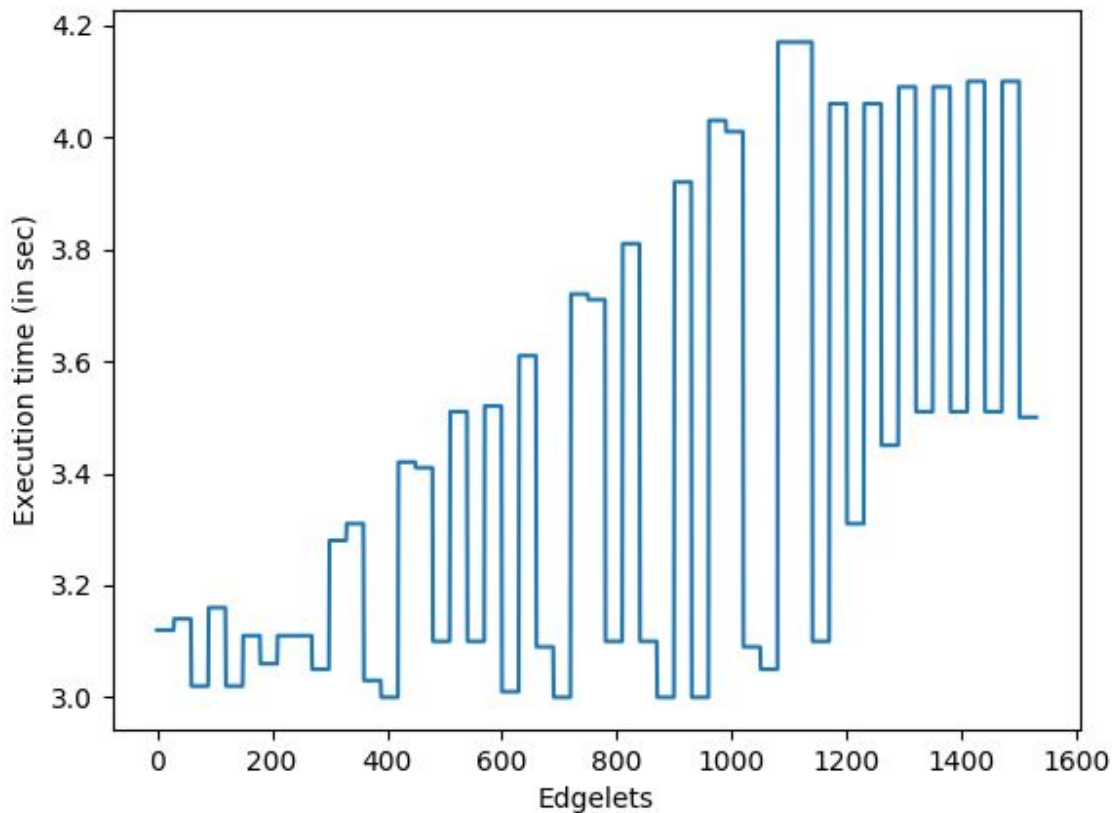


I. Healthcare System

A system of many moving IoT devices (to be considered the equivalent of 'FitBits'), which can process data. These devices move in a specified direction while transmitting data. The simulation parameters are configured in multiple ways and the effect of each parameter on the simulation results (queue time, battery duration etc.) is observed.

The system is constructed in the following manner : 30 IoT devices in groups of ten. Each group moves from (0,0,0) along a particular axis over the course of the simulation. The Edge Device being used is a Raspberry Pi.

