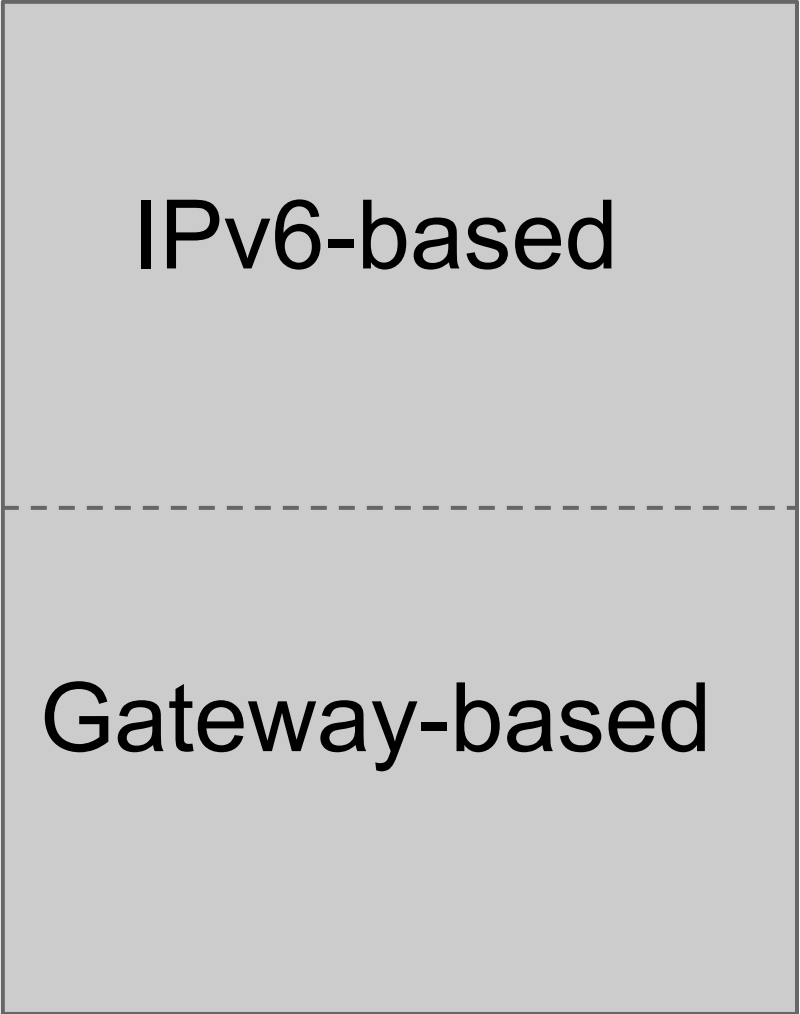


Intro to the Workshop and to the IoT training kit

Marco Zennaro
T/ICT4D Laboratory
ICTP-Italy

WSN options



IPv6-based

Gateway-based

WSN options



The diagram consists of a large light gray rectangle with a thin black border. A horizontal dashed line divides the rectangle into two equal halves. The top half contains the text 'Open WSN' and the bottom half contains the text 'Proprietary WSN'.

Open WSN

Proprietary WSN

WSN options

Open WSN
IPv6-based

Open WSN
Gateway-based

Proprietary WSN
IPv6-based

Proprietary WSN
Gateway-based

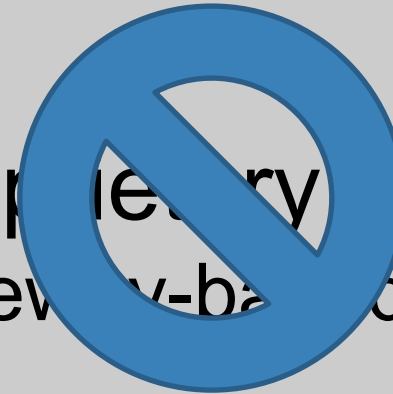
WSN options

Open WSN
IPv6-based

Open WSN
Gateway-based

Proprietary WSN
IPv6-based

Proprietary WSN
Gateway-based



WSN options

Open WSN IPv6-based	Open WSN Gateway-based
Proprietary WSN IPv6-based	Proprietary WSN Gateway-based

Open Hardware

Open-source hardware consists of physical artifacts of technology designed and offered by the open design movement.

Hardware design (i.e. mechanical drawings, schematics, bills of material, PCB layout data, HDL source code and integrated circuit layout data), in addition to the software that drives the hardware, are all released with the FOSS approach.

Arduino

Arduino is an
open-source
electronics prototyping
platform
based on flexible, easy-to-
use
hardware and software.



<http://www.arduino.cc>

Why Arduino?

Arduino is:

- Inexpensive
- Quite easy to learn
- Flexible
- Good for sensing and controlling
- Great for use in education

Software

The programming language is based on **wiring** and in terms of syntax (almost) identical to C++.

The development environment is based on **processing** - both wiring and processing are **open source** components.

Hardware

Arduino boards are based around Atmel processors (ATM168, ATM328).

