**SMART THERMOSTAT: REQUIREMENTS ANALYSIS DOCUMENT**

The project aims to develop a smart thermostat that is capable of operating via UART over a light weight/custom HTTP protocol. To ensure authorized access, simple authentication protocols, such as pre-shared keys or simple token-based authentication are used. The project also aims to create a server that can parse the custom HTTP-like request over UART. To ensure that the system is energy-efficient, efficient energy-saving algorithms are developed incorporating adjustment of temperature based on user patterns, outside weather conditions and time of day.

To login into the system and adjust the thermostat settings, the user must enter the username and password. The username and password are pre-shared to enable access to the system. To ensure security and efficiency, encryption algorithms based on symmetric key cryptography will be used. Error-handling should also be implemented to handle cases where username and/or password are incorrect.

In the proposed system, the login feature is implemented over UART. But UART lacks authentication or encryption mechanisms. So, a simplified HTTP-like protocol over UART is implemented. The username and password are encrypted using a shred secret key before transmitting it over UART. The receiver decrypts it using the same key. If the username and password is valid, access is granted. Otherwise, error messages will be displayed on the console and prompt again to enter username and password again.

The server database stores the username and password. Once the user enters the username and password, it is compared with the username and password that is already stored in the database. If the comparison is evaluated to be true, access is granted.

There are two approaches that can be used to store the username and password: First one, is to store the username and password as plain text in the server database. The second approach is to store hashed username and password to enhance security.

Once the user successfully enters the system, the user can transmit commands over UART using UART terminal(client) running on a computer. The first command supposed to be is “Get temp value”. The server then processes the request. Then it fetches the current temperature value based on the temperature sensor readings and transmits this value over the UART to be displayed on the terminal.

The second command is “Set temp value”. By using this command, the user can set the thermostat to a temperature of user’s choice. What happens on the flip side is that the new temperature value is now stored on the database and the thermostat is set to this value.

The third command is “Schedule temp-value date time”. For instance, if the user wants to schedule a temperature of 25 degree-Celsius on May 1st,1pm; this can be possible using the command “Schedule 25 4/1/24 13”.

Another possibility of the proposed system is the possibility to adjust the temperature settings based on user-patterns, outside weather conditions and time of day to maximize energy-efficiency. But user-preference settings will also be incorporated into this logic to enable manual overrides and user’s comfort.

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