has a lower ID than bridge B2, etc.



a. Assuming the bridges have run a spanning tree algorithm as described in class, will bridge B3 forward frames from host H4 from subnet C to subnet B? Why or why not?

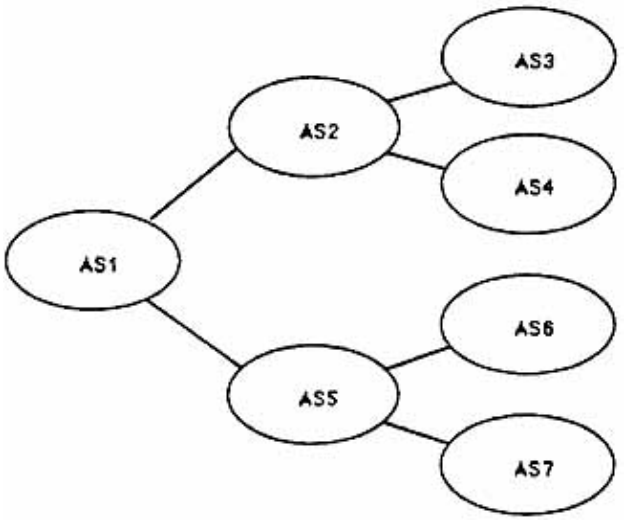
b. A technician using a network monitor noticed that bridge B4 forwarded one frame from host H3 onto subnet A, but didn't forward the next. What is the *most likely* reason for this behaviour? You may assume there are *no equipment failures*.

c. Now assume all the bridges are replaced with IP Multicast routers using the DVMRP algorithm. In that case, will router B3 forward packets from host H4 from subnet C onto subnet B?

d. Again, assuming DVMRP routers, list the condition under which router B4 will *not* forward packets from host H3 unto subnet A. Assume no equipment failures.

Problem #3

In the internetwork shown below, each autonomous system (AS) contains N subnets and each subnet contains H hosts. Perform the computations indicated below. **You must indicate where each part of your answer comes from** (e.g., "H hosts per subnet * N subnets per AS * 7 AS's = 7NH")



a. Assume the internetwork uses the original IP addressing and routing schemes (hierarchical addresses and routing; no subnetting or CIDR). Compute the minimum number of routing entries required by a *router* in AS3.

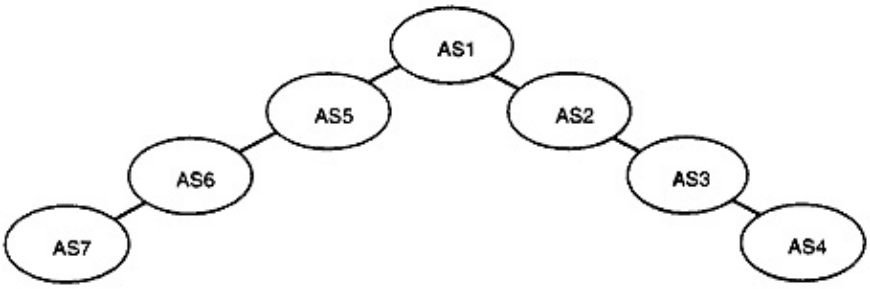
b. Perform the same computation for a *host* (i.e., not a outer) in AS3.

c. Perform the same computation for a router in AS1.

d. Perform the same computations as in parts **a** and **c**, assuming that CIDR is used.

e. Perform the same computations as in parts a, b, and c, assuming *flat* addressing. (Recall that flat addressing means there is *no network component* of the address, as opposed to IP hierarchical addresses which have both a network and a host component).

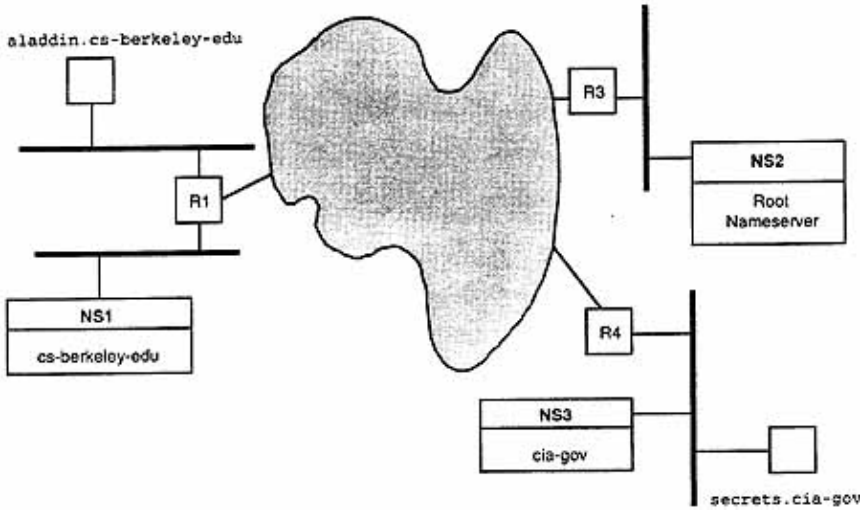
f. Which of your answers in parts **a** or **c** would change for the linear internetwork shown below? For the answers that change, explain why.



