CSC 465 Computer Networks – Spring 2004 – Dr. J. Harrison

MIDTERM EXAMINATION 1 SOLUTION

Question 1. (21 points) Show all layers of the ISO OSI model in their correct order. (You can use a diagram for this purpose.) Then, briefly describe the duties of each layer.

1. Application: To allow access to network resources
2. Presentation: to translate, encrypt and compress data
3. Session: To establish, manage and terminate sessions
4. Transport: To provide reliable process-to-process message delivery and error recovery
5. Network: To move packets from source to destination; to provide internetworking
6. Data Link: To organize bits into frames; to provide hop-to-hop delivery
7. Physical: To transmit bits over a medium; to provide mechanism and electrical specifications

(See Page 31)

Question 2. (6 points) Define the terms *unicast*, *multicast* and *broadcast*, as described in your text. (You may use small diagrams to answer the question.)

Unicast: a message addressed to a single recipient
Multicast: a message addressed to group of recipients
Broadcast: a message addressed to all recipients on a network (Page 37)

Question 3. (9 points) State the full name of the access method used on Ethernet LANs. Describe the principles on which the access method is based, as described in your text.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Principles:

1. Every station has an equal right to the medium (multiple access)
2. Every station with a frame to send first listens to (senses) the medium. If there is no data on the medium, the station can start sending (carrier sense)
3. It may happen that two stations each sense the medium, find it idle, and start sending. In this case, a collision occurs. The protocol forces the station to continue to listen to the line after sending has begun. If there is a collision, all stations sense the collision; each sending station sends a jam signal to destroy the data on the line and, after each waits a different random time, try again.

(See Page 48-49)

Question 4. (9 points) State the full name of the access method used on wireless LANS? Describe how the problem of collisions is addressed using this access method, as described in your text.

Carrier Sense Multiple Access with Collision Avoidance (CSMA/CD)

Each station defines how long it needs the medium and tells other stations to refrain from sending data during this period.

1. The sending station, after sensing that the medium is idle, sends a special small frame called *request to send* (RTS). In this message, the sender defines the total time it needs the medium.
2. The receiver acknowledges the request (broadcast to all stations) by sending a small pocket called *clear to send* (CTS).
3. The sender sends the data frame.
4. The receiver acknowledges the receipt of data.

(See Page 59-60)

Question 5. (6 points) What are the two *modesof operations (or archectures)* of a wireless LAN basic service set? . (Note: one way to answer this part of the question is to draw the network topology corresponding to each mode/architecture.) **Next, compare and contrast each mode.**

Two modes: 1) ad hoc mode 2) infrastructure mode

A wireless LAN operating in Ad Hoc Mode has no access point. Stations/node communicate in a peer-to-peer manner.

Stations/node in a wireless LAN operating in Infrastructure Mode can communicate with each other in a peer-to-peer manner but can also communicate via an "access point". Two stations, each in a different Basic Service Sets, can only communicate via their access points, which are connected using a "distribution system", so have to operate in Infrastructure Mode.

(See page 57-58)

Question 6. (6 points) Briefly describe the token ring access method, as decribed in your text.

Whenever the network is unoccupied, a simple 3-byte token circulates. This token is passed from station to station until it encounters a station with data to send. The station keeps the token and sends a data frame. The data frame proceeds around the ring, being regenerated by each station. Each intermediate station examines the destination address, find that the frame is addressed to another station, and relays it to its neighbor. The intended recipient recognizes its own address, copies the message, checks for errors, and marks the frame to indicate the address was recognized and the frame was copied. The full package then continues around the ring until it returns to the station that sent it.

(See page 54)

Question 7. (6 points). Assume a local name server issues an iterative query on behalf of a resolver. Briefly describe how iterative resolution would then proceed, as described in your text.

The local name server would issue the query to the server it thought had the answer. It the server is authoritative, it would return the answer. Otherwise, the server would send back the address of another server it believed could resolve the query. In the latter case, the local name server would then reissue the query to the newly identified name server. This server, if authoritative, would provide the answer else another server would be identified. The local name server would have to repeat the process of reissuing the query to subsequently identified name servers.

(See page 508)

Question 8. (6 points) What technique is used to "speed up" the domain name resolution process, according to your text? How can this technique be problematic?

Answer: Caching the results of DNS queries. The technique can be problematic because the cache entries can become outdated due to changes in mapping between domain names and IP addresses. (Page 509)

Question 9. (9 points) Please complete the following table, as it appeared in your text. For each special address, show the network ID and host ID components used to form the address. Indicate (in the Source/Dest column) whether the special address is used as the "source" or "destination" (or neither) address in a packet. Note: the word "specific" or "any" can be used for network or host ID when appropriate.

Special Address	Net ID	Host ID	Source/Dest / None
Network Address			
Direct Broadcast			
Limited Broadcast			
This host / this net			
Specific host / this net			
Loopback Address			

Special Address	Net ID	Host ID	Source/Dest / None
Network Address	Specific	All 0's	None
Direct Broadcast	Specific	All 1's	Destination
Limited Broadcast	All 1's	All 1's	Destination
This host / this net	All 0's	All 0's	Source
Specific host / this net	All 0's	Specific	Destination
Loopback Address	127	Any	Destination

(See Page 104)

Question 10. (2 points) Under the classful IP addressing system, how many class C address blocks are available? How many class B address blocks are available? (Note: include any private or special addresses in the count).

See page 97-98.

Class B: 16,384 (or 2^14)
Class C: 2,097,152 (or 2^21)

Question 11. (20 points) For each device in the list below, briefly describe what the device does and what OSI layer(s) the device operates in, according to your text. Then state whether the device has a physical (MAC) address or an IP addresses (or neither, or both). Also state whether the device inspects the physical address or IP address (or neither, or both) of incoming data.

Devices: repeater, hub, bridge and router.

Repeater:

- A repeater receives a signal, and before it becomes too weak or corrupted, regenerates the original bit pattern.
- It only operates at the physical layer.
- It inspects neither the physical nor IP address
- It has neither a physical nor IP address.

Hub:

- A hub is a multiport repeater.
- It only operates at the physical layer.
- It inspects neither the physical nor IP address
- It has neither a physical nor IP address.

Bridge:

- A bridge regenerates the signal it receives. It also can filter frames from being transmitted unnecessarily on certain LAN segments.
- It only operates at the physical and data link layers.
- It inspects the physical address, but not the IP address.
- It has neither a physical nor IP address.

Router:

- A router can connect networks together to form an internet. Like a repeater or bridge, a router regenerates the signal it receives. Like a bridge, a router can also filter frames from being transmitted unnecessarily on certain LAN segments. However a router can also forward or filter packets using the IP address.
- It only operates at the physical, data link and network layers.
- It inspects the physical address and the IP address.
- It has both a physical and an IP address.

(See Section 3.4)