
CS 4270: Internet Lab

Midterm exam

February 28, 2007

Duration: 50 minutes

Name: _____

Part	Maximum	Obtained
I	20	
II	20	
III	20	
IV	20	
V	20	

Final grade:

Problem 1 (20 points)

An Autonomous System X receives three types of interdomain routes: *Customer routes*, *Provider routes*, and *Peer routes*. Suppose that you are configuring the “route export filters” of the border routers in X.

Which routes would you export to the customers of X?

Which routes would you export to the peers of X?

Which routes would you export to the providers of X?

Problem 2-A (10 points) _____

Explain how *ping* works in 2-3 sentences. Make sure that your answer addresses the following questions. What type of packets does the sender transmit? What type of packets does the receiver reply with? What happens when you try to ping a host that is in a NATted network from the public Internet?

Problem 2-B (10 points) _____

Explain how *traceroute* works in 3-4 sentences. Make sure that your answer addresses the following questions. What type of packets does the sender transmit? What do the routers that receive these packets do? How does the tool detect the last hop of the path?

Problem 3-A (10 points) _____

An organization has been assigned the prefix 140.25.0.0/16 and it needs to create networks that support up to 60 hosts on each IP network. What is the maximum number of networks that can be set up?

Problem 3-B (10 points) _____

Write the pseudo-code for the simplest algorithm for *longest-matching-prefix* IPv4 address lookups. Suppose that you are given the destination address D of a packet and a routing table R with three fields per entry i : the prefix $R[i].prefix$, the prefix length $R[i].length$, and the next-hop address $R[i].next-hop$. How would you organize the routing table so that the algorithm runs faster?

Problem 4-A (10 points) _____

Suppose that a router is connected to two networks X and Y. A host in network X sends a packet to a host in network Y. What happens when *Proxy ARP* is disabled at the router? What is different when *Proxy ARP* is enabled?

Problem 4-B (10 points) _____

RIP has several features to avoid the count-to-infinity problem. One is *triggered updates* and another is a *hold-down timer*. Describe each of these two features and explain how it can help to avoid the count-to-infinity problem.

Problem 5 (20 points)

Consider the following bus-based router architecture. Packets arrive and depart from N interface cards. The router also has M forwarding engines with $M < N$. Each forwarding engine has a CPU, a route cache and some memory. Each interface card has some local memory for packet buffers. The router also has a Route Processor card, which includes a CPU and the routing table. The interface cards, the forwarding engines and the Route Processor communicate through three buses: a control bus CB (for the communication of request and response signals), a forwarding bus FB for communicating IP headers, and a data bus DB for the the transfer of IP packets.

Draw the schematic diagram of this router architecture.

Describe what happens to a packet from the time it arrives at an interface card A until it departs from an interface card B, assuming that the forwarding engine that the packet is assigned to does not have the appropriate route in its cache.