CSE3152 COMPUTER NETWORKS
MID TERM EXAMINATIONS SCHEME OF EVALUATION

Q1. The network that physically connects an end system to the edge router on a path from the end system to any other distant end system is called __________.(0.5)

1. **Access network
2. Wide area network
3. Wired network
4. Wireless

Q2. For a 16 Mbps Ethernet link, if the length of the packet is 64 bits, the transmission delay is ____________ (in microseconds).(0.5)

1. **4.0
2. 40
3. 250
4. 250000

Q3. In the transfer of file between server and client, if the transmission rates along the path is 10Mbps, 20 Mbps, 30 Mbps, 40 Mbps. The throughput is usually ___________ .(0.5)

1. 20 Mbps
2. **10 Mbps
3. 40 Mbps
4. 100 Mbps

Q4. With so many diverse devices being networked together, the Internet is also known as ________(0.5)

1. High performance system
2. Distributed collection of things
3. **Internet of things
4. High Performance Internet

Q5. In a network, If P1 is the only packet being transmitted and there was no earlier transmission, which of the following delays could be zero?.(0.5)

1. Propagation delay
2. Transmission delay
3. **Queuing delay
4. Processing delay

Q6. A local telephone network is an example of a _______ network. (0.5)

1. **circuit-switched
2. Packet-switched
3. message-switched
4. None of the listed

Q7. Each Layer offers a well defined service to its ________ layer using the service offered by the ________ Layer. (0.5)

1. Smallpeer, peer
2. **upper, lower
3. lower, upper
4. upper, upper

Q8. Identify the correct order in which the following actions take place in an interaction between a

web browser and a web server.

1. The web browser requests a webpage using HTTP.
2. The web browser establishes a TCP connection with the web server.
3. The web server sends the requested webpage using HTTP.
4. The web browser resolves the domain name using DNS.(0.5)

1. 1,2,3,4
2. **4,2,1,3
3. 4,1,2,3
4. 2,4,1,3

Q9. If 5 files are transferred from server A to client B in the same session of FTP. The number of TCP connections between A and B is ....(0.5)

1. 5
2. **6
3. 10
4. 2

Q10. Choose the one statement which is wrong in case of SMTP. (0.5)

1. **It is a pull protocol
2. It requires message to be in 7 bit ASCII format
3. It transfers files from one mail server to another mail server
4. SMTP is responsible for the transmission of the mail through the internet

Q11A. Given the following address 193.45.67.23/24. Extract the following information: i) First address ii) Last address iii) Number of addresses in the block. iv) Network mask

2M

Scheme:

i) 193.45.67.0 (ii) 193.45.67.255 (iii)256 (iv) 255.255.255.0

Q11B. An organization is granted a block of addresses with the beginning address 15.15.15.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets: one subblock of 12 addresses, one subblock of 62 addresses, and one subblock of 120 addresses. Draw a network topology and Give IP assignments to each subblocks.

2M

Scheme:

Granted Network Address: 15.15.15.0/24
Allocate this to Sub-blocks beginning from Largest sub-block to smallest.
(a) Subblock of 120 Addresses.
It is not a power of 2. We allocate 128 Addresses.
Subnet Mask = 32-$\log_2$128=25.

First Address : 15.15.15.0 (Subnet Address)
Last Address : 15.15.15.127 (Broadcast Address)
Gateway Address: G1= 15.15.15.126
(Can be anything within 15.15.15.1 to 15.15.15.126)

(b) Subblock of 62 Addresses.

It is not a power of 2. We allocate 64 Addresses.
Subnet Mask = $32-\log_2 64=26$.
First Address : 15.15.15.128 (Subnet Address)
Last Address : 15.15.15.191 (Broadcast Address)
Gateway Address: G2= 15.15.15.190
(Can be anything within 15.15.15.129 to 15.15.15.190)

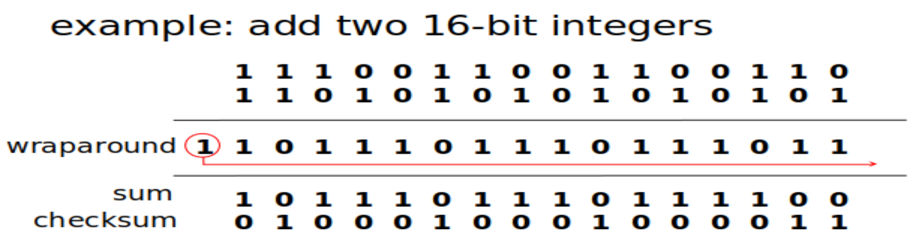
(c) Subblock of 12 Addresses.

