

Homework 4 – Network Layer

Assigned: Mon, Nov 13, 2006

Due: Mon, Nov 20, 2006 *at the beginning of class*

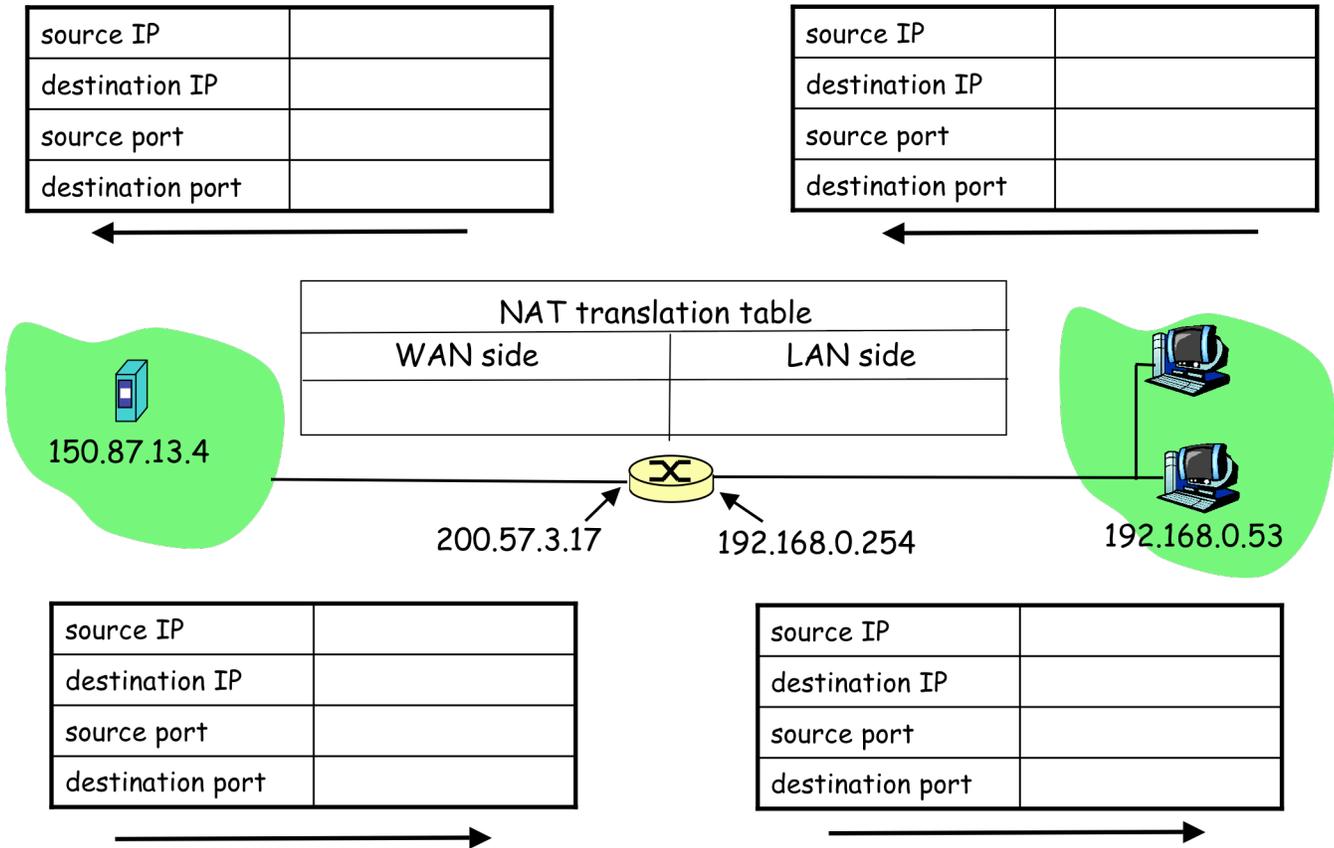
Honor Policy for Written Homework: You may talk about the written homework problems with other students, but each student must write up the solutions *in their own words*. **You must include the names of the students you worked with in your homework submission.** Since the exam questions will be similar in style to the written homework, it is your responsibility to make sure that you understand how to answer each question on your own. *This policy does not extend to programming assignments, which must be completed on your own.*

