Lab 5

School of Architecture, Civil and Environmental Engineering

EPFL, WS 2023-2024

http://disal.epfl.ch/teaching/signals_instruments_systems/

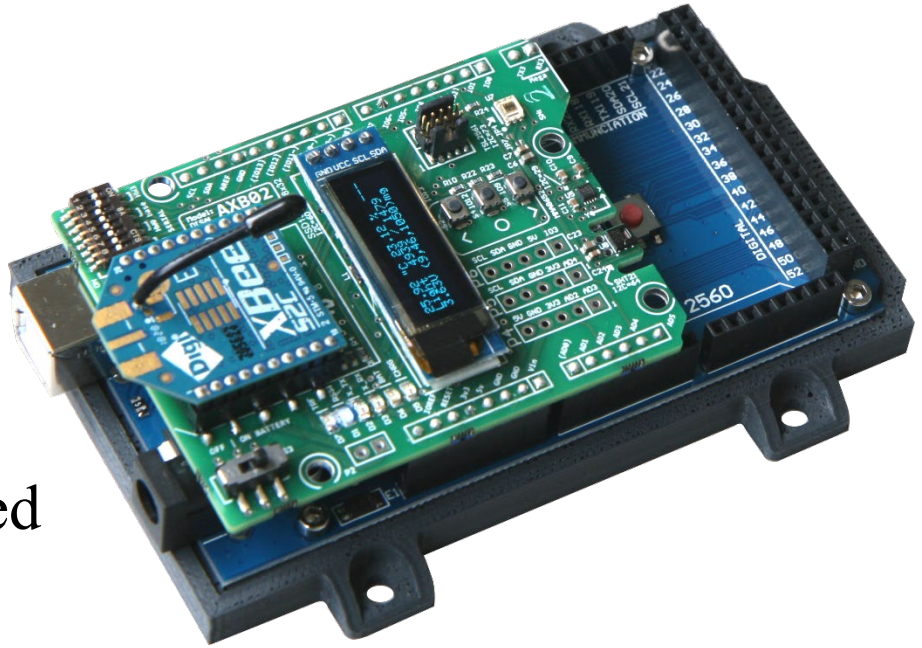
What you will learn today

- Sensor nodes
- Local sensing with one node
- Remote sensing with two nodes

- New hardware tools:
  - Arduino
  - Xbee communication

Hardware

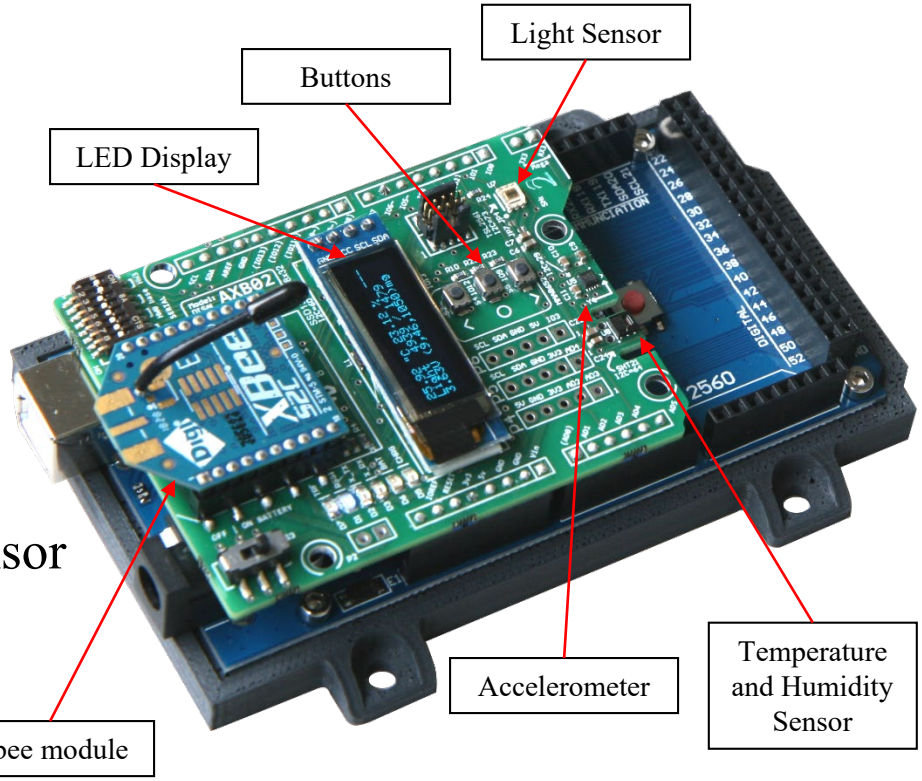
- You will receive:
  - 2 Sensor Nodes
  - 1 Usb Cable



- Each sensor node is composed by:
  - 1 Arduino board
  - 1 Sensor shield
  - 1 Xbee module for communication

Hardware

- You will work with:
  - LED display
  - Buttons
  - Light sensor
  - Accelerometer
  - Temperature and Humidity Sensor
  - Xbee communication module



