

# CS 458 –Internet Engineering Spring 2004

## Second Exam

### Instructions (read carefully):

- This is a closed book and closed notes in-class exam.
- If any problem is unclear, or you believe some assumptions need to be made, state your assumptions at the beginning of your solution.
- Keep your answers short.
- Explain all steps of your solutions.
- Make sure your answers are legible. If we cannot read an answer, we will not grade it.
- The exam must be pledged.

1	20	
2	15	
3	10	
4	15	
5	10	
Total	70	

Name:

Email:

Pledge:

**Problem 1. (20 Points) Networks with bridges and routers.**

Figure 1 (next page) shows a network of bridges (LAN switches), routers and hosts. The IP configuration of the hosts and routers is as follows:

	Ethernet Interface <i>eth0</i>	Ethernet Interface <i>eth1</i>	Default Gateway
Host1	10.0.3.21/24	--	10.0.3.3
Host2	10.0.3.12/16	--	10.0.1.2
Host3	10.0.1.11/24	--	10.0.1.2
Host4	10.0.4.41/16	--	10.0.4.3
Router1	10.0.3.3/24	10.0.1.2/24	10.0.3.2
Router2	10.0.3.2/24	10.0.4.3/24	10.0.3.3

Assume that Proxy ARP is enabled on all interfaces on all routers.

- a. (10 points) Describe the route taken by the Echo Request and Echo Reply messages of the following PING commands. For each PING command, state if it is successful. If not, state where the command fails.
  1. On Host 2: ping 10.0.3.21
  2. On Host 4: ping 10.0.1.11
  
- b. (5 points) Suppose that Proxy ARP was disabled on all routers. Explain how the outcomes in (a) be different.
  
  
  
  
  
  
  
  
  
  
- c. (5 points) Is it necessary to run the Spanning Tree Protocol (STP) on Bridges1 and 2? Explain your answer.

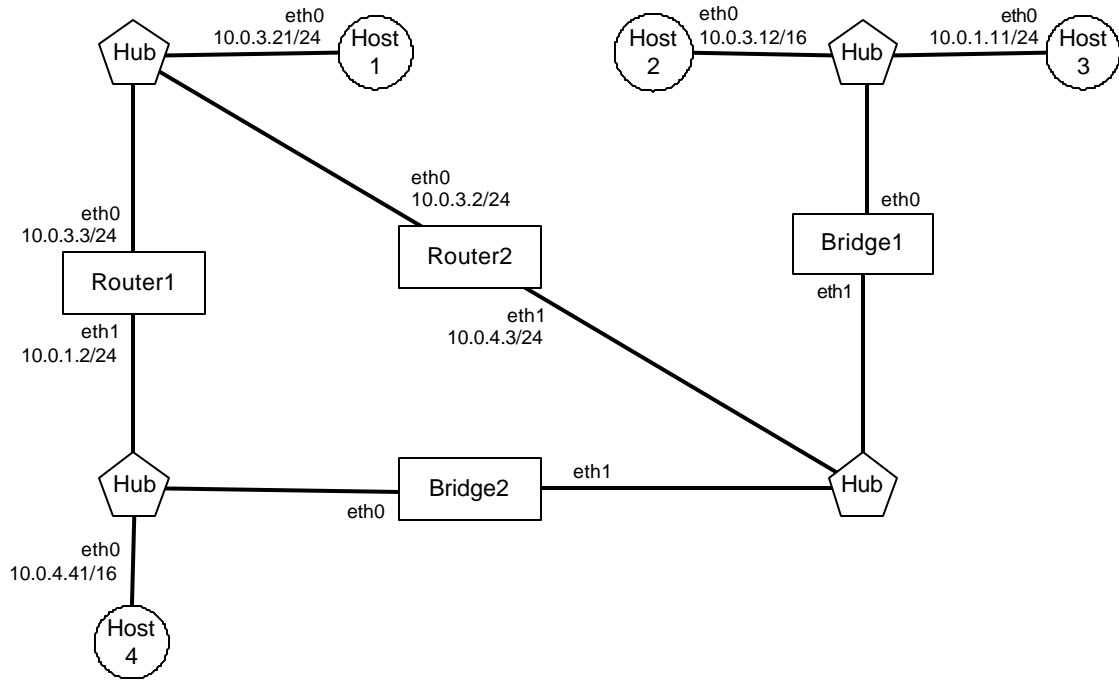


Figure 1.

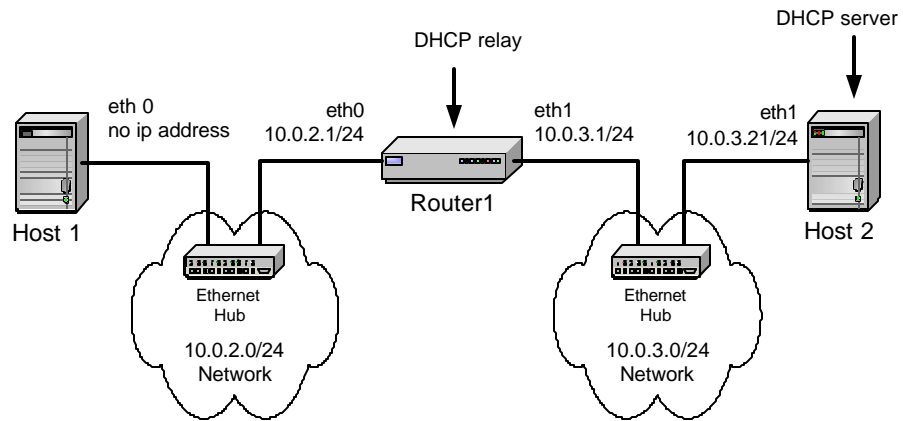


Figure 2.

**Problem 2. (15 points) DHCP**

In Figure 2, Host1 is a DHCP client, Host 2 is a DHCP server. Router 1 is an IP router (i.e., IP forwarding is enabled), that is also configured as DHCP relay server.

- a) (5 Points) Explain why Router1 needs to be configured as a DHCP relay server.
  
  
  
  
  
  
  
  
  
  
- b) (5 Points) Describe how the relay server processes and directs a DHCP Request from Host 1 and the DHCP Reply to Host 1. Does the DHCP relay server modify the IP headers of the DHCP packets?
  
  
  
  
  
  
  
  
  
  
- c) (5 Points) List the IP source and destination addresses in the DHCP Request and the DHCP Response. If the addresses are changed at Router1, show the original and the modified addresses.

**Problem 3. (10 Points) NAT and DHCP**

Most low-cost broadband (Cable/DSL) IP routers for home use perform the following functions:

- DHCP client
- DHCP server
- IP masquerading

Explain how these functions are used to provide Internet access to multiple computers on a home network.

**Problem 4. (15 Points) DNS**

Figure 3 depicts the DNS resolver of host *neon.cs.virginia.edu* and the name server of the host. The figure also shows a DNS root server and the name servers for zones “.com” and “cisco.com”.

- a) (10 Points) Show the sequence of DNS queries and replies when the resolver makes a query for the IP address of “www.cisco.com”. Indicate the content of the queries and the replies. Assume that the resolver issues a recursive query.
- b) (5 Points) How does the sequence of queries and replies differ when the resolver sends an iterative query?