It is not a power of 2. We allocate 16 Addresses.
Subnet Mask = $32-\log_2 16=28$.
First Address : 15.15.15.192 (Subnet Address)
Last Address : 15.15.15.207 (Broadcast Address)
Gateway Address: G3= 15.15.15.206
(Can be anything within 15.15.15.193 to 15.15.15.206)

12A. Why checksum is used in UDP? Find the checksum for the following: 1110011001100110 and 1101010101010101 .

2M

Ans:



12B. Discuss multiplexing and de-multiplexing w.r.t transport layer services with neat diagrams.

2M

Scheme:

At the destination host, the transport layer receives segments from the network layer just below. The transport layer has the responsibility of delivering the data in these segments to the appropriate application process running in the host.

When the transport layer in your computer receives data from the network layer below, it needs to direct the received data to one of correct processes.

The transport layer in the receiving host does not actually deliver data directly to a process, but instead to an intermediary socket. Because at any given time there can be more than one socket in the receiving host, each socket has a unique identifier. The format of the identifier depends on whether the socket is a UDP or a TCP socket, Each transport-layer segment has a set of fields in the segment for this purpose.

At the receiving end, the transport layer examines these fields to identify the receiving socket and then directs the segment to that socket. This job of delivering the data in a transport-layer segment to the correct socket is called demultiplexing.

The job of gathering data chunks at the source host from different sockets, encapsulating each data chunk with header information (that will later be used in demultiplexing) to create segments, and passing the segments to the network layer is called multiplexing. (1.5M)

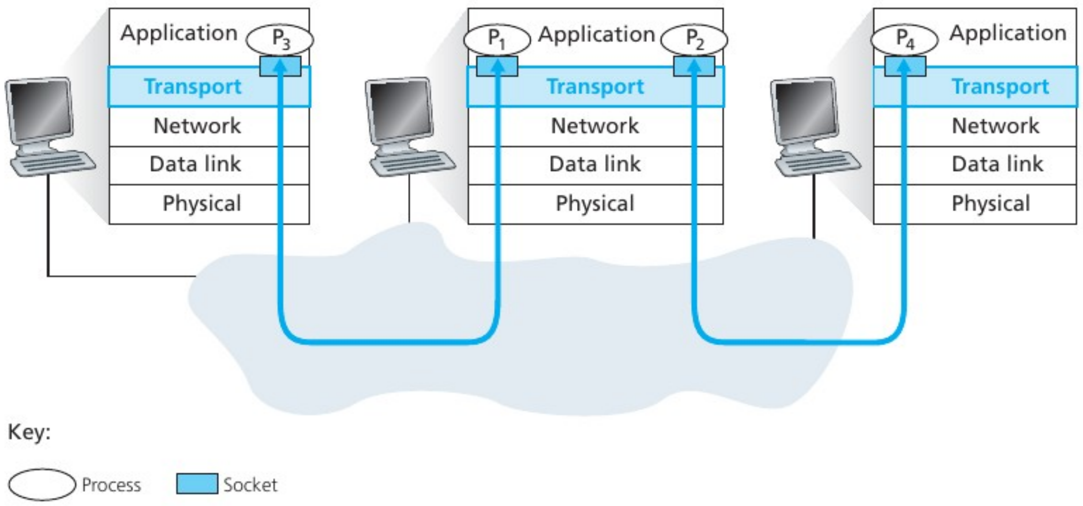
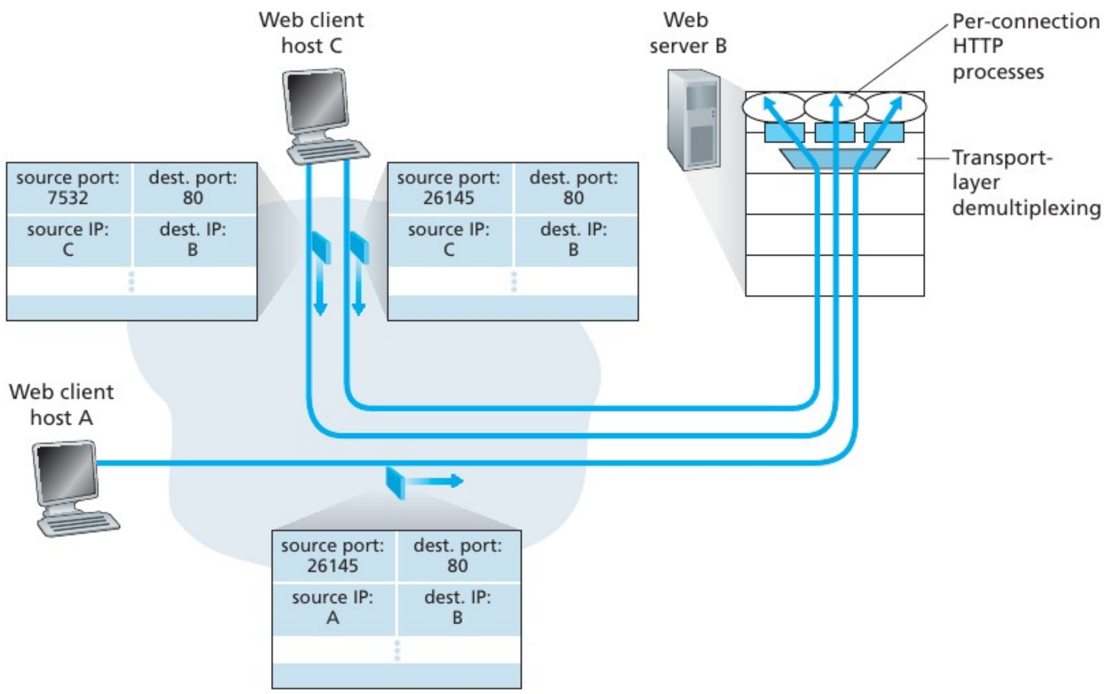


