

King Fahd University of Petroleum and Minerals  
College of Computer Sciences and Engineering  
Department of Computer Engineering

COE 344 – Computer Networks (T131)

**Homework # 02 (due date & time: Tuesday 01/10/2013 during class period)**

**Late homework submission will NOT be accepted**

**\*\*\* Show all your work. No credit will be given if work is not shown! \*\*\***

**Problem # 1 (40 points):** Suppose within your Web browser you click on a link to obtain a web page. Suppose that the IP address for the associated URL is not cached in your local host, so that a DNS look-up is necessary to obtain the IP address. Suppose that four (4) DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of  $RTT_1$ ,  $RTT_2$ ,  $RTT_3$ , and  $RTT_4$ . Further suppose that the Web page associated with the link contains exactly one object; the base HTML file. Let  $RTT_0$  denote the RTT between the local host and the server containing the object. Assuming  $t_{trans}$  transmission time of the base HTML file, find:

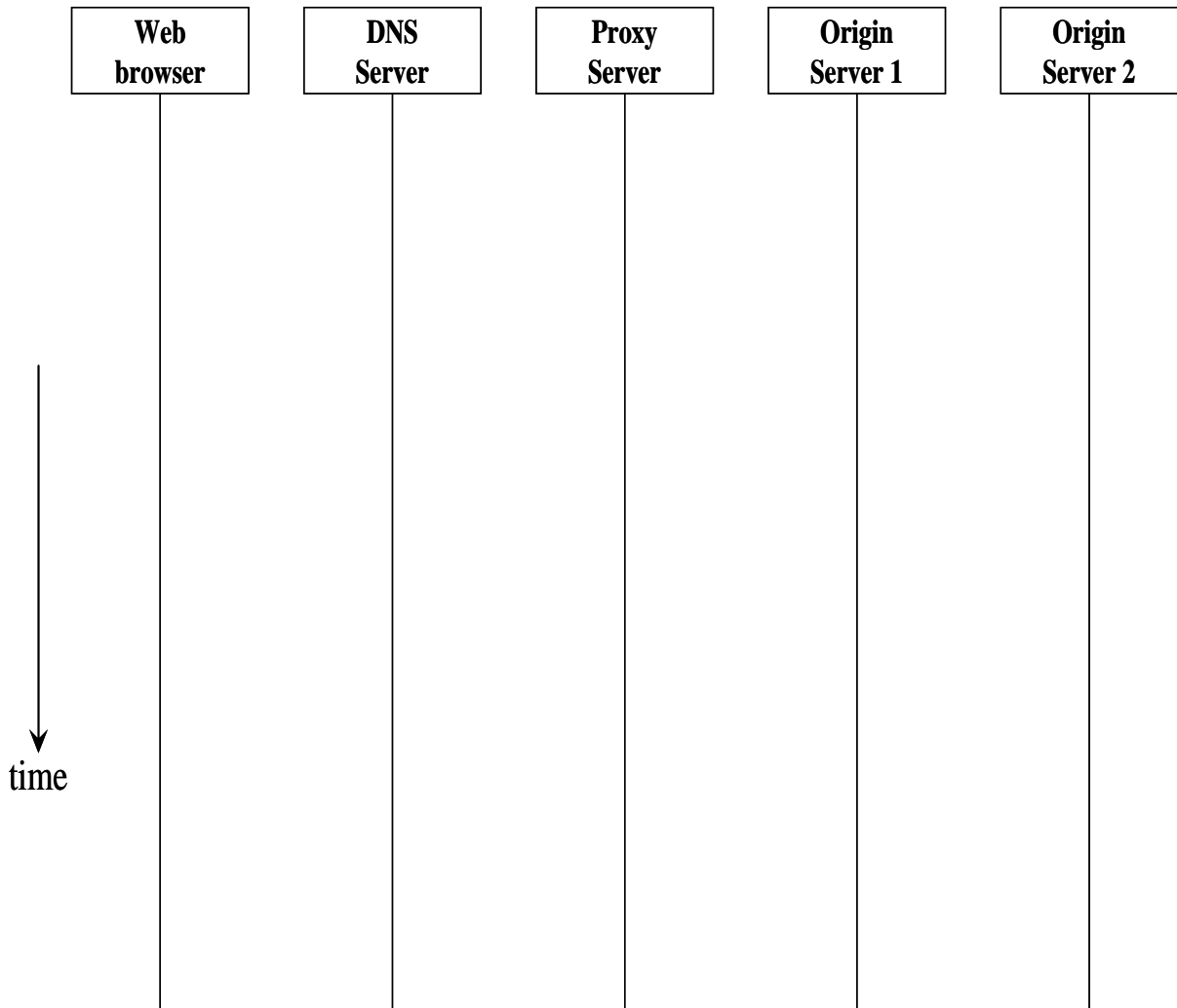
- a. **(8 points)** The amount of time that elapses from when the client clicks on the link until the client receives the base HTML file.
- b. Suppose the base HTML file indexes three (3) more objects. The first indexed object resides on the same server hosting the base HTML file. The second and the third indexed objects reside on a *different* server than the server hosting the base HTML file, and the IP address of such a server is already cached in your local host. Assume that  $RTT_0$  denotes the RTT between the local host and each server containing an object. Using the same assumptions used in part (a) for the base HTML file, and assuming the transmission time for each indexed object is  $t_{trans}$ , find the total amount of time that elapses from when the client clicks on the link until the client receives all objects with:
  - i. **(8 points)** nonpersistent HTTP with no parallel TCP connections
  - ii. **(8 points)** nonpersistent HTTP with parallel TCP connections (assume that parallel TCP connections **cannot** be made to different servers)
  - iii. **(8 points)** persistent HTTP without pipelining
  - iv. **(8 points)** persistent HTTP with pipelining

