

CSIS2033 Networking and Distributed System

Tutorial

1. In a computer network, how are end systems or hosts connected to each other?
2. How long does it take to send a file of 10, 000 bytes from host A to host B over a circuit-switched network? Assume all links are 100Mbps, each link uses TDM with 24 slots/second and it used 10 msec to establish end-to-end circuit.
3. Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates $R_1 = 500$ kbps, $R_2 = 2$ Mbps and $R_3 = 1$ Mbps.
 - a. Assuming no other traffic in the network, what is the throughput for the file transfer.
 - b. Suppose the file is 4 million bytes. Roughly, how long will it take to transfer the file to Host B?
 - c. Repeat (a) and (b), but now with R_2 reduced to 100 kbps.
4. Match the following to one or more layers of the OSI model:
 - a. Reliable process-to-process message delivery
 - b. Route selection
 - c. Provides user services such as email and file transfer
 - d. Transmission of bit stream across physical medium
 - e. Format and code conversion services
 - f. Responsibility for carrying frames between adjacent nodes
 - g. Establishes, manages, and terminate session
5. List out two advantages and two disadvantages of use layering in TCP/IP model.

6. Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
7. For a P2P file-sharing application, do you agree with the statement, “There is no notion of client and server sides of a communication session”? Why or why not?
8. Answer the following questions about the HTTP protocol.
 - a. What is the purpose of HTTP protocol?
 - b. Answer the following questions based on the segment of HTTP response message below.

```
HTTP/1.1 200 OK  
  
Connection close  
  
Date: Thu, 06 Aug 1998 12:00:15 GMT  
  
Server: Apache/1.3.0 (Unix)  
  
Last-Modified: Mon, 22 Jun 1998 18:26:33  
  
Content-Length: 6821
```

 - i. What type of HTTP connection is used?
 - ii. When the document was last modified?
 - iii. Was the server able to successfully find the document or not? What time was the document reply provided?
9. Why is it said that FTP sends control information “out-of-band”?
10. Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP?
11. Describe why an application developer may choose to run an application over UDP rather than TCP.

12. Is it possible for an application to enjoy reliable data transfer even when the application runs over UDP? If so, how?
13. Suppose you have the following four 16-bit byte:
- ```
1010101111001011
1100101011010011
0101010101010100
1010000111001100
```
- a. What is the checksum that allocate in UDP segment?
- b. How the receivers detect errors?
14. In our rdt protocol, why did we need to introduce sequence number and timers?
15. Suppose Host A send two TCP segment back to back to Host B over TCP connection. First segment has sequence number 10 and second segment has sequence number 26.
- a. How much data in the first segment?
- b. Suppose the first segment lost but second segment arrives at B, what will be the acknowledge number?
16. Suppose a TCP connection is transferring a file of 2000 bytes. The first byte is numbered 1 001. What are the sequence numbers for each segment, each carrying 500 bytes?
17. Host A and B are communicative over a TCP connection, and Host B has already received from A all bytes up through byte 358. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 50 and 80 bytes of data, respectively. In the first segment, the sequence number is 359, the source port number is 1028, and the destination port number is 80. Host B sends an acknowledgement whenever it receives a segment from Host A.
- a. In the second segment sent from Host A to B, what are the sequence number, source port number and destination port number?
- b. If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the acknowledgement number, source port number and destination port number?

- c. If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, what is the acknowledgement number?
  - d. Suppose the two segment sent by A arrive in order in B. The first acknowledgement is lost and the second acknowledgement arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgements sent. (Assume there is no additional packet loss). For each segment in your figure, provide the sequence number and the number of bytes of data. For each acknowledgement that you add, provide the acknowledgement number.
18. A router has eight interfaces. How many IP addresses will it have?
19. Suppose an ISP owns the blocks of addresses of the form 101.101.128/17. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?
20. Consider sending a 3000-bytes datagram into a link that has an MTU of 820 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are their characteristics?
21. Consider the network setup in Figure 1 below. Suppose that the ISP instead assigns the router the address 126.13.89.67 and that the network address of the home network is 192.168/16.
- a. Assign addresses to all interfaces in the home network.
  - b. Suppose each host has two ongoing TCP connections, all to port 80 at host 128.119.40.86. Provide the 6 corresponding entries in the NAT translation table.

