# Chapter 1 Computer Network and the Internet

3.what is a client program? What is a server program? Dose a server program request and receive services fron a client program?

A networking program usually has two programs, each running on a different host, communicating with each other. The program that initiates the communication is the client. Typically, the client program requests and receives services from the server program.

4.What are the two types of transport services that the Internet provides to its applications ?What are some characteristics of each of those service?

The Internet provides its applications a connection-oriented service (TCP) and a connectionless service (UDP). Each Internet application makes use of one these two services. The two services will be discussed in detail in Chapter 3. Some of the principle characteristics of the connection-oriented service are:

* + Two end-systems first “handshake” before either starts to send application data to the other.
  + Provides reliable data transfer, i.e., all application data sent by one side of the connection arrives at the other side of the connection in order and without any gaps.
  + Provides flow control, i.e., it makes sure that neither end of a connection overwhelms the buffers in the other end of the connection by sending to many packets to fast.
  + Provides congestion control, i.e., regulates the amount of data that an application can send into the network, helping to prevent the Internet from entering a state of grid lock.

The principle characteristics of connectionless service are:

* + No handshaking
  + No guarantees of reliable data transfer
  + No flow control or congestion control

5.It has been said that flow control and congestion control are equivalent.Is this true for the Internet’s connection-oriented service? Are the objects of flow control and congestion control the same?

Flow control and congestion control are two distinct control mechanisms with distinct objectives. Flow control makes sure that neither end of a connection overwhelms the buffers in the other end of the connection by sending to many packets to fast. Congestion control regulates the amount of data that an application can send into the network, helping to prevent congestion in the network core (i.e., in the buffers in the network routers).

9.Suppose there is exactly one packet switch between the sending host and a receiving host.The transmission rates between the sending host and the switch and between the switch and the the receiving host are R1 and R2 ,respectively.Assuming that the switch sues store-and-forword packet switching .What is the total end-to-end delay to send a packet of length L ?(Ignore queuing,propagation delay,and processing delay)

At time t0 the sending host begins to transmit. At time t1 = L/R1, the sending host completes transmission and the entire packet is received at the router (no propagation delay). Because the router has the entire packet at time t1, it can begin to transmit the packet to the receiving host at time t1. At time t2 = t1 + L/R2, the router completes transmission and the entire packet is received at the receiving host (again, no propagation delay). Thus, the end-to-end delay is L/R1 + L/R2.

19.Consider sending a packet from a sending host to receiving host over fixed route .List the delay component in the end-to-end delay.Which of these delays are constant and which are variable?

The delay components are processing delays, transmission delays, propagation delays, and queuing delays. All of these delays are fixed, except for the queuing delays, which are variable.

## Chapter 1 \_Problems:

8.Suppose users share a 1Mbps link.Also suppose each user requires 100 kbps when transmitting ,but each user transmits only 10 percent of the time (See the discussion Packet Switching Versus Circuit Switching in Section1.3)

1. When circuit switching is used ,how many users can be supported?

10 users can be supported because each user requires one tenth of the bandwidth

1. For the remainder of this problem ,suppose packet switching is used.Find thr probability that a given user is transmitting.

*p*  0.1

**C D答案太难**

13.(实验题)

14.Suppose two hosts.A and B,are separated by 10000 kilometers and are connected by a direct link of R=1Mbps.Suppose the propagation speed over the link is 2.5\*10^8 meters/sec.

A.Calculate the bandwidth-delay product,R\*tprop .

40,000 bits

B.Consider sending a file of 400000 bits from Host A to Host Suppose the file is sent continuously as one big message.What is the maximum number of bits that will be in the link at any given time?

40,000 bits

C.Provide an interpretation of the bandwidth-delay product.

the bandwidth-delay product of a link is the maximum number of bits that can be in the link

D.What is the width (in meters) of a bit int the link ?Is it longer than a football field?

1 bit is 250 meters long, which is longer than a football field

E.Derive a general expression for the width of a bit in terms of the propagation speed S,the transmission rate R,and the length of the link ?

S/R

18.Suppose there is a 10Mbps microwave link between a geostationary satellite and its base station on Earth.Every minute the satellite takes a digital photo and sends it to the base station .Assume a propagation speed of 2.4\*10^8 meters/sec.

A.What is the propagation delay of the link?

卫星距离地球的高度约为36000 km

0.15S

B.What is the bandwidth -delay product ,R\*tprop

1,500,000 bits

C.Let x denote the size of the photo .What is the minimum value of X for the microwave link to be continuously transmitting?

600,000,000 bits

20.In modern packet -switched networks,the source host segment long,application-layer message (for example ,an image or music file)into smaller packets and sends the packets into the network.The receiver then reassemble the packets back into the original message.We refer to this process as message segmentation.Figure 1.21 illustrate the end-to-end transport of a message with and without message segmentation.Consider a message that is 7.5\*10^6 bits long that is to be sent from source to destination in Figure 1.21.Suppose each link in the figure is 1.5Mbps.Ignore propagation ,Queuing,and processing delays.

(太长了，不写了)

报文分组的缺点：分组必须按顺序；无论包大小如何，包头是一定的，报文分组的方法包头的消耗高于其他方法

# Chapter 2 Application Layer

11.Consider an e-commerce site that wants to keep a purchase record for each of its customer.Describe how this can be done with cookies.

When the user first visits the site, the site returns a cookie number. This cookie number is stored on the user’s host and is managed by the browser. During each subsequent visit (and purchase), the browser sends the cookie number back to the site. Thus the site knows when this user (more precisely, this browser) is visiting the site.