Figure 3.2 ♦ Transport-layer multiplexing and demultiplexing



(0.5M)

Q13. What are the different techniques in which communication medium is shared among several channels in circuit switching? Explain.

3M

Scheme:

FDM [1.5M]+ TDM [1.5M]

Multiplexing in Circuit-Switched Networks A circuit in a link is implemented with either frequency-division multiplexing (FDM) or time-division multiplexing (TDM). With FDM, the frequency spectrum of a link is divided up among the connections established across the link. Specifically, the link dedicates a frequency band to each connection for the duration of the connection. In telephone networks, this frequency band typically has a width of 4 kHz (that is, 4,000 hertz or 4,000 cycles per second). The width of the band is called, not surprisingly, the bandwidth. FM radio stations also use FDM to share the frequency spectrum between 88 MHz and 108 MHz, with each station being allocated a specific frequency band.

For a TDM link, time is divided into frames of fixed duration, and each frame is divided into a fixed number of time slots. When the network establishes a connection across a link, the network dedicates one time slot in every frame to this connection. These slots are dedicated for the sole use of that connection, with one time slot available for use (in every frame) to transmit the connection's data.

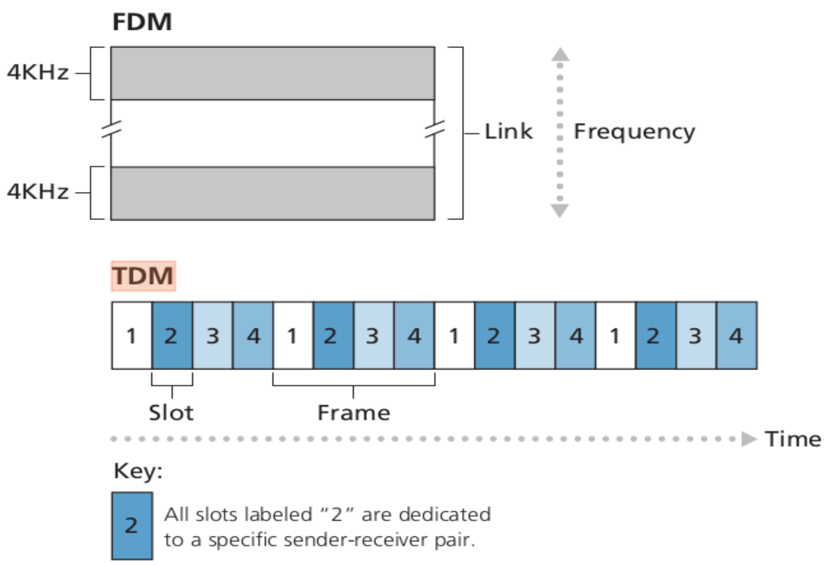


Figure illustrates FDM and TDM for a specific network link supporting up to four circuits. For FDM, the frequency domain is segmented into four bands, each of bandwidth 4 kHz. For TDM, the time domain is segmented into frames, with four time slots in each frame; each circuit is assigned the same dedicated slot in the revolving TDM frames. For TDM, the transmission rate of a circuit is equal to the frame rate multiplied by the number of bits in a slot. For example, if the link transmits 8,000 frames per second and each slot consists of 8 bits, then the transmission rate of each circuit is 64 kbps.