Software

- Use the Arduino IDE installed on the computers.
  - NOTE: if you are working in the EPFL computer rooms, open the IDE first and then open the files inside it
- Download and extract the .tar file with the code from Moodle

Programming an Arduino

- Connect the Arduino to your computer
- Select the correct *Board* and *Port* in the *Tools* menu
- Add the libraries you need the first time you use them (*Sketch/Include Library/ Manage Libraries)*
- Verify your code 
- Correct mistakes (if any), they will be shown in the console
- Upload code to the board 

Arduino code structure

- setup() → called once at startup or reset, used for initialization and configuration
- loop() → main body of the program. Keeps looping

Arduino communication

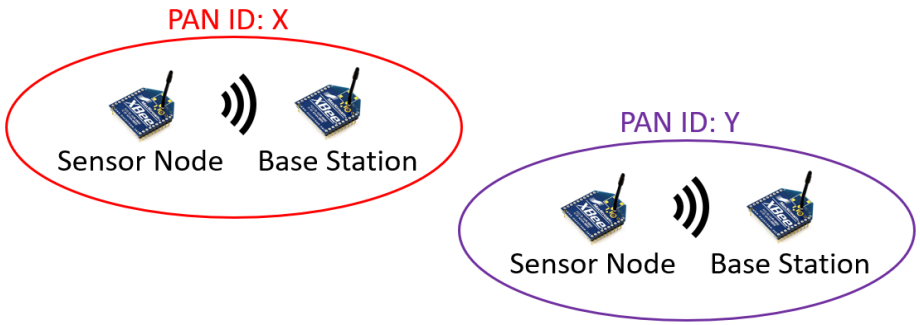
- Serial line communication via USB cable between the board and the computer (*Serial.print("Hello world/n");*)
- Baud rate (set to 9600 for this lab)
- Serial monitor and Serial plotter tools
- I2C communication between microcontroller and sensors (already implemented)

Xbee basics

- Low cost and easy-to-use modules for short-range communication
- Zigbee and 802.15.4 compliant
- Two nodes:
  - One used as transmitter (power it with the battery)
  - One used as a base station (connect it to the computer)
- Transmitter node: reads data from sensors and sends it to base station
- Base station: receives data from transmitter and sends it to the computer

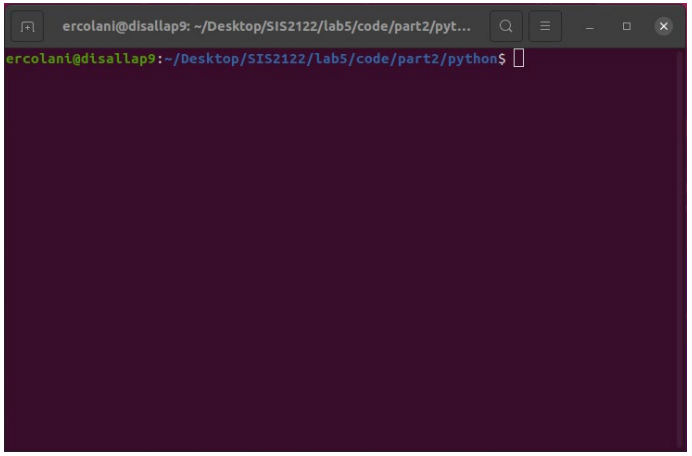
Xbee programming

- In this lab, the Serial3 line is used to communicate from the board to the Xbee.
- In part 3, set the same PAN ID in the transmitter and in the receiver to create a network (**use the number of your computer as PAN ID**)



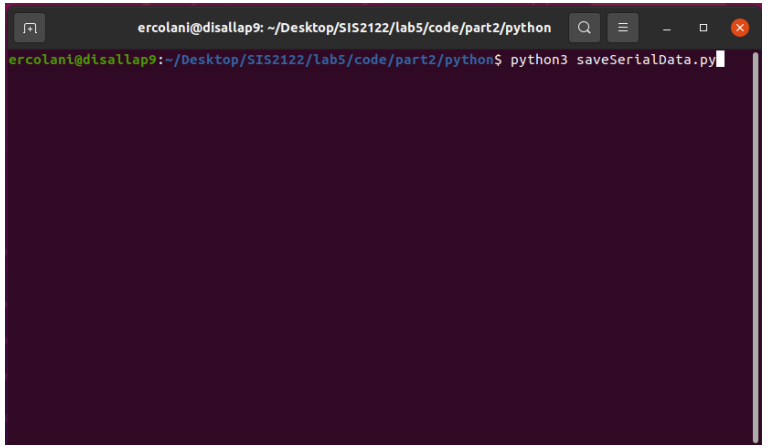
Python scripts

- We will use Python scripts to save the data on the computer.
- Open the terminal
- Run this command to install a missing library:
  - *pip3 install pyserial*



Python scripts

- On the terminal, navigate to the python directory of the lab(in either parts 2 or 3)
- Use the “cd” and “ls” commands to navigate to the appropriate directory
- Launch the python scripts by running:
  - *python3 nameOfScript.py*



At the end of the lab

- Upload the code in the folder *maintenance* on both boards
- Ensure that the battery switch is off

Please fill out the feedback form for Lab 5!

Thank you!