**HW #2: MQTT CoAP and HTTP Protocol Analysis Group 8**

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| **Percent Contribution** | |
| Stepan Kalinin | 25% |
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|  | **TASKS** | Stepan Kalinin | Connor Smith | Sagar Hirenallur Prasannakumar | Rishab Gujarathi |
| MQTT QOS1 | Code |  |  | 50% | 50% |
| Debug |  |  | 50% | 50% |
| Report |  |  | 50% | 50% |
| MQTT QOS2 | Code |  |  | 50% | 50% |
| Debug |  |  | 50% | 50% |
| Report |  |  | 50% | 50% |
| CoAP | Code | 100% |  |  |  |
| Debug | 100% |  |  |  |
| Report | 100% |  |  |  |
| HTTP | Code |  | 100% |  |  |
| Debug |  | 100% |  |  |
| Report |  | 100% |  |  |
| Report | | 25% | 25% | 25% | 25% |

**1. Objective**

For this task, we will be evaluating three communication protocols - HTTP, CoAP, and MQTT (with QoS 1 and 2) - that are commonly used in IoT. Our objective is to determine which protocol is most suitable for transferring different sizes of data, how long it takes to transfer the data, and how much overhead is generated by the header for each protocol.

**2. Description**

**2.1 MQTT**

**Development**

To test the MQTT protocol, we used three computers - one as a publisher, one as a subscriber, and one as a broker. We implemented the subscriber and publisher using the paho-MQTT library in Python and used the open-source MQTT broker Eclipse Mosquitto. Wireshark was used to sniff the packets and calculate the overhead and application-level data.

To calculate the transfer time, we recorded the start time at the publisher and subscriber ends, and then calculated the difference between them. We also captured packets at the publisher end to ensure all packets were captured. We used a Wireshark packet transfer in Python to read the packet data and calculate the total application layer data transferred. Additionally, we sent the end time from the subscriber to the publisher via MQTT to calculate the transfer time at the publisher end.

**Observation**

We discovered that increasing the file size resulted in higher throughput, as the same-sized file was sent multiple times from the sender to the receiver. However, transferring larger files fewer times caused some delays since the underlying protocol is TCP. Additionally, sending the file in a single message resulted in increased throughput with increasing file size. The overhead decreased as file size increased since the entire data was sent in a single MQTT protocol, resulting in similar overhead for each message. We also noted that the overhead of QoS 2 was higher than QoS 1 due to the Publish Release message sent from the sender to the receiver, contributing to the overall overhead. These observations provide valuable insights for selecting the most appropriate IoT protocol based on the data size, transfer time, and header overhead.

**2.2 CoAP**

**2.3 HTTP**

**3. Comparison**