Review Questions [2 pts each]

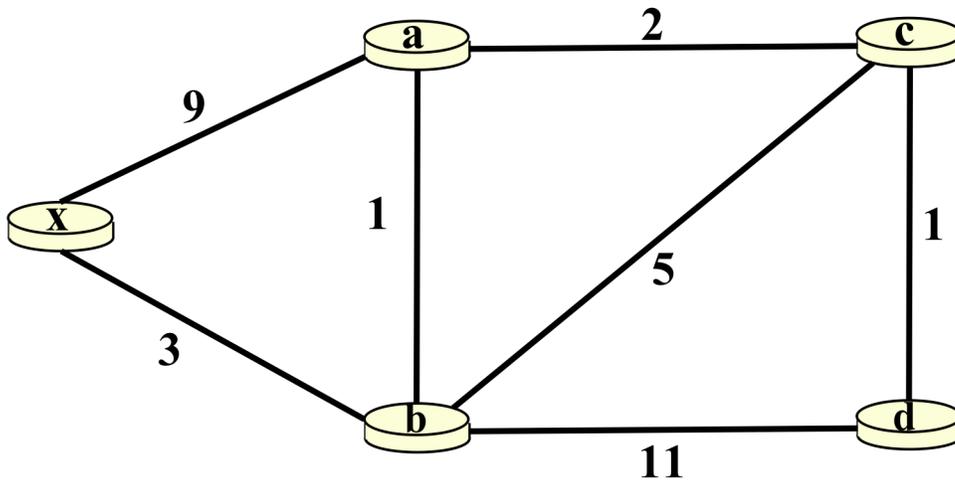
1. What is the difference between routing and forwarding?
2. What are the four main parts of a router?
3. What could cause buffering at an output port of a router?
4. How many bits are in an IP address?
5. Can a single computer have multiple IP addresses? How?
6. What is a subnet?
7. What is the advantage of CIDR addressing over class-based addressing?
8. List the private IP address ranges. What is special about private IP addresses?
9. What is the purpose of DHCP?
10. What causes IP fragmentation?
11. Where is a fragmented IP datagram reassembled?
12. What is the purpose of NAT?
13. Describe the main differences between link-state routing and distance-vector routing.
14. Can routing loops occur with link-state routing? with distance-vector routing?
15. What can be used to counter the “count-to-infinity” problem in distance-vector routing?
16. What is the difference between a routing algorithm and a routing protocol?
17. What is the difference between intra-AS routing and inter-AS routing?
18. What are gateway routers?
19. What are the main differences between RIP and OSPF?
20. What is BGP?

Problems [10 pts each]

1. You are downloading web pages from home. Your machine's IP address is 192.168.0.53, and the address your ISP assigned to you (and given to your home router running NAT) is 200.57.3.17. You are downloading a web page from the server 150.87.13.4. In the diagram below, fill in the NAT table entry for the connection and the source and destination IP addresses and port numbers for the IP datagrams traveling in directions indicated by the arrows. Use valid port numbers and assume the web server is listening on the standard default HTTP port.



