IoT 2023

Assignment 1
Collecting data from IoT-LAB

We assume that you have an account on IoT-Lab. If you don't, please contact Philippe or Kasper. Instructions for connecting to the IoT-Lab testbed without pymakr are on Learnit (W8 – getting started with the testbed).

Part 1.

You should measure temperature from the embedded sensors on 10 pycom nodes of the Strasbourg testbed and report the average temperature per minute over 2 hours.
You should use LoRa from the sensor nodes to send data back to the ITU server, as you did in the exercises of W6. We have setup a LoRa network server in Strasbourg that is configured as the network server you used in the class during the exercise.
You can get access an MQTT broker that we have set up at ITU. This MQTT broker forwards messages to and from the Pycom nodes of the IoT-Lab testbed in Strasbourg. Information on doing this found at https://github.itu.dk/khjo/IoT2023-TestBedResources

You should describe (i) the architecture of the system including the relevant parts of the IoT-Lab testbed, the LoRa network and the backend system, (ii) the design, implementation and test of the embedded program run on the pycom nodes in Strasbourg, and (iii) describe the results that you obtain.

Part 2.

You should configure 10 pycom nodes from the IoT-Lab testbed in Strasbourg into a multi-hop bluetooth network. You should pick two nodes that are most hops away from one another: one of them is configured as a source (it measures the on-chip temperature) and the other is configured as a sink (it receives temperature and forwards it through LoRa as in part 1). The other nodes are arranged in a multi-hop topology connecting the sink and the source.

Bluetooth is a connection-oriented protocol. Two nodes need to establish a connection, before they can transfer data. We can use the advertisement mechanism designed to establish a connection, as a rudimentary mechanism to send/receive data from one node to another: one device sends an advertisement that contains a key-value pair (set_advertisement) while the other listens to advertisements (resolve_adv_data) and receives the key-value. See, the documentation of Bluetooth in Pycom for details.

You should (i) describe the topology of your multi-hop network and how you achieve that topology with Bluetooth, (ii) describe the design, implementation and test of the embedded programs and how you deploy them on the testbed and (iii) describe the results you obtain running a 20 minutes experiment.

Optionally, you can design your embedded programs to minimize energy consumption. You can describe how you modify your initial design to introduce as much deep sleep as possible.