IS 370-Spring 2013
Review Sheet 2- Chapter 2

Discussion Questions

1. Define a network application. What are its components?
2. is The services that a computer network provide to the users.
3. These components are: communicating processes, application layer protocol and messages

2. What are the three types of network application architecture? Give an example for each type.
   a. Client-server
      i. Including data centers / cloud computing
   b. Peer-to-peer (P2P) : distribution (Bit torrent)
   c. Hybrid of client-server and P2P : Skype , Instant messaging

3. Define a web application. What are its components?
   is a network application that allows users to obtain "documents" from Web servers
   consists of many components including:
   - ❖ Web browsers (e.g., Netscape Navigator and Internet Explorer),
   - ❖ Web servers (e.g., Apache, Microsoft and Netscape servers),
   - ❖ an application-layer protocol (i.e. HTTP)
   - ❖ a standard for document formats (i.e., HTML),

4. What is a process? What are the types of processes? How do processes on different hosts exchange information? Give examples for communicating processes in Internet applications.

Process: program running within a end-system.

Two types:

1. Client process: initiates the communication.

2. server process: waits to be contacted.

Hosts communicate with each other by exchanging messages across the computer network for example in web application a browser client exchange message with web server process

5. Define a process socket. Draw a schematic diagram to show its operation.
it is an interface between the application layer and the transport layer ,process sends message into and receive message from the network through the socket
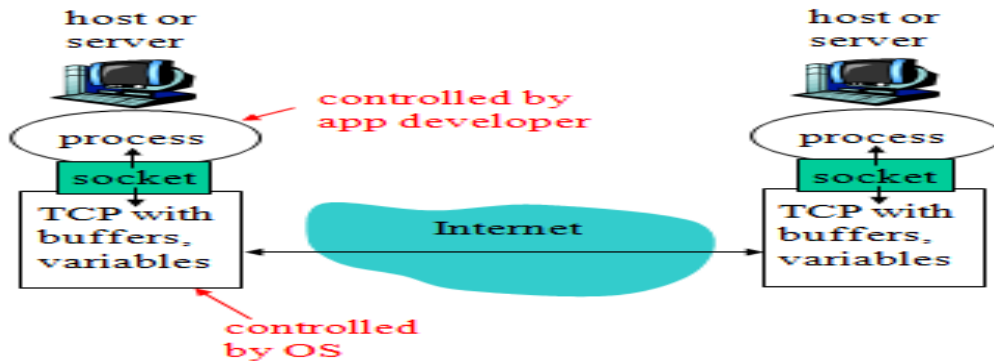
6. What does a process id consist of?
Identifier includes both IP address and port numbers associated with process on host

7. Classify Internet applications in terms of reliability, timing, and throughput requirements. Give examples for each class.

   Reliability :
   Some application don't mind some error it is called error tolerant(real-time audio/video) ,but other applications require 100% correction(file transfer).
   Timing:
   Some application don't mind some delay(Web documents) ,but other applications require no delay and it is time sensitive(interactive games).
   Throughput:
   Some application needs minimum amount of throughput(real-time audio/video) ,but other applications make use of whatever it gets(instant messaging).

8. Define an application layer protocol and give examples.
   It defines how application processes running on different systems and exchange messages to each other
   ❖ Web and HTTP
   ❖ File Transfer Protocol (FTP)
   ❖ Electronic Mail
       o SMTP, POP3, IMAP
   ❖ Domain Name System(DNS)
   ❖ P2P applications

9. What is a webpage? What are its components?
   Web page consists of objects. 1.HTML file 2.Objects(Files)

10. What is a URL? What are its components?

An object is a simply file -- such as a HTML file, a JPEG image, a GIF image, a Java applet, an audio clip, etc. -- that is addressable by a single URL.

has two components: the host name of the server that houses the object and the object's path name

11. Define the web browser and the web server? Give examples.

Web browser : is a user agent (program) for the Web

Example: Internet Explorer, Netscape Navigator

Web Server : houses Web objects, each addressable by a URL

Popular Web servers include Apache, Microsoft Internet Information Server, and the Netscape Enterprise Server.

