CSE 4074 Programming Assignment: Remote Sensing Application

Due Date: January 7th, Sunday, 23:59

In this assigment, you will implement a networked system which consists of two sensors, a gateway, and a server. You will implement all of these modules as applications (no need for any hardware other than your computers). The specification is given below.

Sensors:
You will have a temperature sensor and a humidity sensor. However, these are not actual sensors; they are two applications that generate sensor values randomly and periodically send them to the gateway. The temperature sensor is connected to the gateway via TCP, while the humidity sensor sends values to the gateway via UDP. Every second, the temperature sensor generates a value randomly between 20 and 30 and sends it to the gateway along with the timestamp. Meanwhile, the humidity sensor generates random values between 40 and 90 every second but sends information only if the humidity value exceeds 80. Additionally, every 3 seconds, the humidity sensor should send an 'ALIVE' message to indicate that it is working properly.

Gateway:
The gateway is an application that reads values from the sensors and sends them, along with their timestamps, to the server. Additionally, the gateway monitors sensor activities. If the temperature sensor fails to send any values for 3 seconds, a 'TEMP SENSOR OFF' message will be sent to the server. Similarly, if an 'ALIVE' message is not received from the humidity sensor for more than 7 seconds, a 'HUMIDITY SENSOR OFF' message will be sent to the server.

Server:
The server is connected to the gateway and receives messages based on a protocol defined by you. Initially, the gateway and server should perform a handshake, after which the gateway provides information about the connected devices. Subsequently, all data related to the connected devices will be transmitted to the server, where it will be stored. The server will also feature a web interface, with an HTTP process listening on port 8080. If the server is accessed via 'http://localhost:8080/temperature,' it will send an HTML object containing all temperature data. Similarly, when connected through 'http://localhost:8080/humidity,' an HTML object with all humidity data will be sent. These values will be displayed in text format by any web browser. (If you would like you may add more sophisticated graphical illustrations.)

Bonus: You will get maximum of 10 points bonus, if the humidity sensor is also capable of sending the last measured humidity value when requested by the server (this request may be triggered by the user via the web interface. You may define another url as http://localhost:8080/gethumidity).

Note that the server does not have any direct communication with the sensors. The gateway does not have any storage unit, all the values are stored in the server. The sensors are only capable of storing the last measured value.

All the processes should display the sent and received messages on the screen. Also please provide log files which include these received and sent messages.

Implementation

You can use any programming language of your choice (Java, Python, C, C++, etc). **You should use only socket programming.** Do not use any sophisticated libraries downloaded from the web. You will need to use multi-threaded server processes. Although we have covered the implementation of single-threaded servers in the lecture, there are tons of materials that you may refer for the description of multi-threaded server implementation, and also it is expected that you have some familiarity from the Operating Systems course.

Submission

The due date for this assignment is January 9th, 11.59pm. The deadline is strict, there will be no extension. It may take longer than expected, please start as soon as possible. You have to submit a zip file "your_names.zip" including all **commented** source codes, a **PROJECT REPORT** which contains **a project summary, your solution approach, any encountered problems and how you solved them, any unresolved issues, and a usage explanation. You should also give details of the protocol that is used between the server and the gateway.** You can submit your projects via Google Classroom.

Late submissions: 25% penalty after the deadline and another 25% for every 24h after the deadline.

*You can do this assignment **in groups of three students**. You are not allowed to exchange code snippets or anything across groups. Also you are not allowed to use any code from the Internet (github, etc). We will check your codes for plagiarism.*