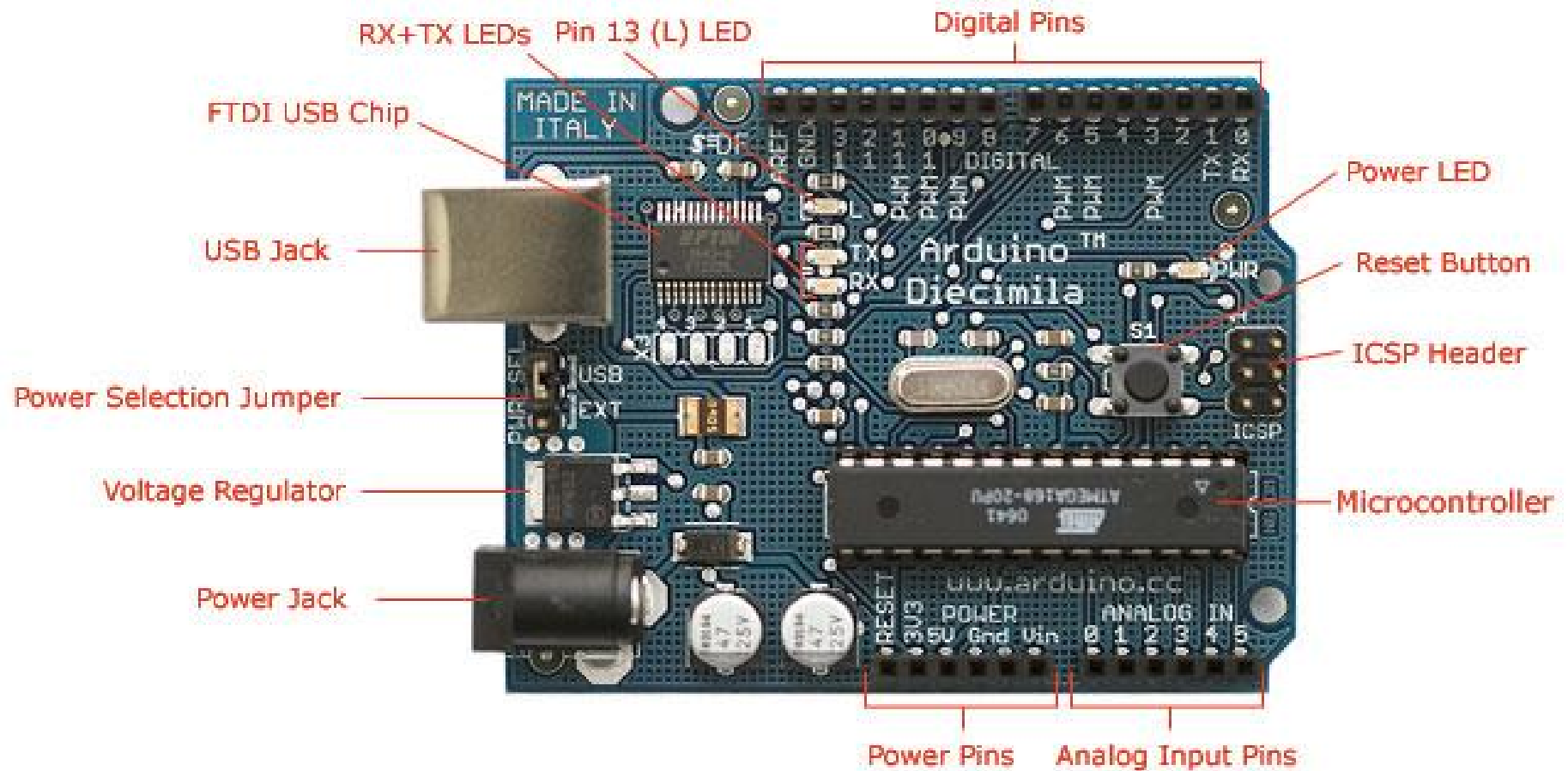
8 bit controllers (new DUE board is first with 32 bit)

16 / 8 Mhz

Approx. 32k of memory for code

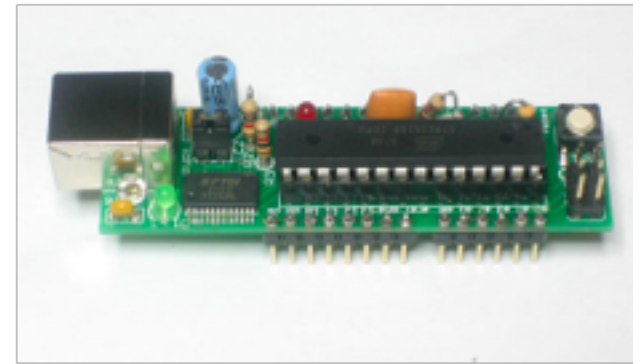
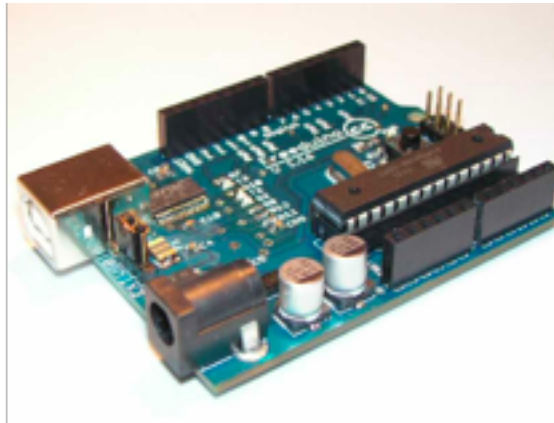
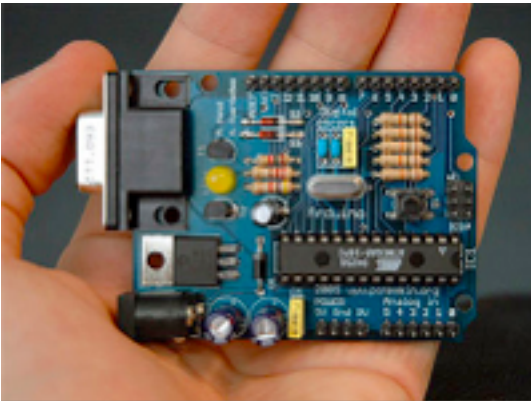
Run on 3.3, 5 (and up) Volts