**Problem # 2 (60 points; 20 points each):**

1. Suppose within your Web browser you submit a URL to obtain a web page. Assume the following:
  - a. The IP address of the server hosting the requested web page is known to the Web browser.
  - b. The base HTML file indexes two (2) objects. Both objects do not reside on the same server that hosts the requested web page.
  - c. The IP address of the server holding the indexed objects is initially not known to the Web browser.
  - d. The local proxy server is used.
  - e. The base HTML file and the indexed objects are not cached by the local proxy server.
  - f. Persistent HTTP with pipelining is used.

Utilizing the following diagram, use labeled arrows to show the complete sequence of messages from the moment your Web browser requests the web page until the indexed objects in the base HTML file are received by your Web browser.

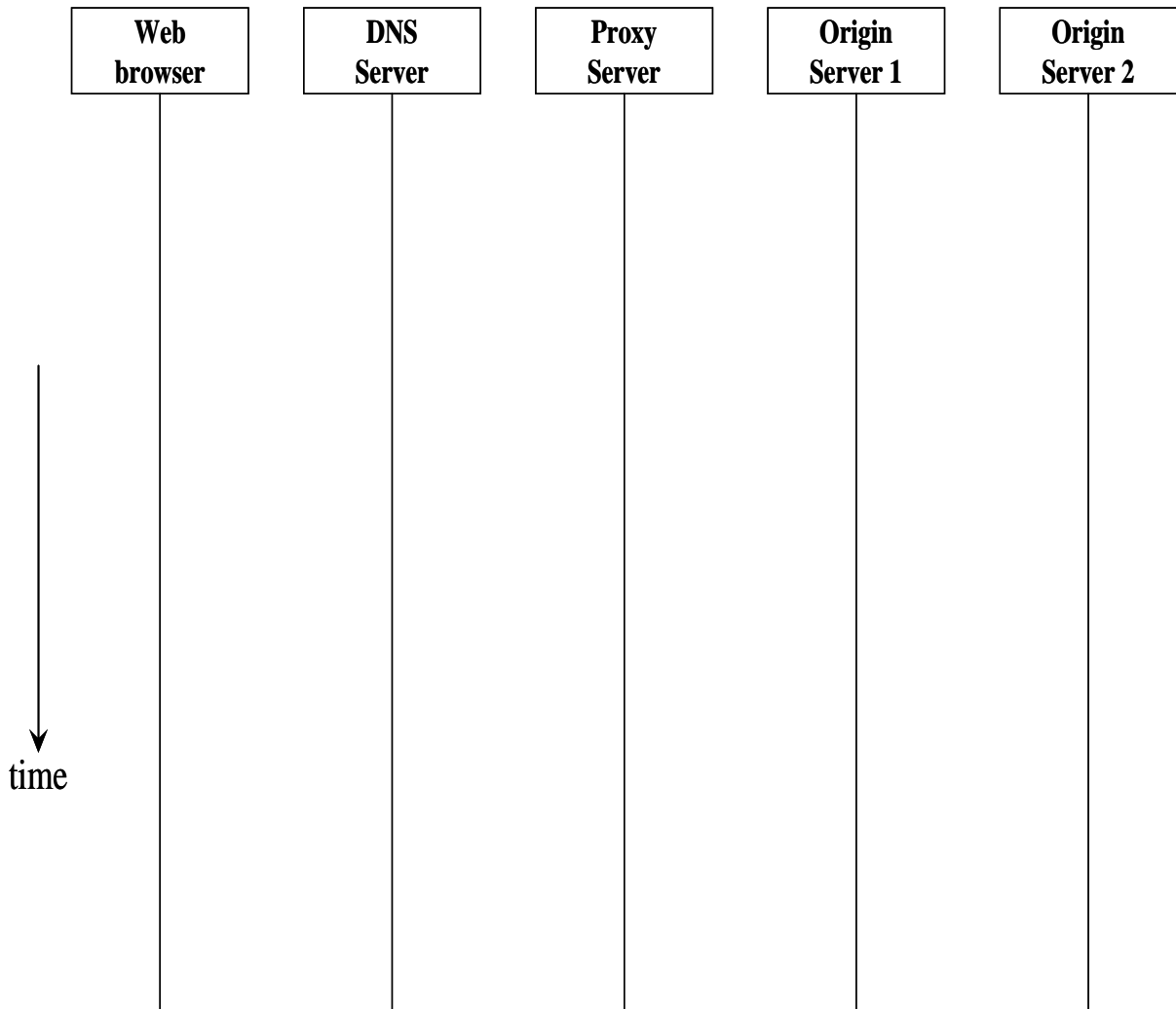
(note that the names of possible message that can be used are *TCP connect. request*, *TCP connect. granted*, *HTTP request*, *HTTP response*, *DNS query*, *DNS reply*)



2. Suppose within your Web browser you submit a URL to obtain a web page. Assume the following:
  - a. The IP address of the server hosting the requested web page is known to the Web browser.
  - b. The base HTML file indexes two (2) objects. Both objects do not reside on the same server that hosts the requested web page.
  - c. The local proxy server is used.
