

# Course ISE 431: Distributed Information Systems

## Recitation 9-10 Exercise

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December 15-22, 2009

In this recitation you will implement a simple client and server using a simplification of the Network Time Protocol as discussed in class.

Your job is create two simple programs - a time server and a time client. To simplify your network communication you may use Java or C# classes which sockets or Remote Procedure Call (RPC). It doesn't matter for this exercise.

### 1 Time Server

The time server should listen on port 5000 for requests from clients. As in the class examples, the client should send its current time stamp ( $T_1$ ) in the request along with its IP address (this may come automatically if you use sockets).

The server should note its (local) arrival time ( $T_2$ ) and send back the following data to the client:

- $T_1$  - the client's sending time
- $T_2$  - the arrival time at the server
- $T_3$  - the sending time at the server

### 2 Time Client

The time client should begin running by taking a copy of the current time from the computer.

The time client should send requests to the time server on port 5000 with its current request time ( $T_1$ ). When it receives the response it should note the arrival time  $T_4$ .

To calculate the estimated offset, use the offset calculation shown in class:

$$\theta = T_3 - \frac{(T_2 - T_1) + (T_4 - T_3)}{2} + T_4 = \frac{(T_2 - T_1) + (T_3 - T_4)}{2}$$

The time client should calculate out the estimated  $\theta$  for the request and adjust its copy of the current time accordingly.

### 3 User Interface

Create a user interface for the time client and time server.

The time server should be multithreaded or use RPC. It should print out a log message on the server computer each time a request is received. The log line should include the IP address of the requestor,  $T_1$ ,  $T_2$ , and  $T_3$ .

The time client should have a mechanism of initiating a request (a button, a menu command, etc) to a given time server (may be hard coded). The time client should print the time it sent the request,  $T_4$ , and the new time that it calculated.