Hardware



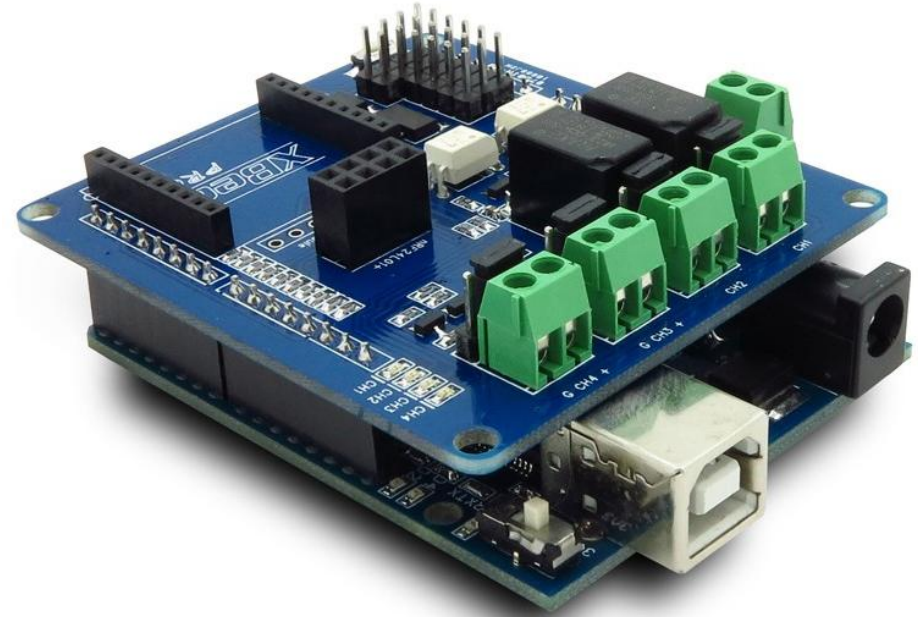
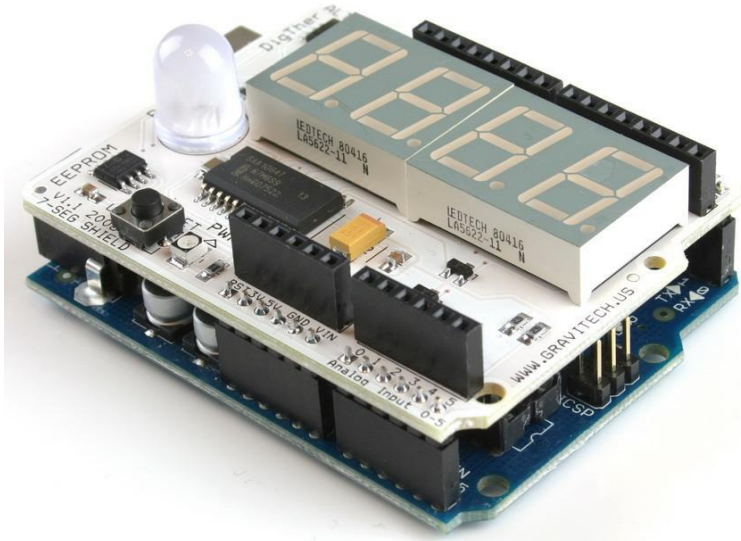
Photograph by SparkFun Electronics. Used under the Creative Commons Attribution Share-Alike 3.0 license.

Arduino compatible boards



[List of Arduino compatible boards](#)

Arduino shields

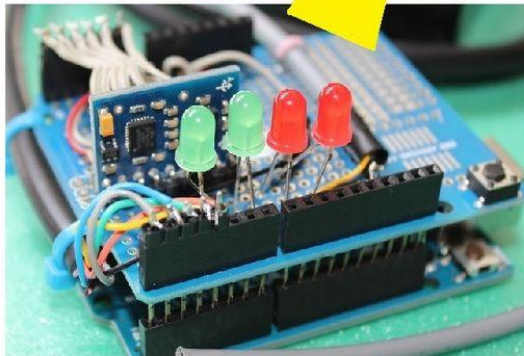
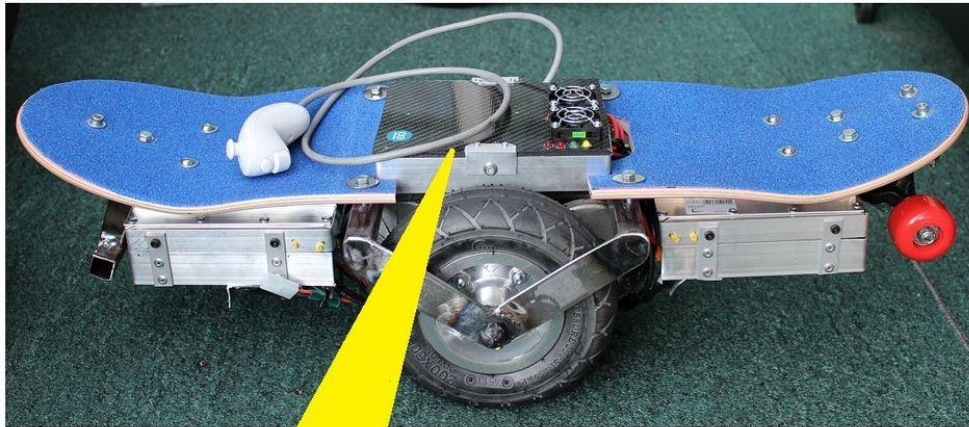


Pin usage details for 317 shields from 125 makers, and counting!

