

2009 –Exam Summer [Network Computing]

Question 1: General Concepts [20 marks]

Each sub-question below is worth 2 marks. Answer either *True* or *False* in each case.

- a) **The Internet Protocol (IP) is a transport –layer protocol.**
 - False

- b) **IPv6 addresses are 128-bits in length.**
 - True

- c) **UDP does not provide flow control.**
 - True

- d) **HTTP uses TCP as its underlying transport protocol.**
 - True

- e) **A DNS server can map host names to geographic coordinates.**
 - False

- f) **TCP uses the sliding window mechanism to achieve flow control.**
 - True

Question 2: Packet Switching & Internetworking [40 marks]

- a) **Explain the basic principles of datagram packet switching as used in the Internet. [5 marks]**
 - Packet Switching is a digital networking communications method that groups all transmitted data – regardless of content, type, or structure – into suitably-sized blocks, called *packets*. Packet switching features delivery of variable-bit-rate data streams (sequences of packets) over a shared network. When traversing network adapters, switches, routers and other network nodes, packets are buffered and queued, resulting in variable delay and throughput depending on the traffic load in the network.

- b) **Identify the main steps that are taken by an IP router in processing a newly arrived packet. (Hint: think about the main fields in the IP header and what they are used for). [10 marks]**
 - If the buffer is full, the packet will be discarded.
 - First of all, the router makes sure that there are no bit errors using the checksum.
 - It then looks at the IP and determines the link to send the packet on.

Question 3: End-to-End Protocols [40 marks]

- a) **List the application-layer protocol, the transport-layer protocol and the network layer protocol that are used by file transfer clients and servers. [6 marks].**
 - FTP – Application Layer
 - TCP – Transport Layer

- IP – Network Layer

Draw a diagram showing the sequence of headers in a packet as it would be sent from a file transfer client to a file transfer server. [4 marks].

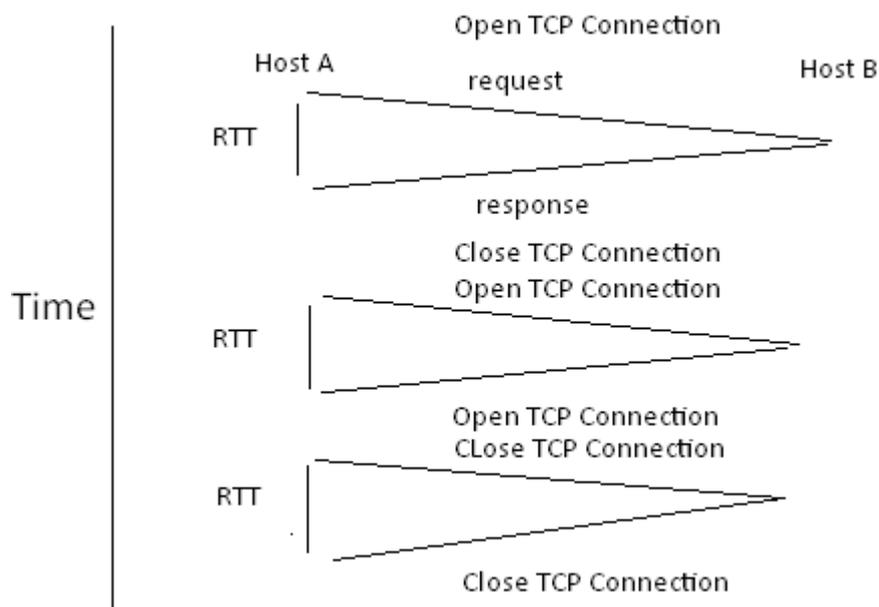
- FTP
- TCP
- IP

Explain the purpose of the port field in Internet transport protocol headers. [5 marks].

- The port field in the protocol header is necessary so when the server receives a packet it can forward the packet to the application that is listening on the port that the port field specifies.