Q14. Compare and contrast HTTP persistent and non-persistent connections in detail.
3M

Scheme:
When the client-server interaction is taking place over TCP, the application developer needs to make an important decision—should each request/response pair be sent over a separate TCP connection, or should all of the requests and their corresponding responses be sent over the same TCP connection? In the former approach, the application is said to use non-persistent connections; and in the latter approach, persistent connections.

The non-persistent connections, where each TCP connection is closed after the server sends the object—the connection does not persist for other objects. HTTP/1.0 employes non-persistent TCP connections. Note that each non-persistent TCP connection transports exactly one request message and one response message. The total response time is two RTTs plus the transmission time at the server of the object. Non-persistent connections have some shortcomings. First, a brand-new connection must be established and maintained for each requested object. For each of these connections, TCP buffers must be allocated and TCP variables must be kept in both the client and server. Second, each object suffers a delivery delay of two RTTs—one RTT to establish the TCP connection and one RTT to request and receive an object.

With HTTP/1.1 persistent connections, the server leaves the TCP connection open after sending a response. Subsequent requests and responses between the same client and server can be sent over the same connection. In particular, an entire Web page (in the example above, the base HTML file and the 10 images) can be sent over a single persistent TCP connection. Moreover, multiple Web pages residing on the same server can be sent from the server to the same client over a single persistent TCP connection. These requests for objects can be made back-to-back, without waiting for replies to pending requests (pipelining). Typically, the HTTP server closes a connection when it isn't used for a certain time (a configurable timeout interval). When the server receives the back-to-back requests, it sends the objects back-to-back. The default mode of HTTP uses persistent connections with pipelining.

Q15. Whether the following applications are tolerant to data loss or not? i) file transfer ii) Email. Also, mention the application-layer and transport-layer protocols used in these applications.
3M

Ans:

Scheme:

For each application [1.5M]

i) File transfer:
Data loss: No loss/ loss-intolerant
Application-layer protocol: FTP
Transport-layer protocol: TCP

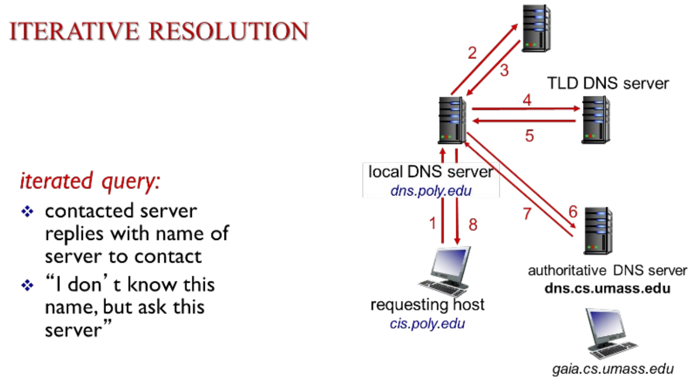
ii) Email:
Data loss: No loss/ loss-intolerant
Application-layer protocol: SMTP
Transport-layer protocol: TCP

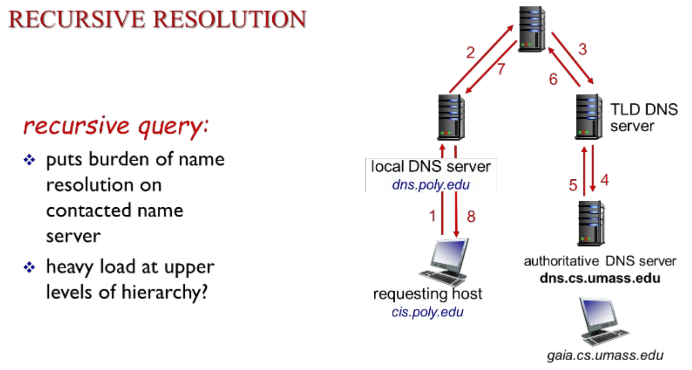
Q16. Compare and contrast iterative and recursive name address resolution in domain name systems using appropriate neat diagrams.

3M

Scheme:

1.5M x 2=3M





Q17. How concurrency of server function can be achieved in TCP socket programming? Write a simple TCP server program in C to demonstrate it.

3M

Scheme:

Concurrency is achieved in TCP socket Programming using fork() API. For each client request, server can fork a child server process **after accepting client request**,which will provide service to client. **(1M)**

Sample Server Program: **(2M)**

Note: Program Syntax,correctness and neatness of Server code will be considered for marking.

Q18. Discuss the disadvantage of Classfull addressing. How these issues are handled in Classless addressing?.

2M

Scheme:

Limited Address for today's Internet, Address Depletion, Address wastage in each blocks should be explained with proper reasoning. (1M)

Various techniques like NAT, subnetting , classless addressing , how it is usefull to minimize the disadvantages should be explained. (1M)

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