[List of Arduino compatible shields](#)

Arduino shields

Self-balancing Skateboard



Arduino Shield

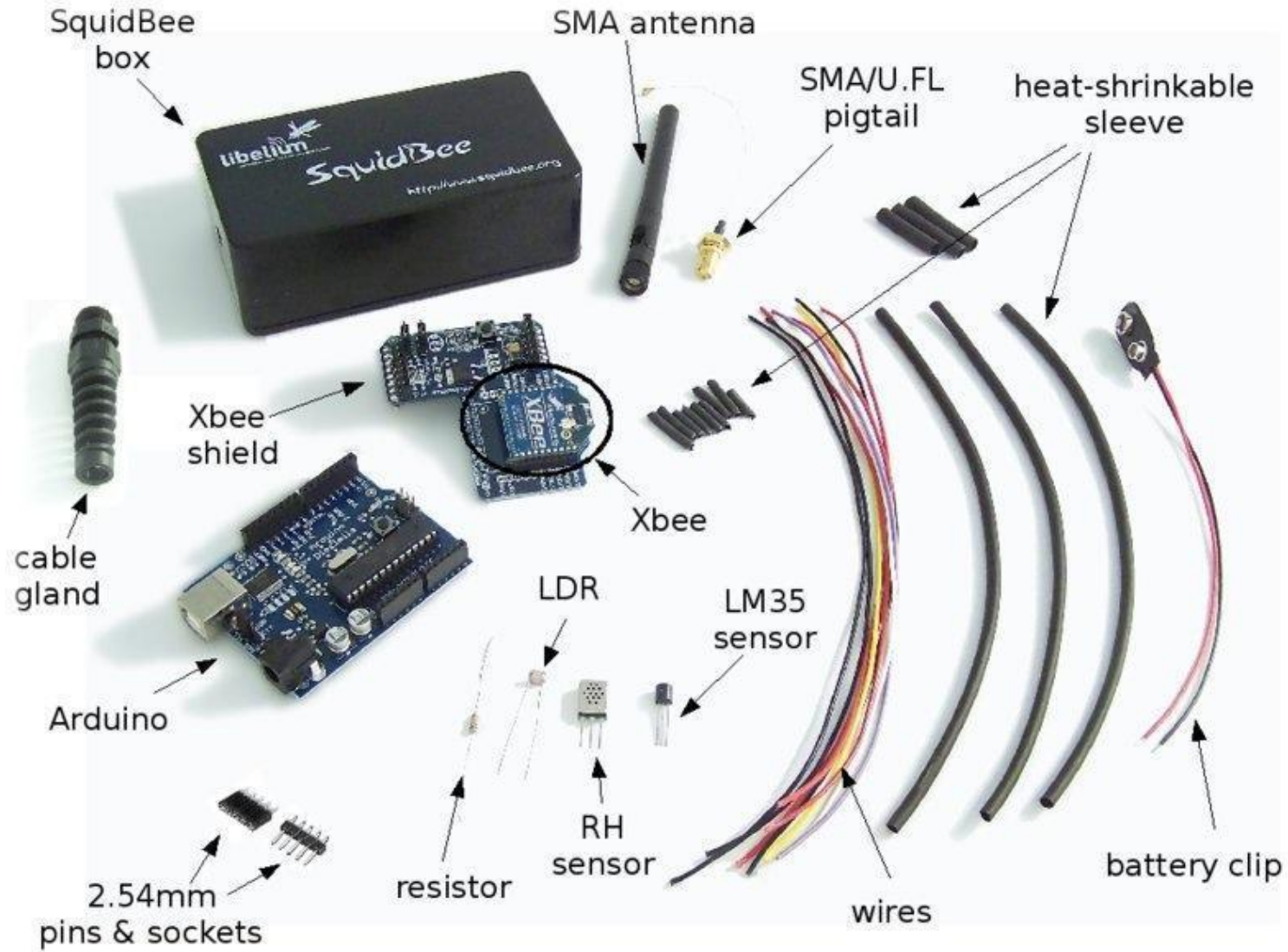
