Puoi visualizzare e modificare la tua risposta   Modifica risposta

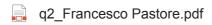# IoT 2023/2024 - Homework #4

IoT system design

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.

1. Propose an overall design for the system, mainly focusing on the communication technology to be used. Motivate your choice
(Domanda non anonima ⓘ)

   📄 q1_Francesco Pastore.pdf

2. Write the pseudocode of the firmware that should be run by the monitoring device installed on each basin (Domanda non anonima ⓘ)

   📄 q2_Francesco Pastore.pdf

3. As an add-on, you are required to install a VGA camera (640x480 pixels, 8 bits per pixel) to monitor the status of the growing process. Is the solution proposed at the previous points still valid? If not, propose an alternative solution.
(Domanda non anonima ⓘ)

   📄 q3_Francesco Pastore.pdf

Short-range connectivity

A personal area network (PAN) works in IEEE 802.15.4 beacon-enabled mode with CFP only, and with a nominal data rate of 250 [kb/s]. Motes in the network have uplink only traffic towards the PAN with the following distribution: P(r=0 [bit/s])=0.1, P(r=10 [kb/s])=0.3, P(r=20 [kb/s])=0.6. Motes use packets of b = 128 bytes for communication, and each packet fits exactly one slot in the CFP.

4. What is the beacon interval (BI) in ms?

   102.4

5. What is the slot time (Ts) in ms?

   4.096

6. Assuming the maximum duty cycle allowed is 30%, what is the active part of the superframe (Tactive) in ms?

   26.624

7. How many active slots are there in the ~~CFP~~ Beacon Interval ?

   6

8. How many inactive slots are there in the ~~CFP~~ Beacon Interval ?

   18

9. How many motes can join the network?

3

Long-range connectivity

You have setup a weather monitoring station on your balcony and would like to transmit the acquired data over a web service (e.g., ThingSpeak). You have no Wi-Fi connectivity at home, therefore you plan to use a long-range IoT communication technology. After careful consideration, you need to choose between LoRa and NB-IoT

10. **What are the main factors you would look at to make your final choice?**
    (Domanda non anonima ⓘ)

    📄 q10_Francesco Pastore.pdf

11. **You opt to use LoRa, using an open-source gateway close by (e.g., provided by the Things Network). However, your transmission are not successfull. What are the possible causes, and what kind of solutions could be adopted?**
    (Domanda non anonima ⓘ)

    📄 q11_Francesco Pastore.pdf

🟦🟥 Microsoft 365