National University of Singapore
School of Computing

CS2105 **Problem Set 2** Semester 2 05/06

1. **(curl)** Web administrators may insert customized header fields into HTTP response headers. For this question, you are to use `curl -I` to view some customized HTTP response headers [1].
   (a) Find the value for the custom header field "X-Dubya:" from the Web server at the URL http://www.housedems.com.
   (b) Use curl to retrieve HTTP response header from the URL http://www.taoofmac.com. Follow the redirections specified by the response header, until you encounter an URL which returns the field "X-Answer:" in the HTTP response header. What is the value for "X-Answer:"?

2. **(dig)** Use `dig` to answer the following questions [2]
   (a) Name the authoritative DNS server for the domain 466453.com.
   (b) Find the IP addresses of www.nus.edu.sg. Repeat several times. Do you always get the same results?
   (c) From either your computer, or sunfire.comp.nus.edu.sg, find the IP addresses of Web server www.yahoo.com.
   (d) Use the dig server at URL `http://www.kloth.net/services/dig.php` (using your Web browser) and find the IP addresses of www.yahoo.com. Do you get the same results as part (c)?
   (e) Find the TTL value for the A-type DNS record of the following hosts at their authoritative DNS server:
      - sentosa.comp.nus.edu.sg
      - ubin.comp.nus.edu.sg
      - delco0.ddns.comp.nus.edu.sg
      - delco1.ddns.comp.nus.edu.sg

      Repeat several times. Did you observe any differences in the range of the TTL values for these hosts?

3. **(KR, Chapter 2, Problem 6)** Suppose with your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS look-up 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, ..., 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, how much time elapses from when the client clicks on the link until the client receives the object?

[1] curl is installed on sunfire. You may also download it from curl.haxx.se
[2] dig is installed on sunfire. You may also download the Windows version from pigtail.net/LRP/dig/

4. **(KR, Chapter 2, Problem 7)** Referring to Question 4, suppose the HTML file references three very small objects on the same server. Neglecting transmission time, how much time elapses with (a) Non-persistent HTTP with no parallel TCP connections? (b) Non-persistent HTTP with parallel connections? (c) Persistent HTTP with pipelining?

5. **(Socket Programming)** Implement a TCP client that does the following: (a) read the host name of a Web server from keyboard, (b) send HTTP request to the Web server. You may use "`HEAD`" HTTP request method instead of "`GET`" to retrieve only the HTTP response header, without the body. (c) print the name of the server software handling your HTTP request (i.e., the value of "Server:" field in HTTP response header). (d) repeat until an empty line is entered. Deal with any errors properly.

   An example run of the program is shown below. Lines prefixed with '>' are input from the user.

```
ooiwt@sf0:> java TCPclient
> www.cnn.com
Apache
> www.aol.com
AOLserver/4.0.9b
> www.google.com
GWS/2.1
> www.msn.com
Microsoft-IIS/6.0
> www.ooiwt.com
ERROR: cannot resolve host 'www.ooiwt.com'
> sunfire.comp.nus.edu.sg
ERROR: cannot connect to host 'sunfire.comp.nus.edu.sg'
>
ooiwt@sf0:>
```