12. How does HTTP work?

   a. Client (browser) initiates TCP connection (creates socket) to server, port 80
   b. Server accepts TCP connection from client
   c. Browser sends HTTP request messages for the objects in the web page to the server
   d. Server receives the requests and responds with HTTP response messages that contain the objects
   e. TCP connection closed

13. What does it mean that HTTP is stateless?

This means that server maintains no information about past client requests.

14. Compare between non-persistent HTTP and persistent HTTP.

non-persistent	persistent HTTP
At most one object is sent over a TCP connection.	Multiple objects can be sent over single TCP connection between client and server.

15. Define cookies. Why do we use it? Explain how does it work using schematic diagram

A way for authentication for sites to keep track of users

Authentication, Preference and recommendation and Shopping cart
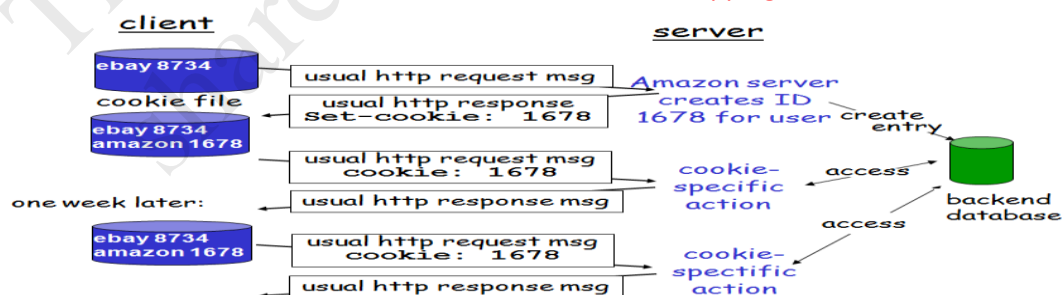
16. Define web cache. Why do we use it. Explain how does it work using schematic diagram?

is a network entity that satisfies HTTP client request *without involving original server*

A Web cache can substantially reduce the response time for a client request.
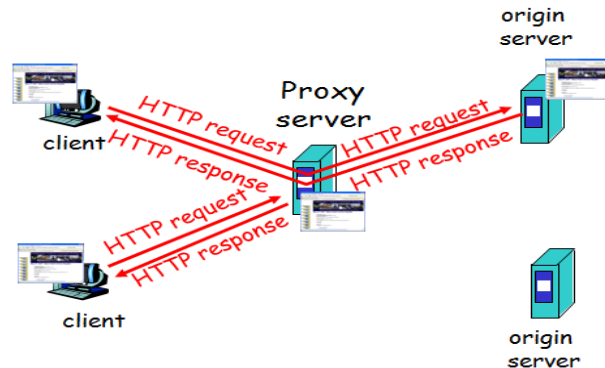
17. What does it mean that FTP is out-of-band?

Uses two TCP connection in parallel 1.control connection 2.data connection

18. How does FTP work?

1.User provides hostname of the remote host to ftp client (local host)

2. Client initiates a TCP control connection with the server (remote host) on port 21

3. Client sends user ID and password over this control connection

4. Client sends commands to change directory and to put/get a file on/from remote server

5. Server initiates a TCP data connection to the client upon receiving a file transfer command

6. Server sends/receives exactly one file over the data connection and then closes the data connection (non-persistent)

7. TCP control connection remains open throughout the duration of the user session (persistent) but a new TCP data connection is created for each file transfer within the session

19. Compare between HTTP and FTP.

	HTTP	FTP
File transfer	Yes	Yes
Remain state	No (stateless)	yes
Out-of-band	No (in-band)	yes
Commands readable	yes	yes

20. What are the functions of the mail reader and the mail servers?

Mail reader: composing, editing, reading mail messages

Mail server: mailbox contains incoming messages for user,   message queue of outgoing (to be sent) mail messages.

21. Explain briefly with the aid of schematic diagram the operation of SMTP.

CH02 . slide (103)

22. Compare between POP3 and IMAP. Why do we use them?

POP3: Previous example uses "download and delete" mode , cannot re-read e-mail if he changes client. is stateless across sessions.   "Download-and-keep": copies of messages on different clients.