12.What is the difference between persistent HTTP with pipelining and persistent HTTP without pipelining? Whice of the two is used by HTTP/1.1?

In persistent HTTP without pipelining, the browser first waits to receive a HTTP response from the server before issuing a new HTTP request. In persistent HTTP with pipelining, the browser issues requests as soon as it has a need to do so, without waiting for response messages from the server.

15.Why is said that FTP sends control information “out-of-band”?

FTP uses two parallel TCP connections, one connection for sending control information (such as a request to transfer a file) and another connection for actually transferring the file. Because the control information is not sent over the same connection that the file is sent over, FTP sends control information out of band.

## Chapter 2 \_Problems:

4.Consider an HTTP client that wants to retrieve a Web document at a given URL .The IP address of the HTTP server is initially unknown.The Web document at the URL has one embedded GIF image that resides at the same server as the original document.What transport and application-layer protocols besides HTTP are needed in this scenario?

Application layer protocols: DNS and HTTP

Transport layer protocols: UDP for DNS; TCP for HTTP

6.(题目太长)

7.

# Chapter 3 Transport Layer

1.Consider a TCP connection between Host A and Host B .Suppose that the TCP segments traveling from Host A to Host B have source port number x and destination port number y.What are the source and destination port numbers for segment traveling from host B to host A?

Source port number y and destination port number x.

2.Describe why an application developer might choose to run an application over UDP rather than TCP?

An application developer may not want its application to use TCP’s congestion control, which can throttle the application’s sending rate at times of congestion.Often, designers of IP telephony and IP videoconference applications choose to run their applications over UDP because they want to avoid TCP’s congestion control. Also, some applications do not need the reliable data transfer provided by TCP.

3.Is it possible for an application to enjoy reliable data transfer even when the application runs over UDP?If so,how?

Yes. The application developer can put reliable data transfer into the application layer protocol. This would require a significant amount of work and debugging, however.

4.

# Chapter 5 Computer Network and the Internet

1.If all the link in the Internet were to provide the reliable delivery service ,would the TCP reliable delivery service be redundant ?Why or why not?

Although each link guarantees that an IP datagram sent over the link will be received at the other end of the link without errors, it is not guaranteed that IP datagrams will arrive at the ultimate destination in the proper order. With IP, datagrams in the same TCP connection can take different routes in the network, and therefore arrive out of order. TCP is still needed to provide the receiving end of the application the byte stream in the correct order. Also, IP can lose packets due to routing loops or equipment failures.

9.Why is an ARP query sent within a broadcast frame ? why is an ARP response sent within a frame with a specific destination MAC address?

An ARP query is sent in a broadcast frame because the querying host does not which adapter address corresponds to the IP address in question. For the response, the sending node knows the adapter address to which the response should be sent, so there is no need to send a broadcast frame (which would have to be processed by all the other nodes on the LAN)

## Chapter 5 \_Problems:

# Chapter 7 Multimedia Network

1.What is meant by interactivity for streaming stored audio/video?What is meant by interactivity for real-time interactive audio/video?

Streaming stored audio/video: pause/resume, re-positioning, fast-forward; real-time interactive audio and video: people communicating and responding in real time.

2.Three camps were discussed for improving the Internet so that it better supports multimedia application.

Camp 1: No fundamental changes in TCP/IP protocols; add bandwidth where needed; also use caching, content distribution networks, and multicast overlay networks. Camp 2: Provide a network service that allows applications to reserve bandwidth in the network.

Camp 3, differentiated service: introduce simple classifying and policing schemes at the edge of the network, and give different datagrams different levels of service according to their class in the router queues.

3.What are the advantage and disadvantage of each scheme?(three schemes for streaming stored media)

Figure 6.1: simple, doesn’t require meta file or streaming server;

Figure 6.2: allows media player to interact directly with the web server, doesn’t require a streaming server;

Figure 6.3: media player interacts directly with a streaming server, which has been designed for the specific streaming application.

5.Why is a packet that is received after its scheduled playout time considered lost?

A packet that arrives after its scheduled playout time can not be be played out. Therefore, from the perspective of the application, the packet has been lost.

## Chapter7 Problem

15.a.How is RTSP similar to HTTP?Does RTSP have method? Can HTTP be used to request a stream?

Like HTTP, all request and response methods are in ASCII text. RTSP also has methods (SETUP, PLAY, PAUSE), and the server responds with standardized reply codes. Yes, using the GET method, HTTP can be used to request a stream

b,How is RTSP different from HTTP? For example,is HTTP in-band or out-of-band ?Does RTSP maintain state information about the client (consider the pause/resume function)

RTSP messages use different port numbers than the media streams. Thus RTSP is out-of-band. HTTP objects are sent within the HTTP response message. Thus HTTP is in-band. HTTP does not keep session state: each request is handled independently. RTSP uses the Session ID to maintain session state. For example, in the lab (programming assignment) for this chapter, the RTSP server is in one several states for each session ID. When in the pause state, the server stores the number of the frame at which the pause occurred.

# Chapter 8 Security in Computer Network

1.What are the different between message confidentiality(保密性) and message integrity（完整性） ?Can you have one without the other ?Justify your answer.

4.Suppose that an intruder has an encrypted message as well as the decrypted version of that message .Can the intruder mount a ciphertext-only attack（唯密文攻击）,a known-plaintext attack(已知明文攻击) ,or a chose-plaintext attack（选择明文攻击）?