Problem #4

Joe Clueless has designed his own name system, Joe's Name System (JNS) which he claims is simpler and better than DNS. JNS is the same as the Domain Name System (DNS) except for the following changes:

- The system has only 2 levels of hierarchy (name, domain)
- If a domain is not used very often, it may be implemented by a single name server.



a. An application running on `aladdin.cs.berkeley.edu` wanted to send a packet to another application running on `secrets.cia.gov`. Besides the information shown in the diagram above, what other information is needed ahead of time? (You should list information needed by `aladdin`, NS1, and NS2).

Aladdin:

NS1:

NS2:

b. List the steps taken to resolve the name, assuming that all caches are empty at the start.

1. Application on aladdin calls local JNS client
2. JNS client on aladdin sends the request to NS1.
5. The JNS client on aladdin returns the result to the application

c. If the application needed to resolve the name `lies.cia.gov`, which steps listed above would be skipped?

d. List TWO ways in which DNS is better than JNS and briefly explain why it is better. (Note: we will grade only your *first two* answers)

Problem #5

In the internetwork shown below, an application on the `client` wants to send a packet to the `server`. Table 1 lists the actions that may be taken in the process of forwarding this packet.

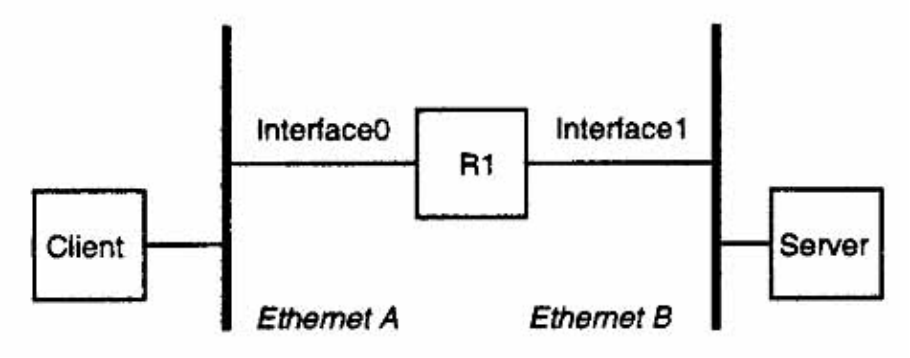


Table 1: Possible Actions

Action	Arguments to be Specified
Lookup a mapping in an ARP Cache	• **IP Address** to be looked up • Corresponding **Ethernet Address** (if found)
Lookup the next hop in a routing table	• **Destination** (IP Address) • **Next Hop**
Call ARP to map an IP address into an Ethernet Address	• **IP Address to be mapped** • **IP address of sender** • **Ethernet address of sender**
ARP sends Request (via Ethernet)	• **Destination Ethernet Address** (where to send request) • **IP Address to be mapped** • **IP Address of sender** • **Ethernet Address of sender**
ARP Sends Response (via Ethernet)	• **Destination Ethernet Address** (where to send response) • **IP Address** that was mapped • **Corresponding Ethernet Address**
Call Ethernet to send a packet	**Destination Ethernet Address**
Call IP to send a packet	**Destination IP Address**

a. List the actions taken to forward the packet from the `client` to the `server`. Specify addresses as Protocol:Host (e.g., IP:R1 or Ethernet:Server).

1. Application on `client` **calls IP** to send the request to **IP**:`server`
2. IP on `client` **looks up next hop** for **IP**:`server`.
15. IP on R1 **calls Ethernet** to send request message to Ethernet:Server

b. List the steps needed to send the response back to the Client.

1. Application on `server` **calls IP** to send response message to **IP**:`client`
9. IP on R1 **calls Ethernet** to send response message to **Ethernet:**`client`