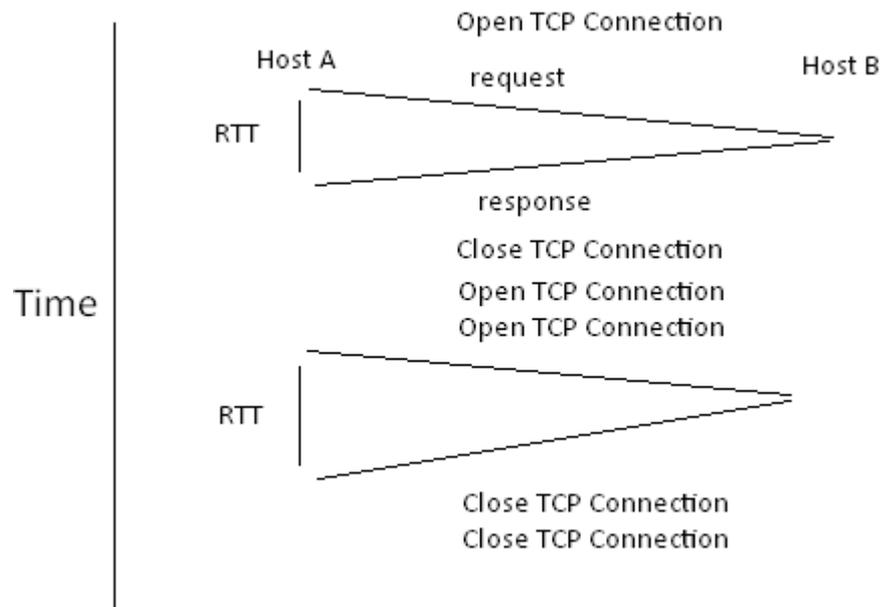
b) Suppose if a user clicks on a link using a web browser that it will result in the download of a HTML file corresponding to the link's URL. Further suppose that the HTML file lists two small image files on the same server, and that these two image files are then downloaded by the browser immediately after receiving the initial HTML file. For each of the cases below, calculate *using time sequence diagrams* the number of round trip times (RTTs) that elapse from when the user clicks on the URL to when the download of all *three* files is complete. Only consider delays due to TCP and HTTP exchanges. Assume that each object can fit in a single TCP segment and that there are no packet losses. For simplicity assume that to open and close a TCP connection requires a total of 3 RTTs. [15marks]

i) Nonpersistent HTTP with no parallel TCP connections.



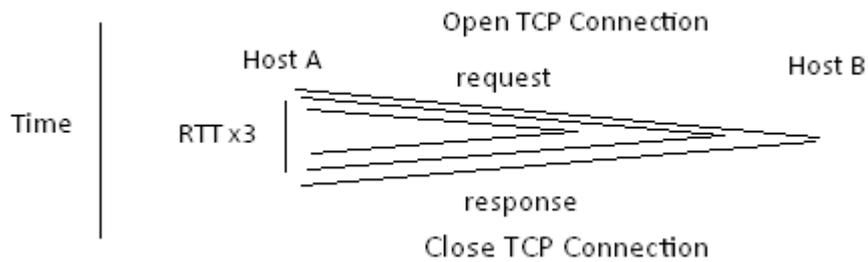
- 3 TCP, 3 RTT

ii) Nonpersistent HTTP with parallel TCP connections.



➤ 3 TCP, 2 RTT

iii) Persistent HTTP with no pipelining.



➤ 1 TCP, 3 RTT

Non persistent HTTP means the connection is closed instantly after each TCP request

Persistent means everything sent on one TCP

Parallel allows the two images to be requested over the same HTTP connection

c) **Video conferencing applications encode and packetize video and voice for delivery between computers on the Internet. The bandwidth required is relatively high and because users interact in real-time a low latency is desirable. Given the choice of TCP or UDP as transport protocol, which would you recommend for these applications and why? (Hint: think about issues such as reliability, latency, congestion) [10 marks]**

- I would choose UDP
 - With UDP the applications are loss tolerant, meaning if a packet is lost the transmission will continue, disregarding the lost packet while TCP would eventually retransmit the lost packet(s).
 - UPD can send packets faster than TCP because there is no flow control or congestion control.
 - Also UDP does not buffer packets as they are received; the application takes care of putting the data in order.

Question 4: Services & Security [40 marks]

a) Expand the acronym DNS. Copy the following figure into your answer book and use it to explain how the name of host `www.abc.com` is resolved to its corresponding IP address. [15 marks]

- The client makes a request to the DNS. The DNS then makes a request to the root name server looking for the IP of the `.com` name server. The root name server replies and then the DNS contacts the `.com` name server looking for the DNS server of the `abc.com`. The `.com` name server replies with the name server entry of the `abc.com` and the LNS then connects to this and gets the current IP of the `abc.com` host which is then returned to the client.

