

Name: _____

ID: _____

CSE 474 Computer Networks

Fall 2012 Final Exam

11.01.2013 Friday, Duration: 105 minutes

| Q1 | Q2 | Q3 | Q4 | B | SUM |
|-----|-----|-----|-----|-----|------|
| /50 | /20 | /10 | /20 | /15 | /100 |

Q-1: (50 pts) Short Knowledge Questions

Please answer the following questions **as brief as possible**. (not more than two or three sentences)

1. (4 pts) Why DNS uses UDP instead of TCP?
2. (4 pts) Suppose a web server has 10 ongoing TCP connections. How many server-side sockets are used? How many server-side port numbers are used?
3. (4 pts) What is meant by network-assisted congestion control? Does TCP take this approach? Explain your answer.
4. (4 pts) "From the perspective of TCP, the multimedia applications running over UDP are not being fair." What's the reason?
5. (4 pts) Consider a router with N input lines, each with input link rate R and an internal switching fabric that is $2N$ times faster than R . Where in this router can packet queue form? Explain your answer.
6. (3 pts) What is the most common link state routing protocol in the Internet?
7. (4 pts) Give two advantages of using NAT.

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8. (8 pts) Consider that a web server with IP address 10.0.0.2 is running on a LAN with a NAT router. Suppose that a client wants to connect to this web server. What is the problem? Give one possible solution for this problem.

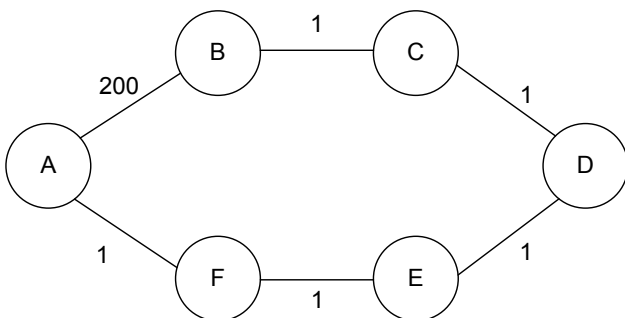
9. (4 pts) Recall that the ICMP protocol is used by IP nodes to report error conditions and provide some information to an end system. A new version of ICMP has been defined for IPv6. This new ICMPv6 protocol needs new type of error message called "Packet Too Big". What is the reason?

10. (4 pts) IEEE 802.11 Wireless LAN uses CSMA/CA (Collision Avoidance) instead of CSMA/CD (Collision Detection). What could be the reason?

11. (3 pts) Give a protocol which uses Cyclic Redundancy Check (CRC).

12. (4 pts) In a LAN, can Point-to-Point Protocol (PPP) used instead of Ethernet? Why?

Q-2. (20 pts) Distance Vector Routing



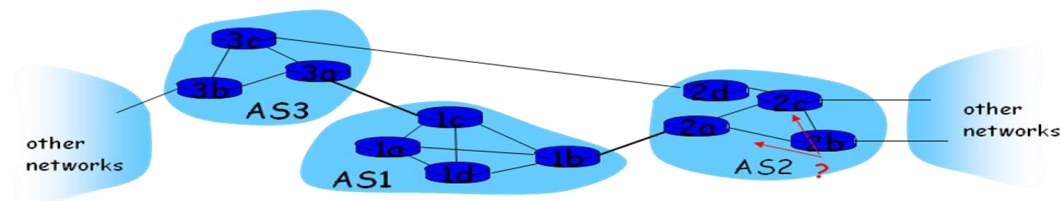
Consider the ring network shown above.

(a) (7 pts) What are the distance vectors in nodes B and C? *Note: You don't need to run the distance vector algorithm. You can just compute the distance vectors by inspection. Follow the notation we used in the class: $D_x(y)$ equals the least cost from x to y .*

(b) (8 pts) Now, suppose that the only destination is D (i.e. we will only consider routing table entries for D). Suppose that link from C to D fails (and its cost increases to infinity). Show, how the **count-to-infinity problem** can occur in this situation. Approximately how many messages will be exchanged between all nodes by the distance vector algorithm after the detection of the failure? *Note: Again you don't need to run the DV algorithm.*

(c) (5 pts) Explain how **poisoned reverse** can avoid the count-to-infinity problem in the above scenario.

Q-3. (10 pts) Hierarchical Routing

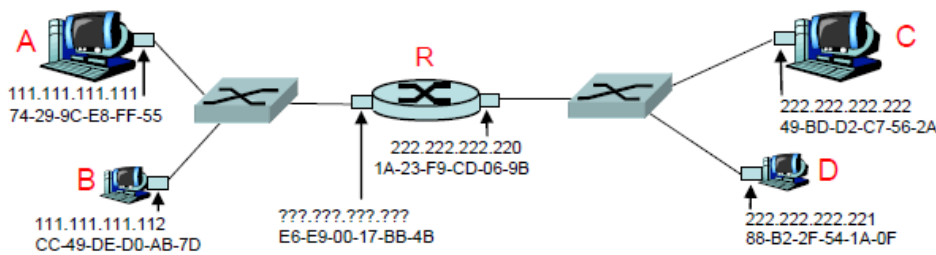


Above figure shows three Autonomous Systems (ASs) attached to each other. Suppose that router 2b wants to send packets to 3b using BGP, and it learns two routes (one is over AS1 and the other is directly to AS3).

a) (3 pts) Which gateway (2a or 2d) would router 2b forward packets if it selects the route based on **shortest AS-PATH**? Why?

b) (3 pts) Which gateway (2a or 2d) would router 2b forward packets if it selects the route based on **hot-potato routing**? Why?

c) (4 pts) Given that there are two different routes, is it possible that 2b learns just one route in the above network? Why?

Q-3. (20 pts) Link Layer

Consider the LAN scenario above. Answer each question below *briefly*, e.g., *in a sentence or two at most*.

- (3 pts) Assign an IP address to the leftmost interface of the router, given that the subnet part of IP addresses are 24 bits.
- (3 pts) Suppose A wants to send an IP datagram to B and knows B's IP address. Must A also know B's MAC address to send the datagram to B? If so, how does A get this info? If not, explain why not.
- (3 pts) Suppose A wants to send an IP datagram to C and knows C's IP address. Must A also know C's MAC address to send the datagram to C? If so, how does A get this info? If not, explain why not.
- (4 pts) Suppose that R has a datagram (that was originally sent by A) to send to C. What are the MAC addresses on the frame that is sent from R to C? What are the IP addresses in the IP datagram encapsulated within this frame?
- (4 pts) Suppose the switches above are learning switches and suppose that the switch has just been turned on. Suppose now A send an Ethernet frame to B.
 - On how many outgoing switch interfaces will this first frame be carried?
 - Now suppose that B replies to A and A sends a second frame to B. On how many outgoing switch interfaces will this second frame be carried?
- (3 pts) Suppose now that the router is removed from the scenario above. Can the nodes keep their IP addresses the same as shown in the picture above? Explain in one or two sentences.

Bonus questions:

B-1. (5 pts) Briefly explain reverse path forwarding. (in maximum three sentences)

B-2. (5 pts) What is a label-switched router? How it differs from ordinary IP router in the context of forwarding?

B-3. (5 pts) Explain how CDMA works.