College of Computer Sciences and Engineering

Information and Computer Science Department

ICS 343: Fundamentals of Computer Networks (3-3-4)

Name: **ID:**

Part I (Chapter 1)

1.1. Why are telecommunication protocols needed? **(5 points)**

A protocol defines the rules that both the sender and receiver and all intermediate devices need to follow to be able to communicate effectively. When communication is simple, we may need only one simple protocol; when the communication is complex, we need a protocol at each layer, or protocol layering.

1.2. Name four basic network topologies. Mention a design-**weakness** of each type. **(8 points)**

Topology	**Weakness**
Mesh	Too expensive in terms of wiring
Star	If central hub fails the whole topology is disconnected
Bus	One main link connects all/ Signal weakens over lengthy distances
Ring	One main link connects all/ Signal weakens over lengthy distances

1.3. What does WWW stand for? How is it different from the ***Internet***? **(5 points)**

WWW stands for *World Wide Web*.
The Web is a system (service) that is part of the Internet. The Internet is the most dominant interconnected-network (or internet). Other services provided by the Internet include E-mail and File Transfer.

1.4. Explain the difference between packet-switching and circuit-switching. Give an application-example of each. **(10 points)**

The answer is provided on pages 15-17 of the textbook.

Part II (Chapter 2)

2.1. Briefly explain the need for layering. Mention two reasons to justify distributing TCP/IP over more than one layer. **(6 points)**

There are two principles of protocol layering.

The first principle dictates that if we want bidirectional communication, we need to make each layer so that it is able to perform two opposite tasks, one in each direction.

The second principle that we need to follow in protocol layering is that the two objects under each layer at both sites should be identical.

Advantages of protocol layering:

- **Modularity**
- **Separate the services from the implementation**
- **Communication doesn't only happen between end-points**

More details are in Section 2.2.1 of the textbook.

2.2. What are the names of the packets (data units) handled by each of the TCP/IP protocol suite layers? **(5 points)**

According to Figure 2.9:

Layer	Data Unit
Application	Message
Transport	Segment/User Datagram
Network	Datagram
Data Link	Frame
Physical	Bit

2.3. Briefly explain the processes of ***Encapsulation*** and ***Decapsulation***. Why are they performed? **(10 points)**

Answer is detailed in Section 2.4 of the textbook.

Part III (Chapter 25)

3.1. Explain the differences between the Client-Server model and the Peer-to-Peer model. Give an application-example of each. **(10 points)**

Client-server

- **Asymmetric relationship**
- **Client predominately makes requests, server makes replies**
- **HTTP, FTP, SSH**

Peer-to-peer (P2P)

- **Symmetric relationship**
- **No need for a server to be infinitely running**
- **Example: Internet Telephone**
- **Concerns of security and applicability**
- **Example: BitTorrent, Skype**

More details are in Section 25.1.2

3.2. Briefly explain the role of the Application Layer in the TCP/IP suite. **(8 points)**

- **Application Layer enables the user, whether human or software, to access the network**
- **Provides user interfaces and support for services such as electronic mail, remote file access and transfer, access to WWW, and so on**
- **SMTP, SNMP, FTP, TELNET, DNS**