Self-balancing machines shield

From Arduino to WSN

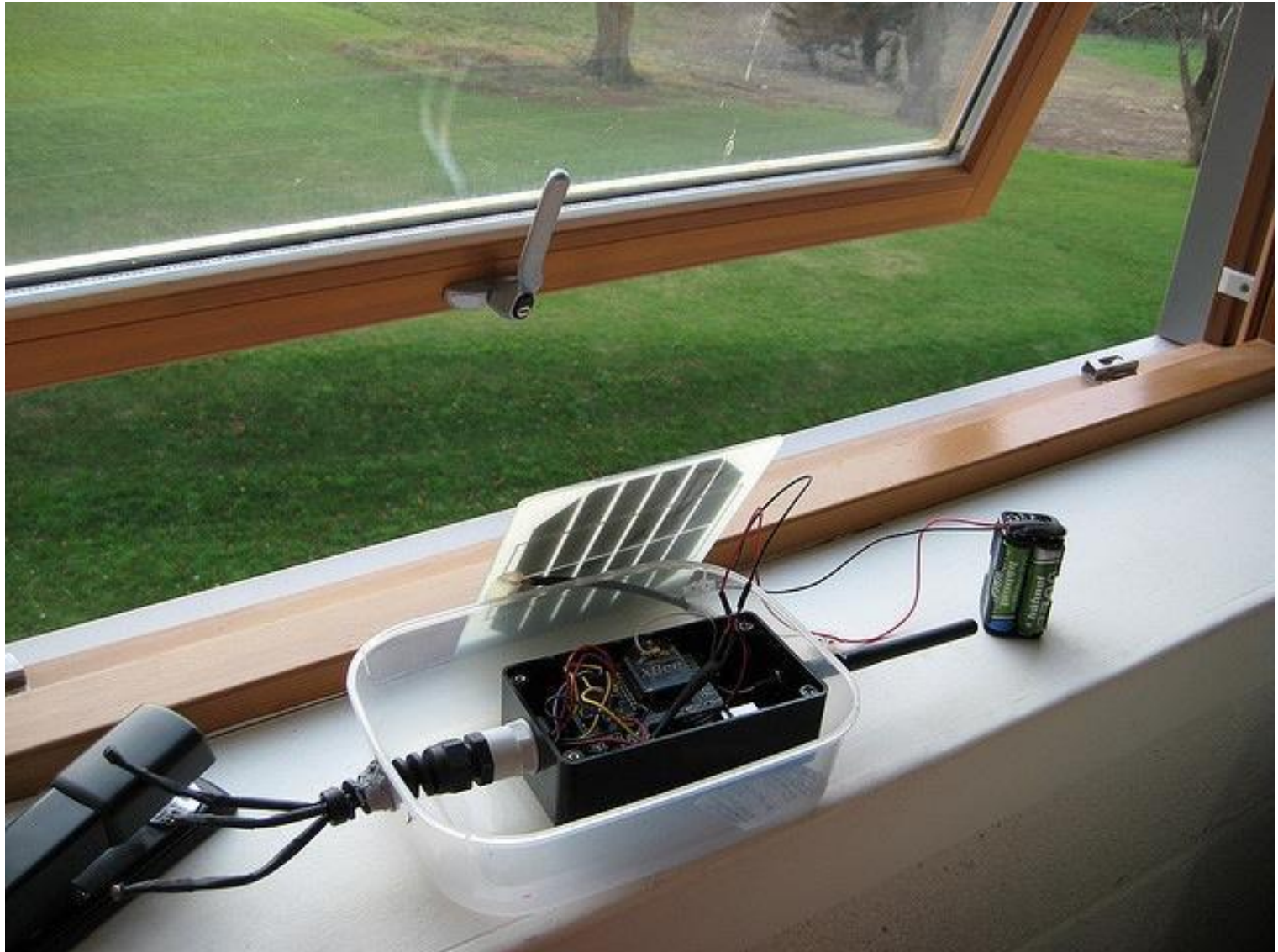


- ~~external sensors~~
- wireless
- batteries