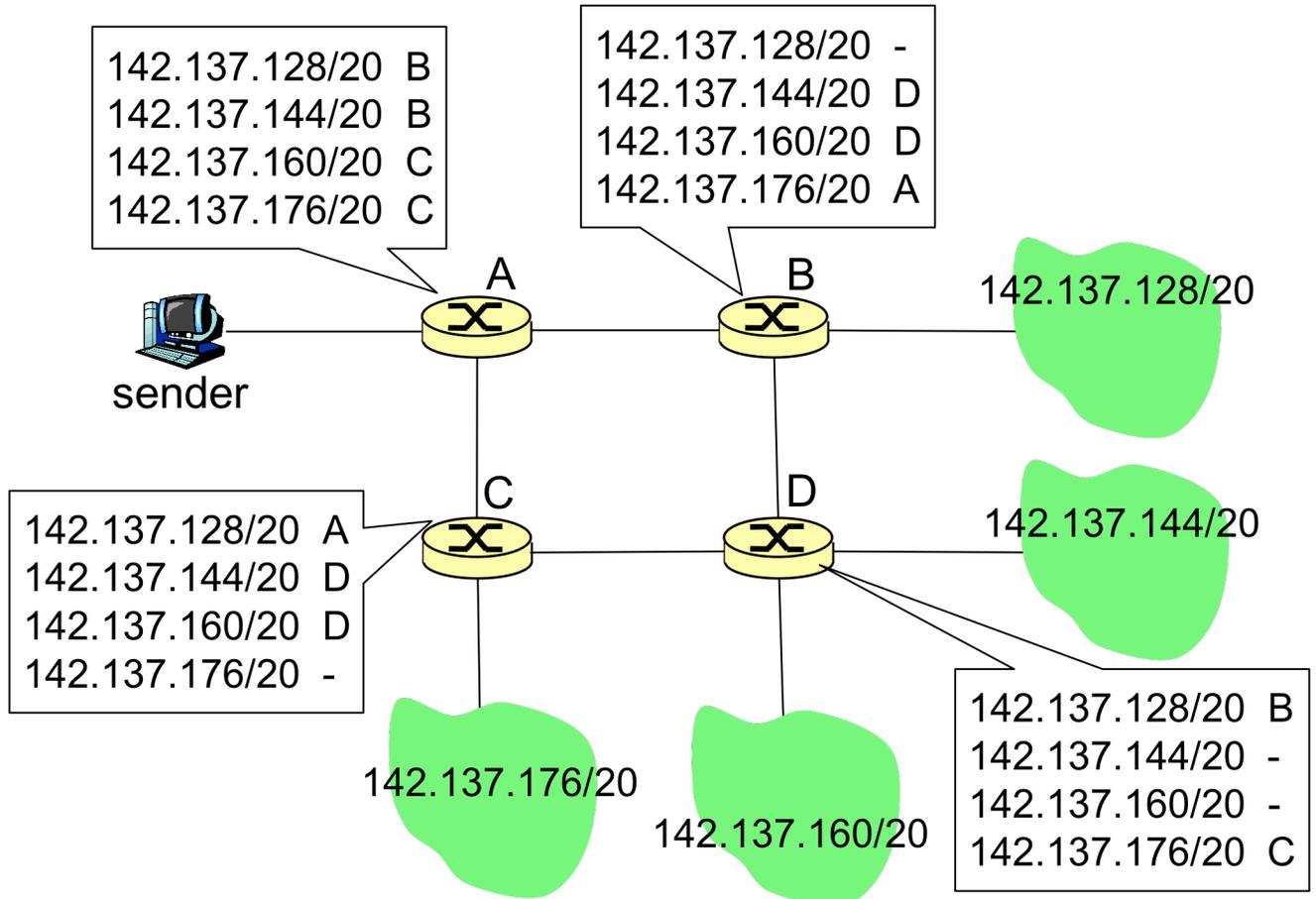
2. Given the following network with the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from **x** to all network nodes. Show how the algorithm works by filling in the following table, showing what happens at each step.



Step	N	D(a), p(a)	D(b), p(b)	D(c), p(c)	D(d), p(d)
0	x				
1					
2					
3					

3. Consider a network where the MTU closest to the sender is 4000 bytes and the MTU closest to the receiver is 1500 bytes. If a 3600-byte IP datagram (including IP header) is sent from the sender to the receiver, **how many IP fragments would be created?** For each fragment, **give its size in bytes** (including the IP header).

4. Consider the following network diagram. A forwarding table is specified for each router, which lists a network and the next hop. A next hop of '-' indicates that the network is directly connected to the router.



For the following destination IP addresses, give the destination network and the route that the packet will travel:

- a) 142.137.153.17

Destination Network:

Route:

- b) 142.137.180.48

Destination Network:

Route:

5. You are the network administrator at TigerPaw Widgets, Inc. You've just been told that a new block of network addresses with the CIDR address of 168.101.47.128/25 has been assigned to the company.
 - a. How many new valid IP host addresses can you assign?
 - b. What is the range of those addresses?

6. Complete the following distance-vector tables from the class discussion.