The results for the base simulation are as follows:



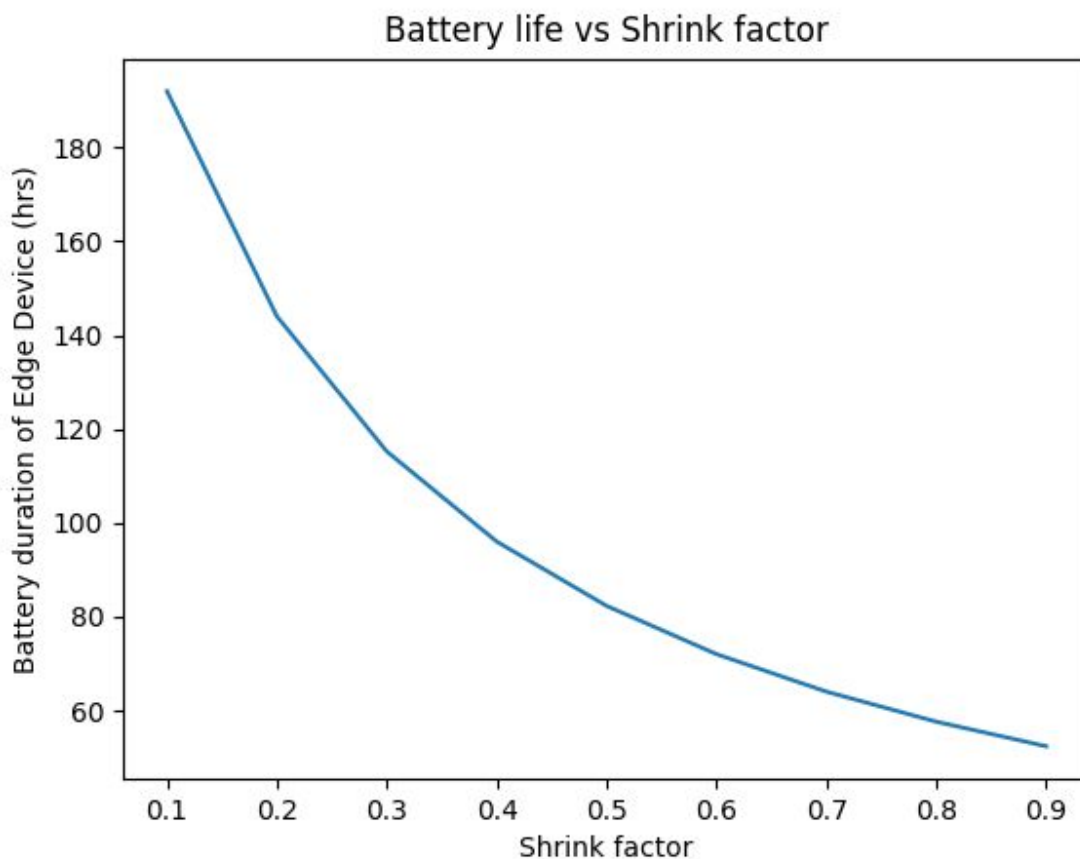
Mean Execution Time - 3.422

Variance - 0.160

Considering that this is not a time critical application, a latency of around 3.5 seconds is acceptable.

Furthermore, since the edge devices are also battery powered, we have tested how the battery life of the edge devices varies with different shrink factors. The shrink factor is a measure of the degree of computation to transmission. If the shrink factor is low, then a larger portion of the data is processed on the edge device itself and not sent to the cloud.

Research has shown that transmission drains more battery than computation and thus for a longer battery duration, more computation must be done on the edge itself. However, transmitting the data ensures faster processing and should be considered in real time applications with strict requirements.



Finally, the choice of network/communication protocol is considered. The network protocol chosen is Bluetooth, specifically a low energy version of Bluetooth called BLE (Bluetooth Low Energy). BLE's energy efficiency and low data rate has made it one of the more popular protocols in many applications.

There are four communication protocols available in IoTSim. They are as follows:

Protocol Name	Transmission Speed	Battery Drain Rate
MQTT	1	1
AMQP	1	1
COAP	3	1
XMPP	3	1.5

We can see that COAP appears to be a little better than XMPP which is the default. However, XMPP has a higher drainage rate due to the fact that it is built over TCP, offering it fault tolerance as compensation. In this case however, since messages are continuously transmitted, it is okay to use UDP as base protocol and thus we switch to COAP, allowing the battery of the IoT devices to last longer.