  - d. The base HTML file and the two indexed objects are already cached at the local proxy but stale. However, the IP addresses of the two servers hosting the base HTML file and the two objects are cached by the proxy.
  - e. Persistent HTTP with pipelining is used.

Utilizing the following diagram, use labeled arrows to show the complete sequence of messages from the moment your Web browser requests the web page until the indexed objects in the base HTML file are received by your Web browser.

(note that the names of possible message that can be used are *TCP connect. request*, *TCP connect. granted*, *HTTP request*, *HTTP response*, *DNS query*, *DNS reply*)



3. Suppose within your Web browser you submit a URL to obtain a web page. Assume the following:
- The base HTML file indexes two (2) objects. Both objects reside on the same server that hosts the requested web page.
  - The IP address of the server hosting the requested web page is known to the Web browser.
  - The local proxy server is used.
  - The base HTML file and the two indexed objects are already cached at the local proxy but stale.
  - Persistent HTTP with pipelining is used.

Utilizing the following diagram, use labeled arrows to show the complete sequence of messages from the moment your Web browser requests the web page until the indexed objects in the base HTML file are received by your Web browser.

(note that the names of possible message that can be used are *TCP connect. request*, *TCP connect. granted*, *HTTP request*, *HTTP response*, *DNS query*, *DNS reply*)

