

Midterm, Open Book and Notes, Time 1h
Attempt all questions. Use the additional sheets included with your exam to work
out your solutions
February 9th, 2009
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Student Name:

Student ID:

Note: Answer all questions. Use the worksheets in the back of the exam for extra workspace.

1. Given the following routing table of a Cisco router that is connected to two subnets and has no default router set: (6pts.)

Destination	Next hop
128.5.2.0	eth0
128.5.3.0	eth1
128.5.1.0	128.5.2.2 (next hop router)

- a. Sketch out the network configuration as seen by this router.

The router is attached to subnet (e.g., a LAN) 128.5.2.0 on one interface and to subnet (e.g., a LAN) 128.5.3.0 on another interface. To get to subnet 128.5.1.0 it needs to go thru another router attached to subnet 128.5.2.0, with IP address 128.5.2.2. (2.5pts.)

- b. If a 4th subnet is added to the configuration, and it is created off of subnet 128.5.1.0, how would you make this router aware of this new configuration?

We would have to add a routing entry indicating that 10.0.4.0 is to be reached via router 128.5.2.2. (1.5pts.)

- c. Explain what is meant by: no default router set

It means that there is no default router to send datagrams to if the given entries don't map on to a destination. (1pt.)

- d. How would you remedy that?

By adding a default gateway entry to the routing table. (1pt.)

0.0.0.0 Rdefault

2. Six hosts are connected to one hub. (6pts.)

Host1 128.5.199.1/19
Host2 128.5.208.5/16
Host3 128.5.200.131/24
Host4 128.5.204.7/20
Host5 128.5.200.96/26
Host6 128.5.200.106/28

List all the pairs that can ping successfully to each other.

(2 pts for each correct combination)
Host1 and Host2
Host1 and Host4
Host5 and Host6

3. In Figure 1 and Table 1 below we give the configuration of three subnetworks interconnected via two routers. Assume that the arp cache for each PC is empty but each router has an up to date cache. (14 points)

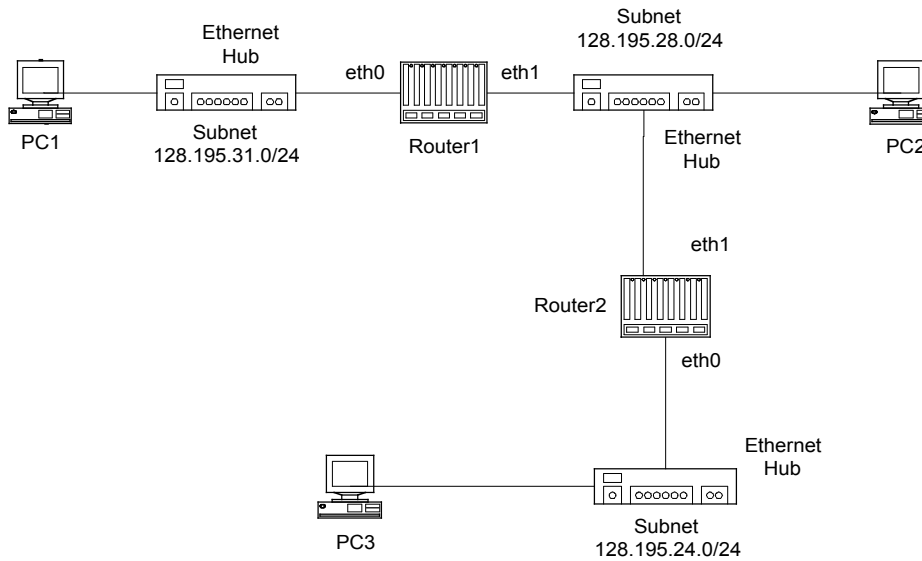


Figure 1. Problem 3

Linux PC / Router	Interface [eth0]	Interface [eth1]	Default Gateway
Router1	128.195.31.1/24	128.195.28.1/24	128.195.28.2
Router2	128.195.24.1/24	128.195.28.2/24	128.195.28.1
PC1	128.195.31.67/20	Disabled	128.195.31.1
PC2	128.195.28.40/24	Disabled	128.195.28.1
PC3	128.195.24.10/24	Disabled	128.195.24.1

Table 1. Problem 3

- a. A user on PC1 issues a ping command to PC2:

```
PC1% ping -c 1 128.195.28.40
```

- i. Is the ping successful? Explain in detail the message flow that takes place that supports your answer. (5pts.)

Yes it is. PC1 regards the IP address of PC2 as a local network address. And Router1 will use Proxy ARP to transfer PC1's ICMP request to deliver PC2's network.

Proxy ARP on the router is used to "intercept" the ARP request from PC1 on the local subnet as PC1 thinks PC2 is local ("/20"). The router responds to PC1 and PC1 then forwards the Echo request to the router. The router then sends the request to PC2. No ARP is used as the router has an up to date cache. PC2, for its Echo response, will issue an ARP request as it is looking for the router MAC address as it is the default entry in its routing table for addresses outside of the local subnet. The router will respond. PC2 then sends the Echo response to the router which will forward it to PC1. No more ARP.

- ii. Give the entries of PC1's arp cache both before and after the ping operation is completed (successfully or unsuccessfully). (2 pts.)

Before: Nothing.

After the ping, the ARP cache will have the entry with the IP address of PC2 associated with the router MAC address.

- b. Now a user on PC2 issues a ping command to PC3:

```
PC2% ping -c 1 128.195.24.10
```

- i. Is the ping successful? Explain in detail the message flow that takes place that supports your answer. (5pts.)

Yes it is.

Assumption: PC2 has a MAC address of Router1 because of Problem a. (students may not assume this and use ARP to get MAC address of the router 1, that is fine!)

First, PC2 has a default gateway of Router1 and it sends ICMP Echo request to Router1. Router1 gets the packet and sends an ICMP redirect message with new gateway address of Router2 to PC2. And Router1 sends the ICMP Echo request to Router 2.

Router2 knows PC3's MAC address, therefore, it forward PC2's ICMP Echo request to PC3. PC3 receives ICMP Echo request. PC3 then needs to get Router2's MAC address. PC3 sends ARP request for Router2 and Router2 replies. PC3 then responds to the ICMP request of PC2 with the MAC address of Router2. Router2 forwards this packet to PC2. Ping succeeds.

- ii. Give the entries of PC2's arp cache both before and after the ping operation is completed (successfully or unsuccessfully). (2 pts.)

Assumption: previous MAC address obtained in Problem 4-a is still in the cache on PC2.

If students did not make this assumption in part (i) above then they will have an empty cache table before the ping command. Assumptions have to be consistent.

Before:

Router1's IP address and Router1's MAC address as it's corresponding address.

After:

Router1's IP address and Router1' MAC address as it's corresponding address.

Router2's IP address and Router2' MAC address as it's corresponding address.