

## Computer Networking

### Homework#2

1. Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
2. Describe how Web caching can reduce the delay in receiving a requested object.
3. Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP?
4. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that  $n$  DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of  $RTT_1, \dots, RTT_n$ . Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let  $RTT_0$  denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object and there is no local DNS server, how much time elapses from when the client clicks on the link until the client receives the object?
5. Assume that you click on a Web browser to obtain a web page from the web server. Assume the web page contains 3 very small objects on the same server. Let  $RTT_0$  denote the Round Trip Time (RTT) between the local host and the server containing those objects. Assume there is no proxy server. Neglecting packet transmission times, how much time elapses when the client clicks on the link until the client receives those objects with
  - (a) Non-persistent HTTP with parallel connections?
  - (b) Non-persistent HTTP with no parallel TCP connections?
  - (c) Persistent HTTP connections with pipelining function?