

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

COE 344 – Computer Networks (T172)

**Homework # 02 (due date & time: Tuesday 27/02/2018 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 (30 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 two (2) DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of  $RTT_1$  and  $RTT_2$ . 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:

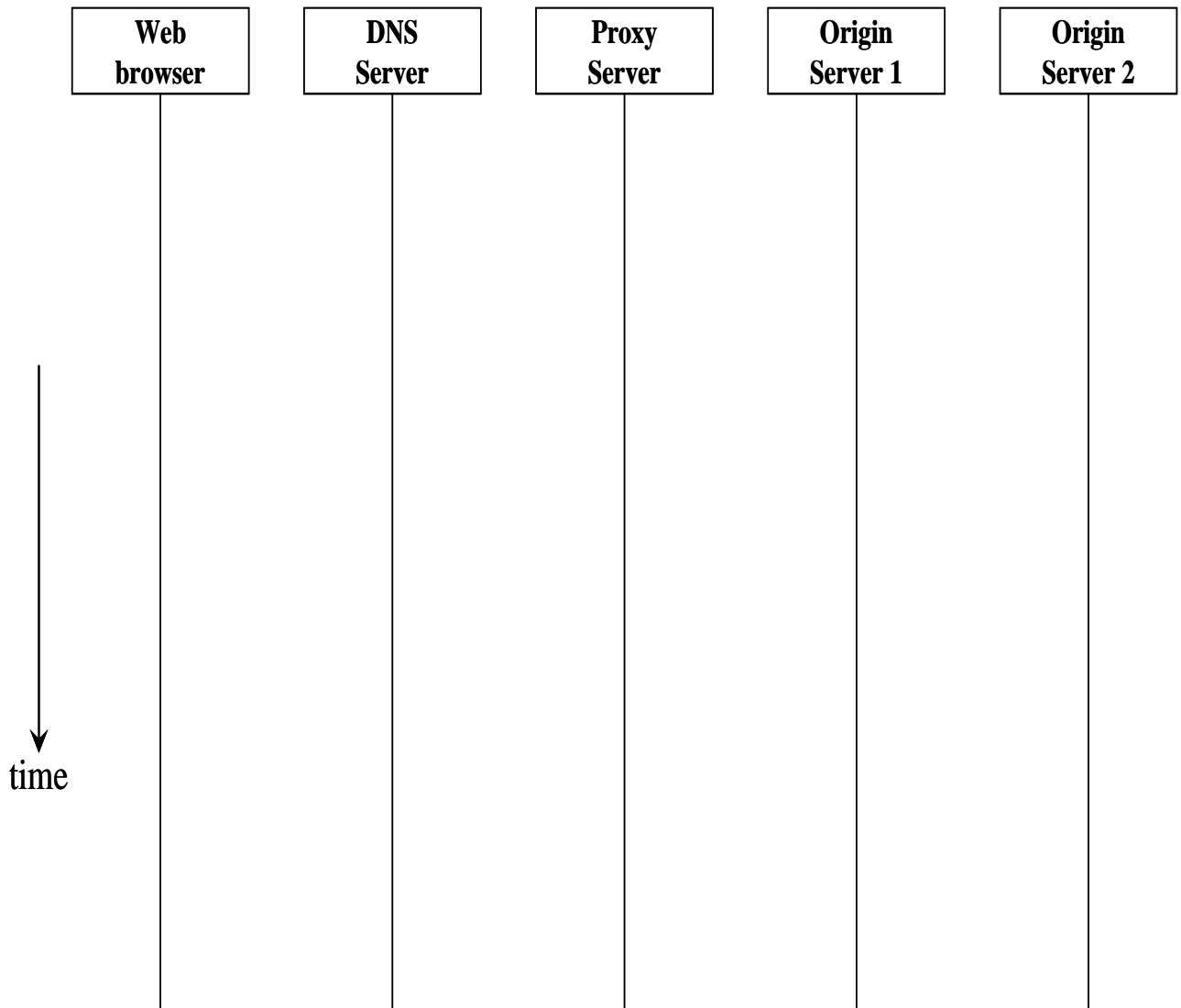
- a. **(6 points)** The amount of time that elapses from when the client clicks on the link until the client receives the base HTML file.
- b. Suppose the base HTML file indexes two (2) more objects. The first indexed object resides on the same server hosting the base HTML file. The second indexed object resides 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 (including the base HTML file) with:
  - i. **(6 points)** nonpersistent HTTP with no parallel TCP connections
  - ii. **(6 points)** nonpersistent HTTP with parallel TCP connections (assume that parallel TCP connections can be made to different servers at the same time)
  - iii. **(6 points)** persistent HTTP without pipelining
  - iv. **(6 points)** persistent HTTP with pipelining

**Problem # 2 (20 points; 10 points each):**

1. Suppose within your Web browser you submit a URL to obtain a web page. Assume the following:
  - a. The local proxy server is used, and currently has no established TCP connections.
  - b. The base HTML file is hosted by Origin Server 1 and indexes two (2) objects. Both objects reside in Origin Server 2.
  - c. The IP address of Origin Server 1 is not known to the local proxy server. On the other hand, the IP address of Origin Server 2 is already known to the local proxy server.
  - d. The base HTML file and the indexed objects have never been cached by the local proxy server.
  - 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*)



2. Suppose within your Web browser you submit a URL to obtain a web page. Assume the following:
  - a. The local proxy server is used, and currently has no established TCP connections.
  - b. The base HTML file is hosted by Origin Server 1 and indexes two (2) objects. The first object resides in Origin Server 1, while the second object resides in Origin Server 2.
  - c. The base HTML file is already cached at the local proxy and is up-to-date.
  - d. The two indexed objects are already cached at the local proxy but stale. However, the IP addresses of Origin Server 1 and Origin Server 2 are cached by the proxy.
  - e. Persistent HTTP without 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*)

