

# Internet of Things - Homework - Question 2

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## Question

You are required to design an IoT system to monitor the status of the production process in a small indoor bacterial cellulose factory. The factory is operated in a small university lab (100sqm) and has about 20 bacterial cellulose growing basins, which must be monitored continuously to ensure the growing process is successful. The main parameters to be monitored are luminosity (2 bytes), content of sugar (2 bytes) and pH of the growing solution (1 byte). Growing bacterial cellulose is a slow process, with growing cycles of about 14 days. Monitoring cycles of 1 hour are needed to allow for changing the environmental parameters for an optimal process.

2. Write the pseudocode of the firmware that should be run by the monitoring device installed on each basin.

## Answer

Each monitoring device should first go through a setup phase to prepare the sensors and communication modules. In particular, they should connect to the Wi-Fi network and the MQTT broker. Then, if needed, it should set up the luminosity, sugar content, and pH sensors.

After the setup phase, the monitoring device should enter a loop where it reads the luminosity, sugar content and pH values. It then sends the data to the central server and goes into deep sleep mode for 1 hour. This process

should then be repeated indefinitely to continuously monitor the production status.

To recognise the monitoring device, a unique sensor ID could be assigned to each device. This could allow the central server to identify the source of the data and monitor the status of each basin. This value should be sent along with the data in the MQTT publish message.

In alternative, different topics could be used for each sensor, with the sensor ID included in the topic name.

```
sensor_id = 1

mqtt_host = "10.0.0.1"
mqtt_port = 1883

wifi_ssid = "my_wifi"
wifi_password = "my_password"

function setup():
    setup_wifi(wifi_ssid, wifi_password)
    setup_mqtt_client(mqtt_host, mqtt_port)

    setup_luminosity_sensor()
    setup_sugar_content_sensor()
    setup_ph_sensor()

function loop():
    luminosity = read_luminosity()
    sugar_content = read_sugar_content()
    ph = read_ph()

    send_data(sensor_id, luminosity, sugar_content, ph)

    deep_sleep(1 hour)
```