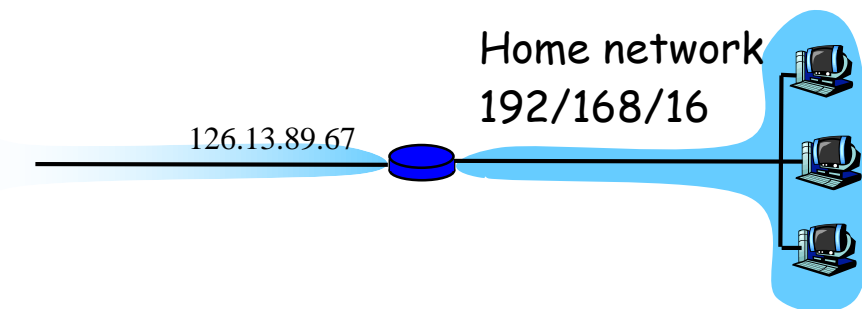


Figure 1: Network address translation

22. Consider 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 computing a table similar to the one discussed in class. Include the forwarding table at router x.

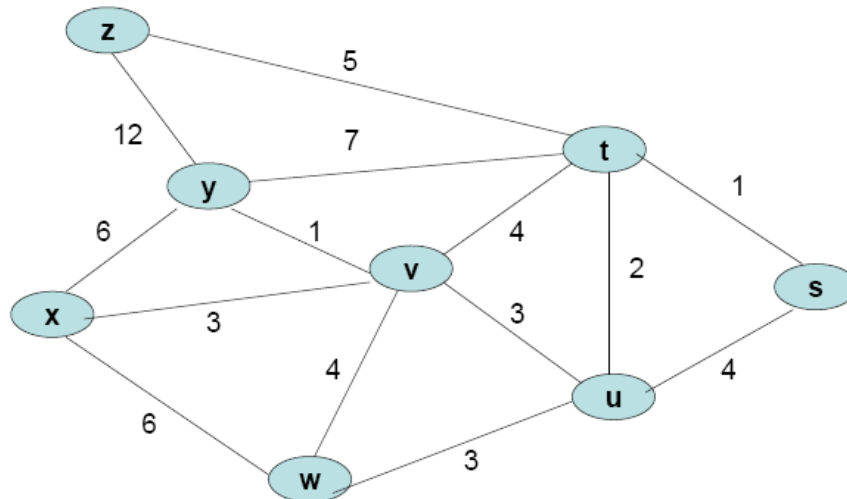


Figure 2

23. Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node z.

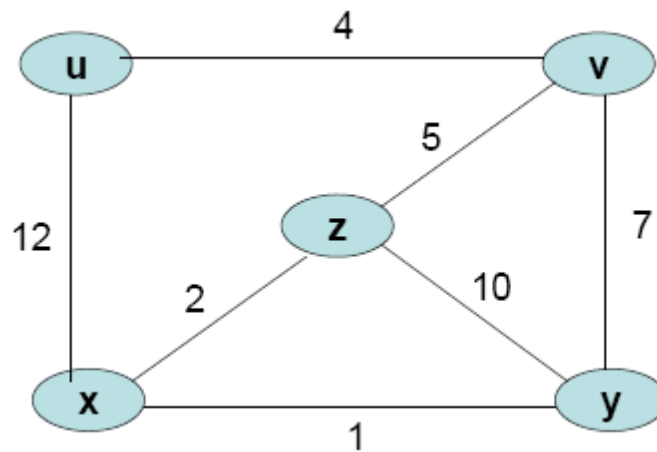


Figure 3

24. Consider the 4-bit generator,  $G = 1001$  and suppose that  $D$  has the value 10101010. What is the value of  $R$ ?
25. Why is an ARP query sent within a broadcast frame?

26. Why is an ARP response sent within a frame with a specific destination MAC address?

27. What are the differences between switch and router?