ECE 528- Application Software Design

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Due Date: March 2nd, 2023

Question 1:

i.   Whether we create a new thread for each request or use a thread pool, we should expect each HTTP request to be handled in a separate thread. The methods in PlugSim are synchronized with a lock, as the methods for plug switching and generating a report are independent. However, interleaving of switch and report calls from multiple users is possible, resulting in responses that may match the requests (e.g., "on" for "on" and "off" for "off"), or may be inconsistent (e.g., "off" for "on" and "on" for "off").

ii.   The outcome is determined by the order in which switchOn () or switchOff () is invoked, as well as which request is executed last.

Question 2:

- The function TOGGLE should be executed only once since it reverses the previous plug state. Executing it more than once can lead to confusion and cause the plug status to switch more than once, making it impossible to track. While the risk of message loss exists, the sender cannot determine when to resend the message since the message loss is unknown.

- ON and OFF are considered as absolute commands, which implies that they direct the plug to switch to a specific state, regardless of how many times they are transmitted. Therefore, they can be transmitted as many times as needed to achieve the desired outcome while supporting both exactly-once and at-least-once delivery modes. The message can be transmitted multiple times using at-most-once delivery to increase the chances of the message not being lost, thereby providing an additional level of delivery assurance.

Question 3:

- To achieve this, you can utilize the existing subject (prefix/update/plug/power) and add more message content to it. Along with the plug status and power, you can include a timestamp with a different key (not "state" or "name"), such as "timestamp". It is not necessary to publish the messages to a different topic.

- The format of the message would be: "PlugName, Power, Timestamp".