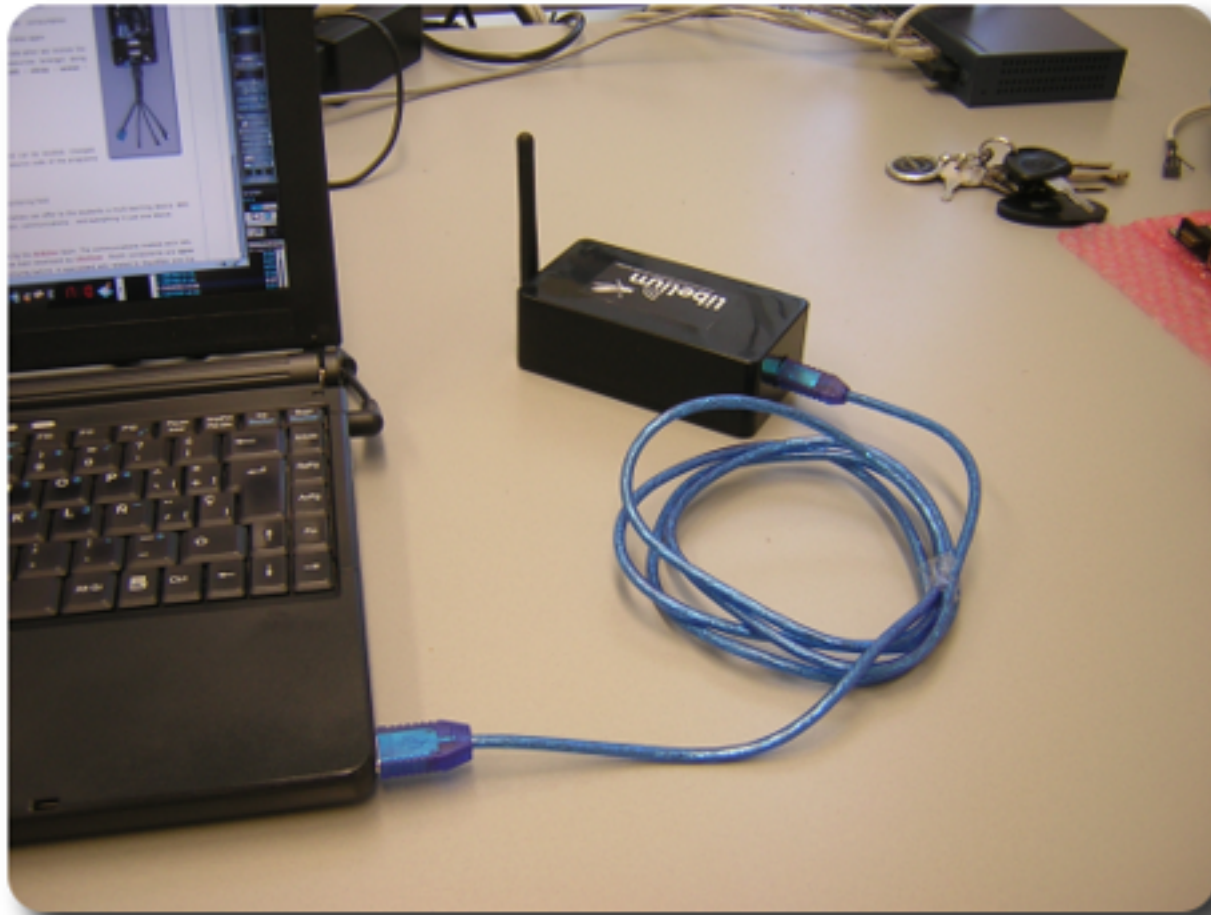
Squidbee by Libelium



Squidbee by Libelium



Squidbee by Libelium



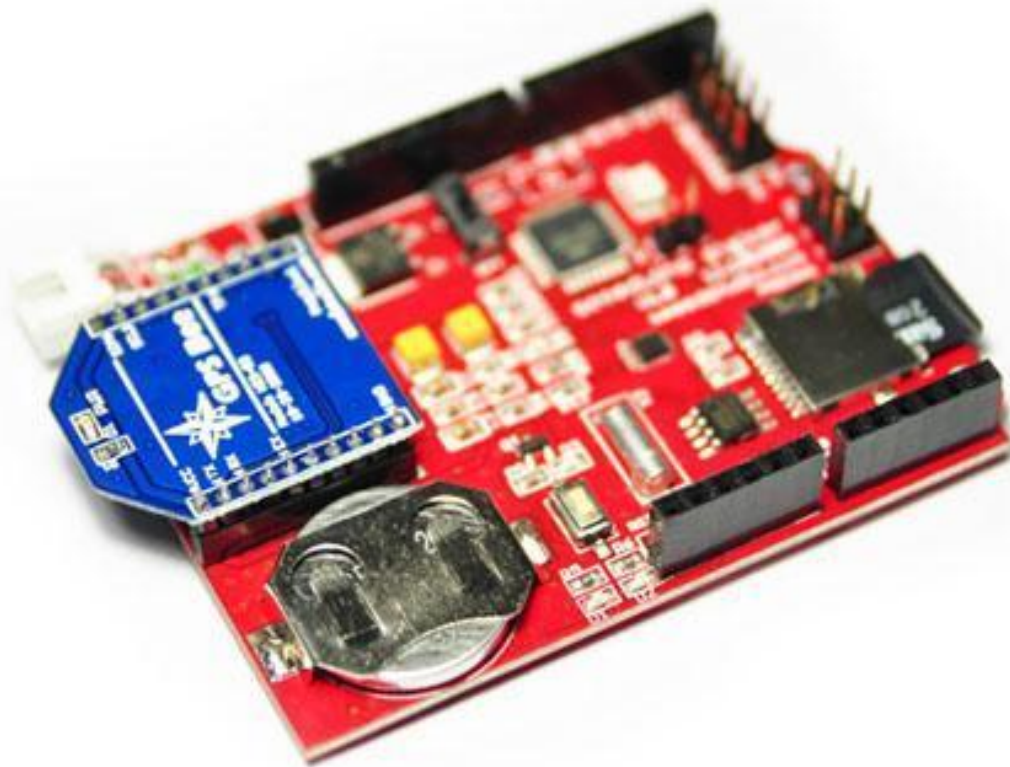
