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I. Introduction
This document describes the necessary steps to set up the Lion board as a LoRa end point. You can run the demo without a LoRa gateway and an account at Digimondo’s FireFly IoT (LoRa) platform. In this case You will only be able to see the LoRa messages sent by the Lion board on the serial port.

(For acquiring a gateway and an account please contact the Arrow office of your region.)

II. Hardware prerequisites
- Arrow SmartEverything Lion board
- X-NUCLEO-IKS01A1
  - LSM6DS0 – MEMS 3D accelerometer
  - LIS3MDL – MEMS 3D magnetometer
  - LPS25HB – MEMS pressure sensor
  - HTS221 – humidity sensor

1) Attach the antenna and place the sensor shield on top of the Lion board!
2) Connect the board to your computer’s USB port using the mini-USB port on the board.

III. Software prerequisites
- Arduino IDE (check Lion board’s User Manual for link)
IV. **Installing sensor libraries in Arduino IDE**

This section will guide you through how to install the necessary extra libraries.

1. The correct setup of Arduino IDE is explained in the Lion board’s User Manual. This is a necessary first step.
2. Open Arduino IDE
3. Go to Sketch -> Include Library -> Manage Libraries...
4. Type the following part numbers in the upper-right search box.

    LSM6DSO, LIS3MDL, LPS25HB, HTS221

    For each search result click Install. (For HTS221 install: SmartEverything HTS221)

V. Necessary modifications in the code

**LPS25H sensor library**

Locate “LPS25HReg.h” file on your computer. In line 13 You can see the following:

```c
#define LPS25H_ADDRESS     0x5C
```

Change this value to 0x5D.

This is necessary as the library downloaded is written for a slightly different hardware setup.

**Getting sensor feedback**

Open LoRaDemo.ino file with Arduino IDE!

It is possible to see the sent sensor data. In order to do so, delete the comment symbol (//) before `#define SENSOR_FEEDBACK (line 10).`
With or without a gateway
As it was explained earlier it is possible to run the demo without a gateway. If this is the case then make sure you comment out `#define LIVE` in the 9th line in LoRaDemo.ino.

```c
#define LIVE
```

This way the following part of the code will not run:

```c
// Activation procedure
#define LIVE
String response = "denied";
while(response[0] == 'd') // If server response is "denied" try again
{
    while (lora.sendRawCmd(join)) // Sending join command
    {
        SerialUSB.println("\nOT JOIN FAILED "); // Join command sending not successful
delay(5000);
    }
    SerialUSB.println("\nOTA Network JOINED! "); // Join command sent
    while(!lora.available()) // Waiting for server response
    {
    
    }
    response = lora.read(); // Reading server response
SerialUSB.print("\r> ");
SerialUSB.println(response);
}
#endif
```

Meaning that the board will not attempt connecting to a network server. It will still send LoRa messages but there will be no channel set up through which the message could be forwarded to the cloud.

Still, you can see the created message on the serial port.

ABP or OTAA join
You can test either join method that is ABP – Activation By Personalization or OTAA – Over The Air Activation.

```c
#define ABP // Either ABP or OTAA is allowed to be defined, the other has to be commented out!
// #define OTAA
```
VI. **Flashing the Lion board**

When you are done modifying the code it’s time to load it up into the board.

1. In Arduino IDE select: Tools -> Board: -> “SmartEverything Lion (Native USB port)”
2. Go to: “Tools -> Port: ” and select the serial port your Lion board is connected to.

3) Now You can verify and upload the code by pressing the arrow button:

If it's successful You should receive this feedback:
VII. **Serial monitor**

To open a serial monitor in Arduino IDE follow these steps:

1. Make sure that You have the right port selected. Check “Tools -> Port:”! It should look something like this:

   ![Tools menu with selected port](image1)

2. Then You can open the corresponding COM port’s serial monitor. (Tools -> Serial Monitor)

3. After 10 seconds You should see something similar to this:

   ![Serial monitor output](image2)

   a) **Without gateway, no sensor feedback**
   
   Make sure to use the same serial port settings as You can see below in the lower-right corner!

   ```
   //#define LIVE
   //#define SENSOR_FEEDBACK
   ```
b) Sensor feedback enabled

If you have enabled sensor feedback, you should see something like this:

```c
#define SENSOR_FEEDBACK
```

Every sent sensor data is 2 bytes long, except for humidity which is only 1 byte long.
c) With Live system

If you have a complete environment set up (meaning a gateway & an account in Digimondo’s system):