IMAP: Keep all messages in one place: the server. Allows user to organize messages in folders. keeps user state across sessions

23. What are the services provided by DNS?
   ❖ hostname to IP address translation
   ❖ host aliasing
   ❖ Canonical, alias names
   ❖ mail server aliasing
   ❖ load distribution
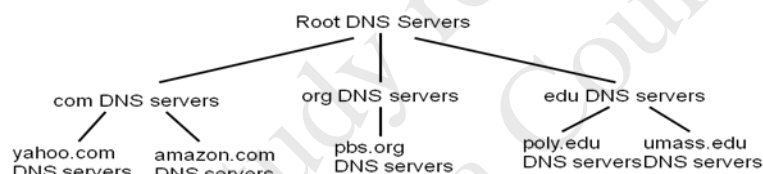
24. Why do we use distributed database in DNS?

single point of failure, traffic volume, distant centralized database, Maintenance

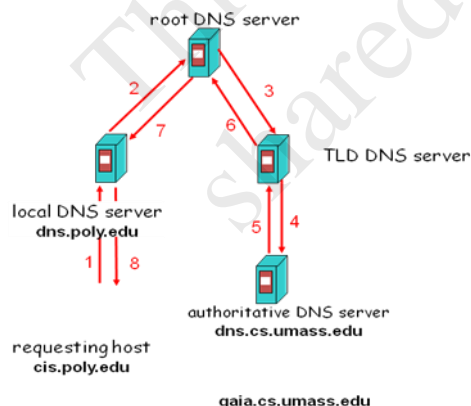25. Explain the hierarchy of DNS servers?

client queries a root server to find com DNS server

client queries com DNS server to get amazon.com DNS server

client queries amazon.com DNS server to get IP address for www.amazon.com

26. Give an example that illustrates how DNS translates hostname to IP address. Draw a schematic diagram that shows the steps of translation.

27. How does DNS store mapping information in the distributed database? Give examples for different types of mapping information.

DNS stores mapping information in distributed db in the form of **resource records** (RR). Each DNS **reply message** carries one or more RRs. The format of RR is shown below:

RR format: **(name, value, type, ttl).** There four types of mapping information:

Type=A
- ❖ **name** is hostname
- ❖ **value** is IP address
  (relay1.bar.foo.com, 145.37.93.126, A)

Type=NS
- ❖ **name** is domain
- ❖ **value** is hostname of authoritative DNS server for this domain
  (foo.com, dns.foo.com, NS)

Type=CNAME
- ❖ **name** is alias name for some "canonical" (the real) name
- ❖ **value** is canonical name
  (foo.com, relay1.bar.foo.com, CNAME)

Type=MX
- ❖ **name** is alias name for a mail server
- ❖ **value** is canonical name of mail server
  (foo.com, mail.bar.foo.com, MX)

28. Compare between file distribution time in client-server architecture and P2P architecture.

Ch02 – Slides 140 - 141

29. Describe briefly the bit-torrent file distribution system.
- ❖ file divided into 256KB *chunks.*
- ❖ peer joining torrent.
- ❖ while downloading chunks from other peers, peer uploads chunks to other peers.
- ❖ peers may come and go.
- ❖ once peer has entire file, it may (selfishly) leave or (altruistically) remain providing chunks to other peers.

30. Explain briefly how each of the following techniques facilitates searching for information in a database. DHT   - Circular DHT   - Circular DHT with short cuts
- - DHT.
    - o Assign integer identifier to each peer.
    - o To get integer keys, hash original key.
    - o Peer is aware of all the peers.
    - o Hash function maps original keys to n-bit keys
- - Circular DHT
    - o Each peer *only* aware of immediate successor and predecessor.   "Overlay network"
- - Circular DHT with short cuts
    - o Each peer keeps track of IP addresses of predecessor, successor, short cuts.

