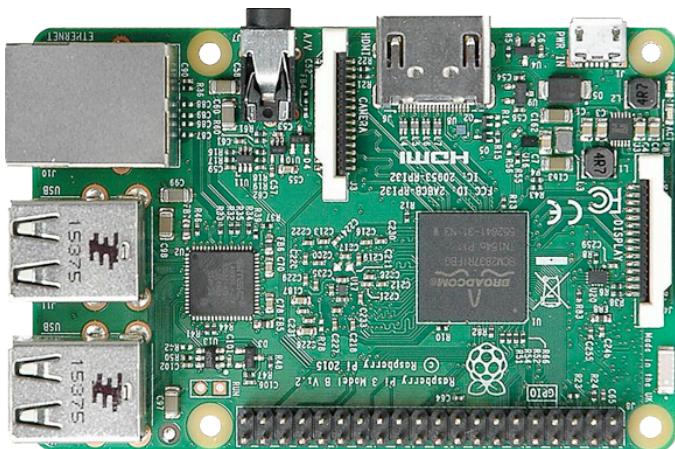


last update June 8th, 2018

TO BUILD THE GATEWAY

- Raspberry: take either the RPI2 or RPI3 (RPI3 better for WiFi and Bluetooth)



You also need an 8GB SD card **class 10**

RPI3 has built-in WiFi and Bluetooth 4.0,

if you get or already have the RPI2 and want WiFi and Bluetooth, get dongles, but it is not mandatory. Dongles that have been tested successfully are:



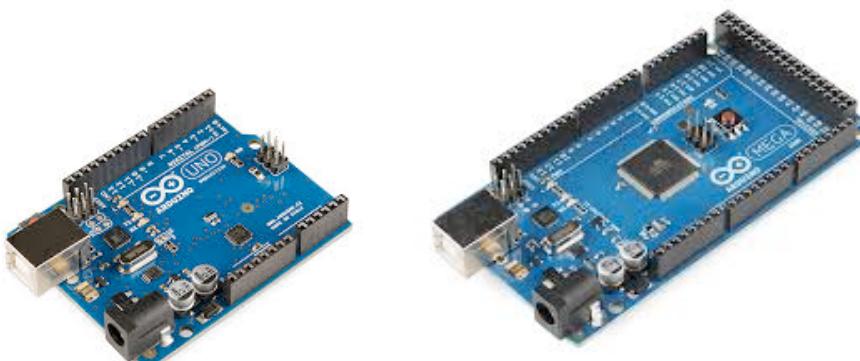
WiFi: TP-LINK
TL-WL725N



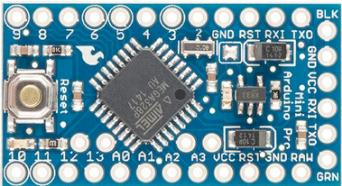
Bluetooth 4.0: CSR
dongle or Konig dongle

TO BUILD THE IOT DEVICE

- For prototyping and development tests Arduino Uno/MEGA2560



- For integration phase: Arduino Pro Mini (take the 3.3v, 8MHz version). Original version is from Sparkfun



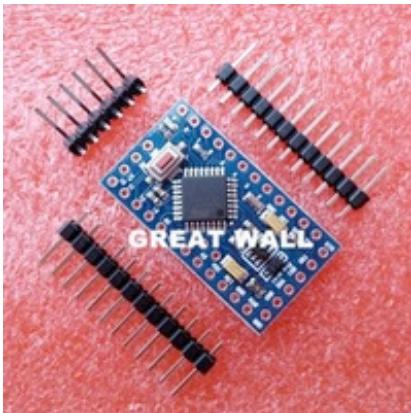
3.3v and 8MHz version

Can be bought as low as 1.5€ from Chinese manufacturers

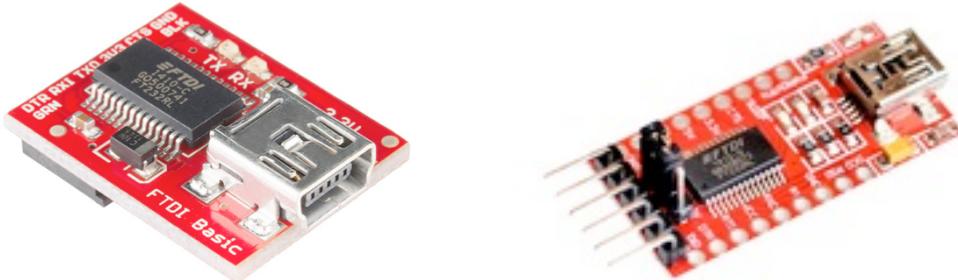
<http://www.aliexpress.com/popular/arduino-pro-mini-328.html>

