**1.1 What are two types of transport services that the Internet provoides to its applications? What are some characteristies of each of these services?**

面向连接的可靠数据传输（TCP）与无连接的不可靠数据传输（UDP）

TCP在传输数据之前建立连接，数据有序到达，提供可靠性，流量控制，拥塞控制

UDP传输之前不需要建立连接，不提供可靠性数据库传输，流量以及拥塞控制

**1.2 Suppose there is a link-layer switch between a sending host and a receiving host.Please list all delays if a packet is sent from source to distination. Which pf these delays are constant and which are variable?**

节点处理延迟，传输延迟，传播延迟，排队延迟

变量：排队延迟

常量：节点处理延迟，传输延迟，传播延迟

**1.3 What are the five layers in the Internet protocol stack?What are the principle responsibilities (主要职责)of each of these layers?**

应用层，传输层，网络层，数据链路层，物理层

应用层位面向用户的一层，提供各种应用；

传输层提供端到端的系统进程的通信；

网路曾提供源至目的端的路径选择；

数据链路层提供相邻节点的数据传输；

物理层提供透明的比特流的传输；

**1.4 If a host communications with another one whose IP address is known, how dose it get the MAC address from the IP address?**

通过ARP协议

每一个节点中的ARP模块在它的RAM中有ARP表，此表中存有IP地址到MAC地址的映射，发送方发送一帧数据给接收方时，若发送节点ARP表中有目的节点的映射，则直接使用此地址，若没有，则发送节点向局域网中所有的节点发送ARP查询报文，此查询分组通过广播的形式被局域网中所有的节点接受，所有的节点检查本身的IP地址是否和ARP包中的目的IP地址吻合，符合的节点发送ARP响应报文给查询节点，包括其MAC地址和IP地址的映射关系，发送节点更新本身的ARP路由表，利用查询的结果，发送数据报。

**1.5 Which layer in the Internet protocol stack does a router process? Which layer dose a link-layer switch process? Which layer does a host process? Which layer does a network adapter process?**

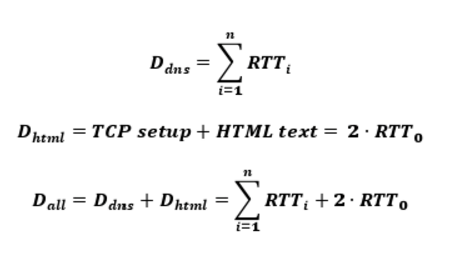
路由器：网络层及其以下各层

链路层交换机：数据链路层及其以下各层

主机：所有的五个层次

网络适配器（网卡NIC）：数据链路层，物理层

**2 Suppose within your Web browser you click on a link to obtain a Weg page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visted before your host receives the IP address from DNS the success visits incur an RTT of RTT1 ……RTTn Further suppose that the Web page associated with the link contains exactly one object consisting of a small amount of HTML text Let RTT0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object how much elapses(时间消逝) from when the client clicks on the link until the clients receives the object?**



**3 Define the following parameters for a switching network:**

**N = number of hops between two given end systems**

**L = message length in bits**

**B = data rate,in bps,on all links**

**H = overhead(header)bits per packet**

**P = fixed ed packet size in bits(include H)**

**S = call setup time in seconds**

**D = propagation delay per hop in senconds**

**For N=4,L=3200,B=9600,P=1024,H=116,S=0.2,D=0.001,computer the end-to-end delay for circuit switching and datagram packet switching Assume that there are no ACK ignore processing delay at the nodes.**

1. circuit switching

call setup times :C1 = S = 0.2

delay C2 = propagation delay + transmission delay = N\*D+L/B = 0.337

T = C1 + C2 = 0.537

2. datagram packet switching

Di:transmission delay and propagation delay of all packets to pass y=through ist hop

The number of packets = [L/(P-H)] = 4

t = transmission delay of one packet = P/B = 0.107

p = propagation delay of one hop = D = 0.001

D1 = 4t+p = 0.428

D2 = D3 = D4 = t + p = 0.108

T = D1 + D2 + D3 + D3 = 0.752

**4 Consider transferring an enormous file of L bytes from Host A to Host B Assume an MSS of 4096 bytes**

(a)What is the maximum value of L such that TCP sequence numbers are not exhausted（耗尽）? Recall that the TCP sequence nunber fields has 4 bytes.(You can express the value in exponential form)

TCP 序列号以字节为单位，其序列号字段长度为4个字节，因此一共有232个可能的序列号

由于序列号根据发送的字节数增长而增长，因此MSS的大小可以与从A发送到B的文件的大小无关，文件大小可以简单的估算为232Bytes

(b)For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 64bytes of transport. network and data-link header are added to each aegment before the resulting packet is send over a 230 bps link. Ignore flow control and congestion control as A can pump out the segment back to back and continuously.

需要传输的TCP报文段为232/4096=220

64字节的首部将带来220\*26=226字节的首部

需要船速的bit总数为（232+226）\*8 = 235+229 bits

（235+229）/230 = 32.5seconds

**5 Consider sending a 1000-byte IP datagram into a link that has an MTU of 400 bytes Suppose the original IP datagram is stamped with the identification number 2014**

1)Assuming the original IP datagram header length is 20 bytes. How many IP fragments are generated?

原始的IP包的净载荷为980字节（1000-20）

链路的MTU为400字节，减去20字节的包头，能承受的有效净载荷为280字节

由于净载荷为8的倍数，因此每一个IP fragmentation能够承载376字节的净荷

原始的980个字节被分成3个IP fragmentaton

2)What are the Identified. Fragmentation offset and Flags values in these IP fragment.

|  |  |  |  |
| --- | --- | --- | --- |
| 序号 | Indentifier | Fragmentation offset | Flags |
| 1 | 2014 | 0 | 1 |
| 2 | 2014 | 47 | 1 |
| 3 | 2014 | 94 | 0 |

**6 The minimum frame for fast Ethernet(100Mbps) is 64 bytes A switch designed for use with fast Ethernet has a backplane that can move frames at speed of 10 Gbps or the switch has ability to move frame ar speed of 10 Gbps . How many frames/sec should it handle in the worst case?**

The worst case is an endless stream of 64-bytes(512-bit)frames

If the backplane can handle 10\*230bps the number of frames it can handle is 10\*230 / 512 = 10\*221

20971520frames/sec