3.3. Name 5 known application layer protocols (You may use acronyms). **(5 points)**

HTTP
FTP
SSH
SMTP
POP
SFTP
DNS
TELNET
SNMP
Check page 41

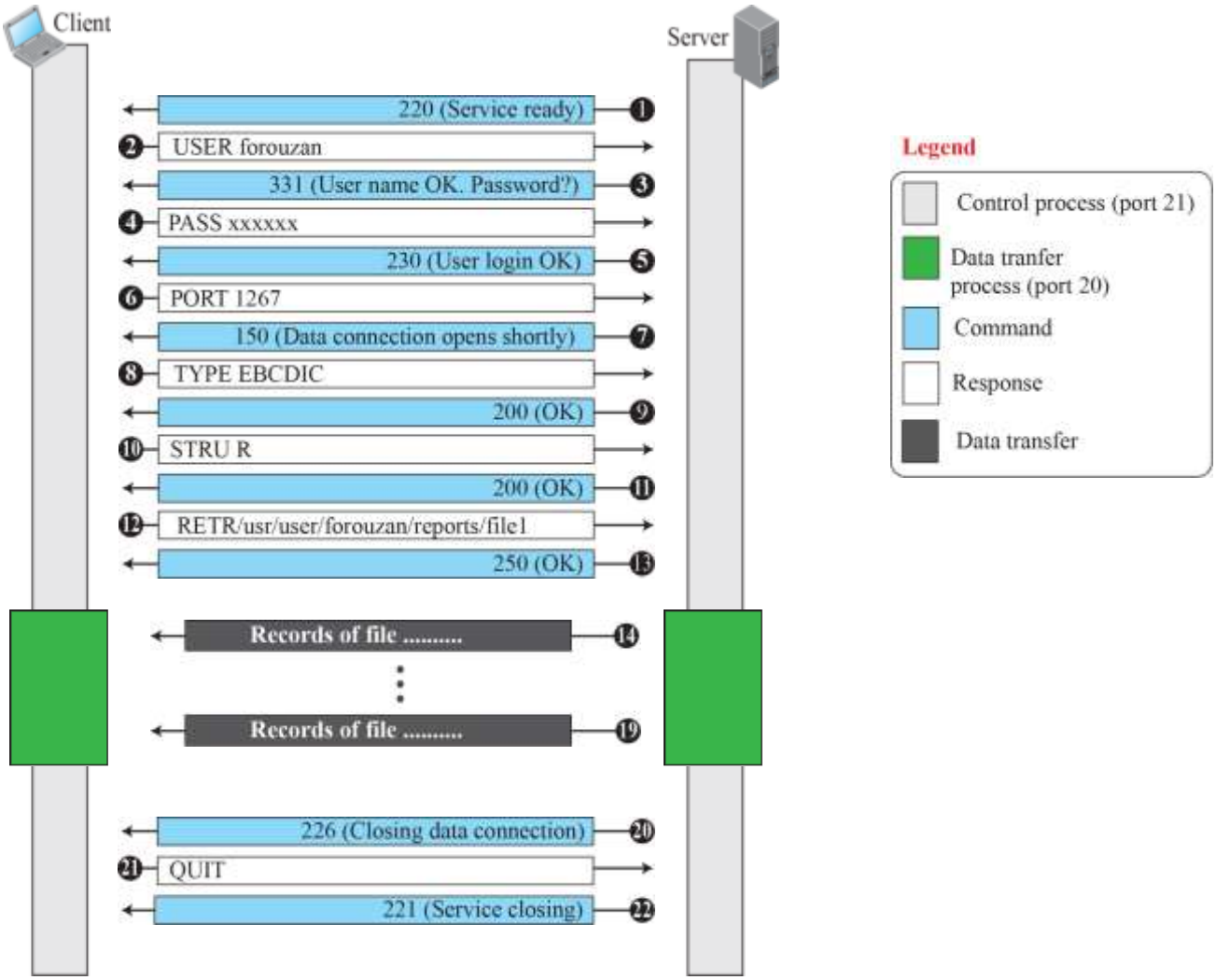
Part IV (Chapter 26)

4.1. What is HTTP? What does it do? What is HTML? **(10 points)**

The Hyper Text Transfer Protocol (HTTP) is used to define how the client-server programs can be written to retrieve web pages from the Web. An HTTP client sends a request; an HTTP server returns a response. The server uses the port number 80; the client uses a temporary port number. HTTP uses the services of TCP, which, as discussed before, is a connection-oriented and reliable protocol.

HTML (Hypertext Markup Language) is a language for creating Web pages

4.2. Why are there two types of connection establishments/terminations in FTP? **(8 points)**



The two connections in FTP have different lifetimes. The control connection remains connected during the entire interactive FTP session. The data connection is opened and then closed for each file transfer activity. It opens each time commands that involve transferring files are used, and it closes when the file is transferred.

Extra details:
Figure 26.11 (above) shows an example of using FTP for retrieving a file. The figure shows only one file to be transferred. The control connection remains open all the time, but the data connection is opened and closed repeatedly. We assume the file is transferred in six sections. After all records have been transferred, the server control process announces that the file transfer is done. Since the client control process has no file to retrieve, it issues the QUIT command, which causes the service connection to be closed.

4.3. In an electronic-mail given scenario, what is an MTA? What is an MAA? What is the difference between them? **(10 points)**

When an email is sent, the message is routed from server to server, all the way to the recipient's email server. More precisely, the message is sent to the mail server tasked with transporting emails (called the MTA, for Message Transfer Agent) to the recipient's MTA. On the Internet, MTAs communicate with one another using the protocol SMTP, and so are logically called SMTP servers (or sometimes outgoing mail servers).

The recipient's MTA then delivers the email to the incoming mail server (called the MAA, for Message Access Agent), which stores the email as it waits for the user to accept it.
An MTA performs a *push* program, whereas an MAA client-server performs a *pull* program.

More details are in Section 26.3.1.
And: http://ccm.net/contents/116-how-email-works-mta-mda-mua