We tested this one:

https://fr.aliexpress.com/store/product/Free-Shipping-1pcs-pro-mini-atmega328-Pro-Mini-328-Mini-ATMEGA328-3-3V-8MHz-for-Arduino/731260_32340942669.html?spm=2114.12010608.0.0.4LfFx2



You will also need the FTDI breakout (3.3v version) to program the board. You need only one to program all your boards. Original product from Sparkfun is here: <https://www.sparkfun.com/products/9873>



We tested a Chinese one (on the right) that can be set either at 5v or 3.3v. Much cheaper!

https://fr.aliexpress.com/store/product/Free-shipping-FT232RL-FT232-FTDI-USB-3-3V-5-5V-to-TTL-Serial-Adapter-Module-Mini/1735233_32648254875.html?spm=2114.12010608.0.0.PizHXM

LORA RADIO MODULES

- take the Modtronix inAir9 with 6mm pin header already soldered (see the available option on the modtronix web page); and the 868MHz whip antenna



<http://modtronix.com/inair9.html>

<http://modtronix.com/ant-f105-868.html>

This screenshot of a product page from modtronix.com shows the 'Wireless SX1276 LoRa Module, 868MHz and 915MHz, 3.3V, SMA Connector'. The price is listed as USD15.95. A red arrow points to the 'Description' section, which contains detailed technical information about the module's features and options. The page includes a PayPal Express Checkout button and a sidebar with related products like a relay module and a 1-wire interface module.

Description

We will soon be releasing two new versions of the inAir9 module. One version will have an integrated whip antenna, and the other will have a standard SMA connector. The inAir9 is a 868 and 915MHz wireless module. It is part of our Mod product range. The frequency bands used are the 863-870MHz and 902-928MHz ISM bands. This module is **not** designed for the 915MHz band. The inAir9 has a maximum of +20dBm output power. This modules requires less supply current than the inAir9, even when configured for the same output power (+14dBm or less). Choose this module if power consumption has to be kept at a minimum, and no more than +14dBm is required.

The SX1276 is a revolutionary new chip enabling wireless communications at distances up to 15km, using Semtech's LoRa®(Long Range) technology. This chip also supports high performance (G)FSK modes for systems including WMBus, IEEE802.15.4g.

This module can be used for **868** and **915MHz** communication. It is based on the Semtech SX1276RF1KAS and SX1276RF1IAS reference designs, which also use identical components for 868 and 915MHz. We have also confirmed with Semtech engineers that

- other radio modules are possible but require more soldering work



- Antenna for gateway: you can use a general purpose antenna such as this type of omni-directional antenna



We tested this one:

<https://fr.aliexpress.com/item/868MHZ-915MHZ-GSM-3G-antenna-small-sucker-7dbi-aerial-3meters-SMA-male-2/32512220307.html?spm=a2g0s.9042311.0.0.27426c37eBDSMw>

If you want to build your own antenna or adjust the length of the antenna cable, then you will need the following items.