Seeeduino



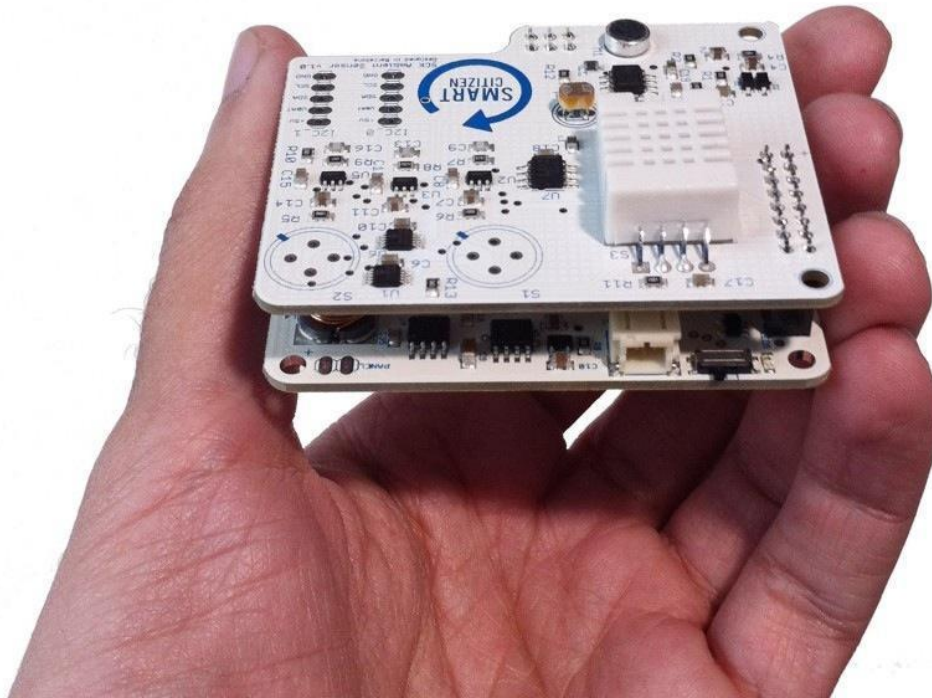
Seeeduino



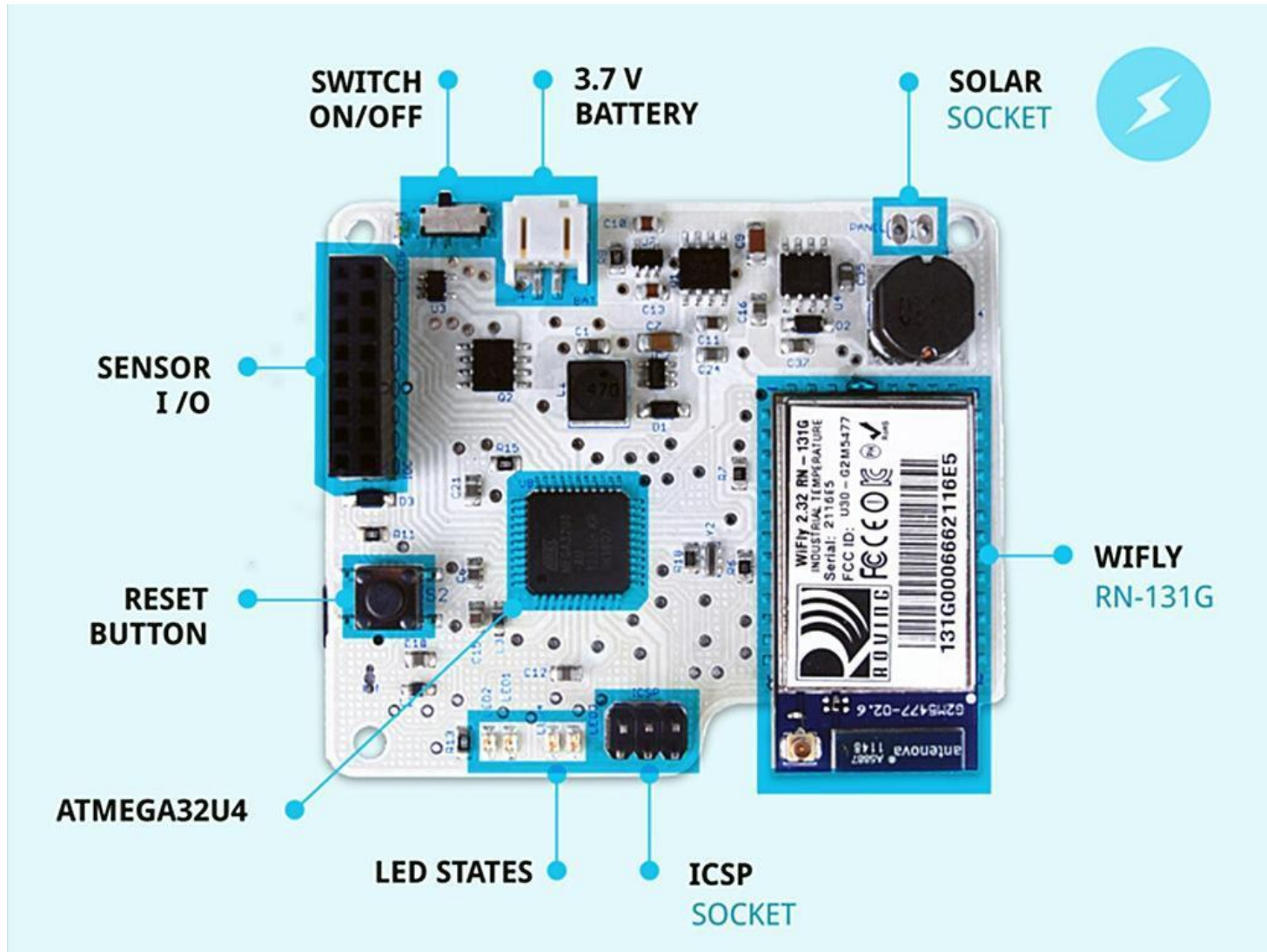
Seeeduino



Smart Citizen Kit