Put *T* in front of the true statement and *F* in front of the false statement in each of the following:

31. Two processes communicate with each other through their sockets[t]
32. A process is uniquely identified by the IP address.[f]
33. *ipconfig* command is used to get computer's IP address.[t]
34. Audio and video applications are loss-tolerant. .**(T**)
35. File transfer and telnet require 100% reliable data transfer. .(**T**)
36. Multimedia applications are elastic applications.(**F)**
37. Email and file transfer are bw sensitive applications. .(**F**)
38. UDP requires handshaking.[f]
39. Most Internet applications use UDP.[f]
40. HTTP is a stateless protocol.[t]
41. HTML is the main object in the web page.[t]
42. A web browser is the client-side in a web application.[t]
43. HTTP use port 81 to communicate[f]
44. Non-persistent HTTP transfer more than one object in a single TCP connection.[f]
45. A Web cache can substantially reduce the response time for a client request.[t]
46. Cookies preserve privacy.[t]
47. FTP is in-band protocol.[f]
48. FTP uses port 20 to transfer data.[t]
49. SMTP is a pull protocol.[f]
50. DNS uses centralized database to store mapping information.[t]
51. Client-server can distribute file faster than P2P.[f]
52. In bit torrent, a peer accumulates chunks of the file over time.[t]
53. DHT is used to reduce time searching for information in a database.[f]

Fill in the space in the following sentences:

54. **Network Applications** are the services that a computer network makes available to the users.
55. An Internet application is composed of **communicating processes** , **Protocol** and **messages**
56. **process** is a program running within a host.
57. **Client process** initiates communication and runs on the client side.
58. **Server process** waits to be contacted and runs on the server side.
59. Processes in different hosts communicate by **exchanging messages**
60. **P2P architectures** have both client processes and server processes on the same host.
61. In web applications the two communicating processes are called **Web browser** and **web server**
62. **Socket** is an API between the application layer and the transport layer.
63. **HTTP protocol** defines how messages are passed between Web browser and Web server.

65. **Web page** is a document consists of a base HTML file and several referenced objects.

66. URL has two components: **Host name** and **Pathname** .

67. **Web Browser** is a user agent (program) for the Web that displays to the user the requested
   Web pages.

68. **Web Server** houses Web objects, each addressable by a URL.

69. **RTT (Round Trip Time)** time for a small packet to travel from client to server and back.

70. **Cookies** a way for authentication for sites to keep track of users without user name and password

71. **Cache** is a network entity that satisfies HTTP client request without involving original server.

72. **IMAP** and **POP** Are examples of mail access protocol.

73. The major component of email are **user agents mail servers (sender & recipient) simple mail transfer protocol: SMTP**

   1. 74. DNS services are **hostname to IP address translation , host aliasing ,mail server aliasing ,load distribution**

   2. 75. The classes of DNS servers are **Root DNS servers**, **Top-level domain** and **Authoritative DNS servers**

76. **DHT** is a method to build a scalable distributed database in P2P architecture

77. **Bittorrent** Is a method for file distribution in P2P architecture.

78. In DHT a (key, value) pair is assigned to the peer that has **Closest** ID to the key.

Problems:

1. Suppose that a web page consists of a base HTML file and 5 JPEG images, and that all objects reside on the same server. If RTT = 2 msec and file transmission time is 1 sec, compute the total time required to transfer this web page in the following cases:

   a) Non-persistent connection
   b) Non-persistent connection with 6 TCP connection open at the same time
   c) Persistent without pipelining
   d) Persistent with pipelining

   a) Non-persistent connection
      6*(2RTT+transmission time)=6*(2(0.002)+1)=6.024 sec
   b) Non-persistent connection with 6 TCP connection open at the same time
      6RTT+RTT+transmission time=(6*0.002)+(0.002)+(1)=1.014 sec
   c) Persistent without pipelining
      RTT+6*(RTT+ transmission time)=(0.002)+(6*(0.002+1))=6.014 sec
   d) Persistent with pipelining
      2RTT+transmission time=(2*0.002)+(1)=1.004 sec

2. Suppose that we have a file of size 10 Gbyte that we need to distribute on 100 clients. The following information is known about the clients: upload rate = 3Mbps, min download rate = 60Mbps. What will be the file distribution time if we use:
a) a sever of upload rate 30 Mbps
b) P2P architecture