- SMA connectors (for cable model RG58) for custom antenna cable



SMA Female



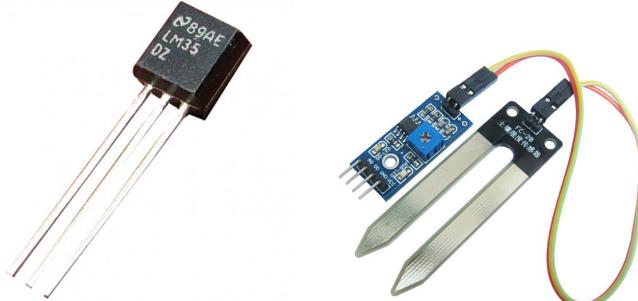
SMA Male

- Coax crimping tool (with RG58 format) and RG58 coax cable



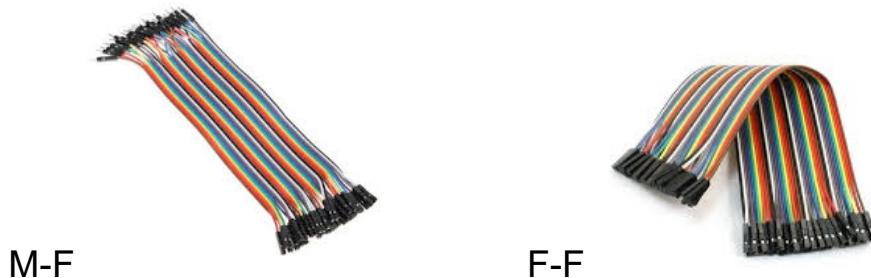
SIMPLE PHYSICAL SENSOR FOR TEST AND DEMONSTRATION

- Simple temperature sensor: take a simple LM35DZ (from local electronic stores)
- Simple Soil humidity sensor: take a low-cost one from AliExpress



WIRES, CASING, AND VARIOUS ADDITIONAL PARTS

- Breadboard cables: need both M-F and F-F



take those that are about 10cm to 20cm maximum.

- Water-proof cases: electric out-door cases for instance



<http://www.lextronic.fr/P34821-botier-tanche-avec-3-presses-toupes.html>

<http://www.lextronic.fr/P22453-botier-tanche-115-x-65-x-40mm.html>

or any water-proof casing you can find suitable from your local hardware/electric stores

For the gateway, we are using this waterproof box



<http://www.mhzshop.com/shop/Accessoires-MHz/Boites-etanches/Boite-etanche-avec-fixation-mat-203x203x65mm-GentleBOX-JE-200.html>

You may need your own cable gland to have a real customized case



(see on AliExpress)

- Some standoffs/spacer and associated screws for the gateway



take 10mm to 20mm maximum

- PoE gland & injector



(see on AliExpress)

- LM2596 DC-DC down stepper & DC 5.5x2.1mm female power jack



(see on AliExpress)

- 4-AA battery couplers for the IoT device



(see on AliExpress)

- Simple waterproof switch



or

(see on AliExpress)

SOLDERING MATERIALS THAT ARE NOT MANDATORY BUT ARE ALWAYS GOOD TO HAVE!

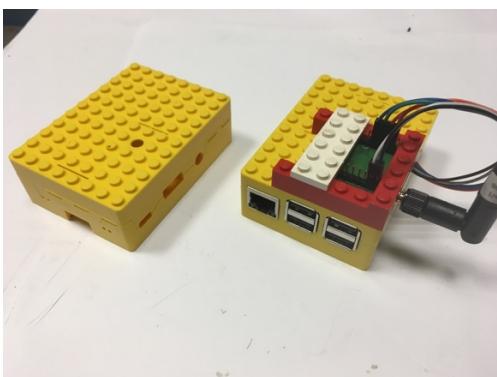
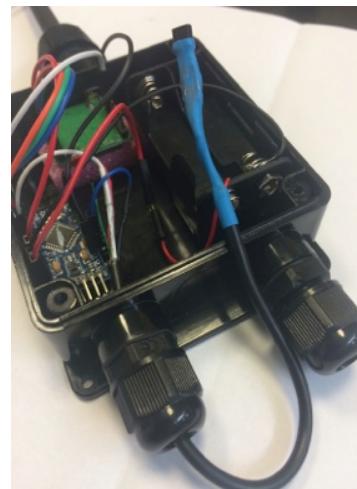
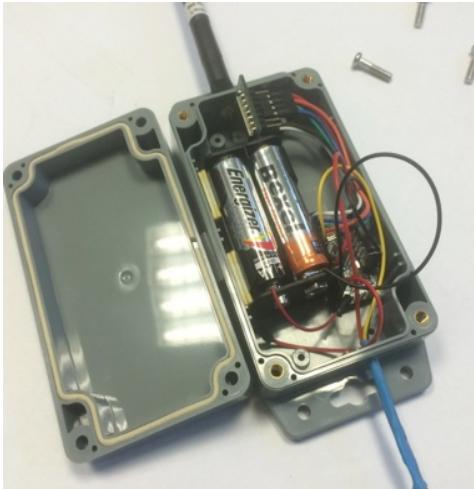
- A simple soldering iron (or station if you want to invest) with thin solder wire



- A set of heat-shrink tubes to isolate wires / silicon for joints



RESULTS:



Enjoy!

C. Pham, University of Pau, France