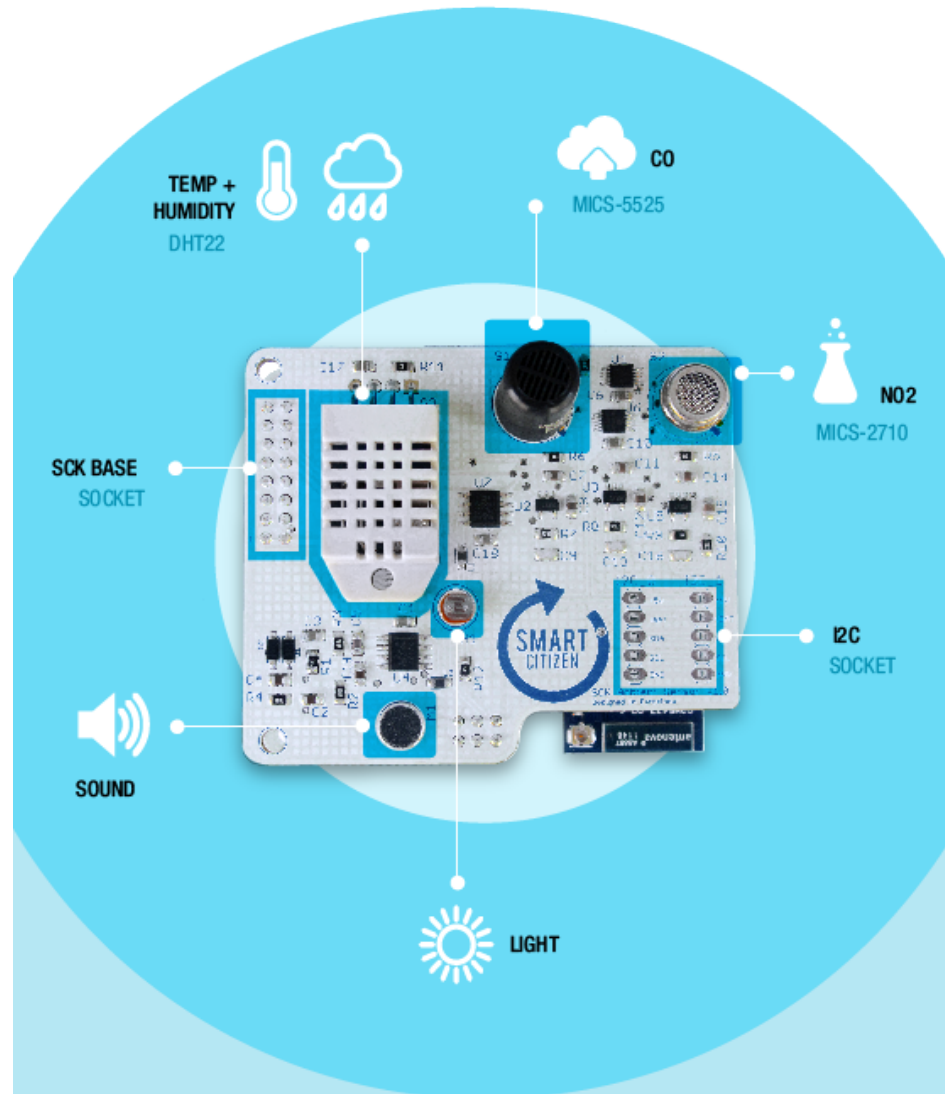


Smart Citizen Kit



Smart Citizen Kit

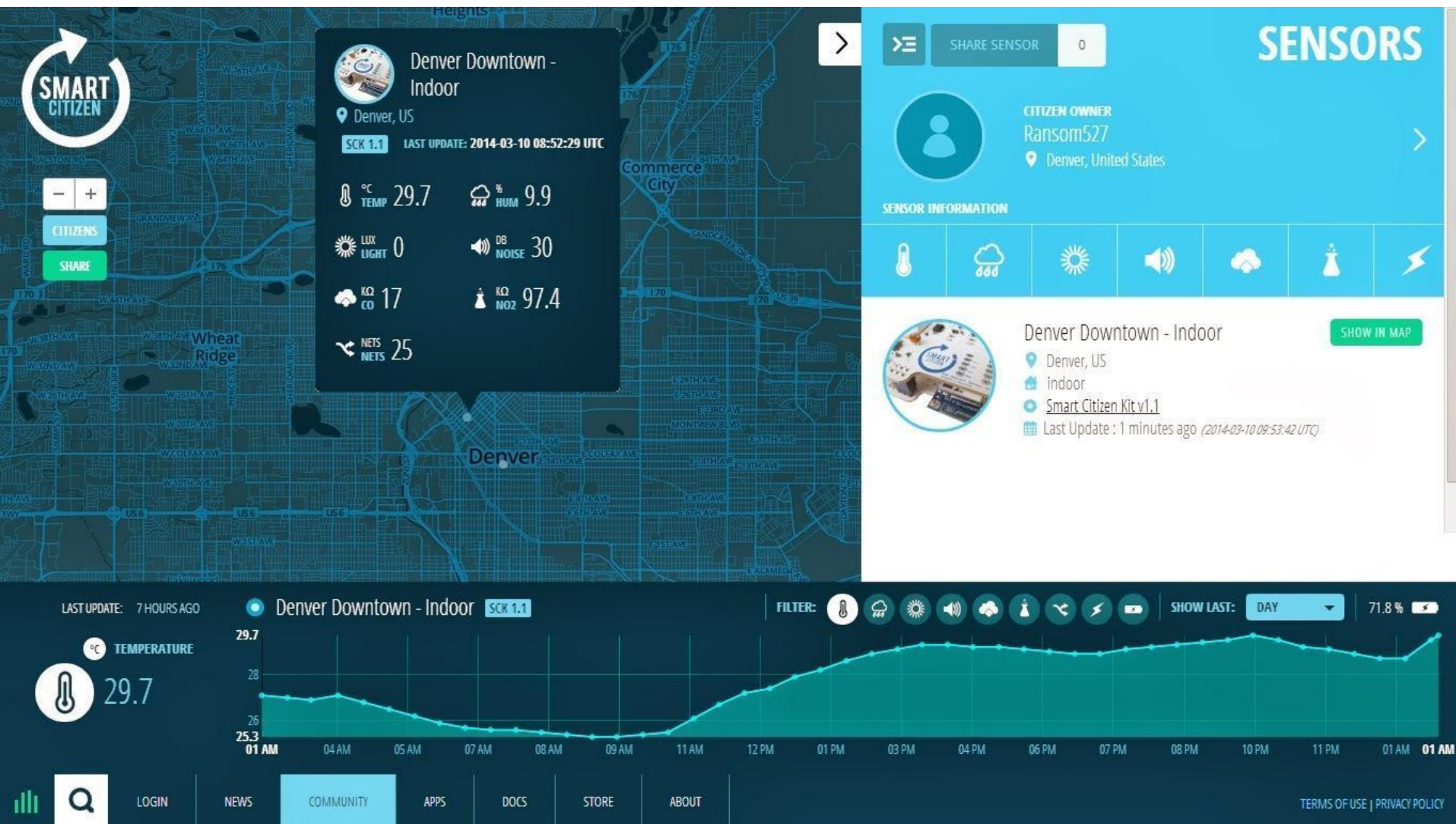
SECOND LAYER - SENSORS BOARD



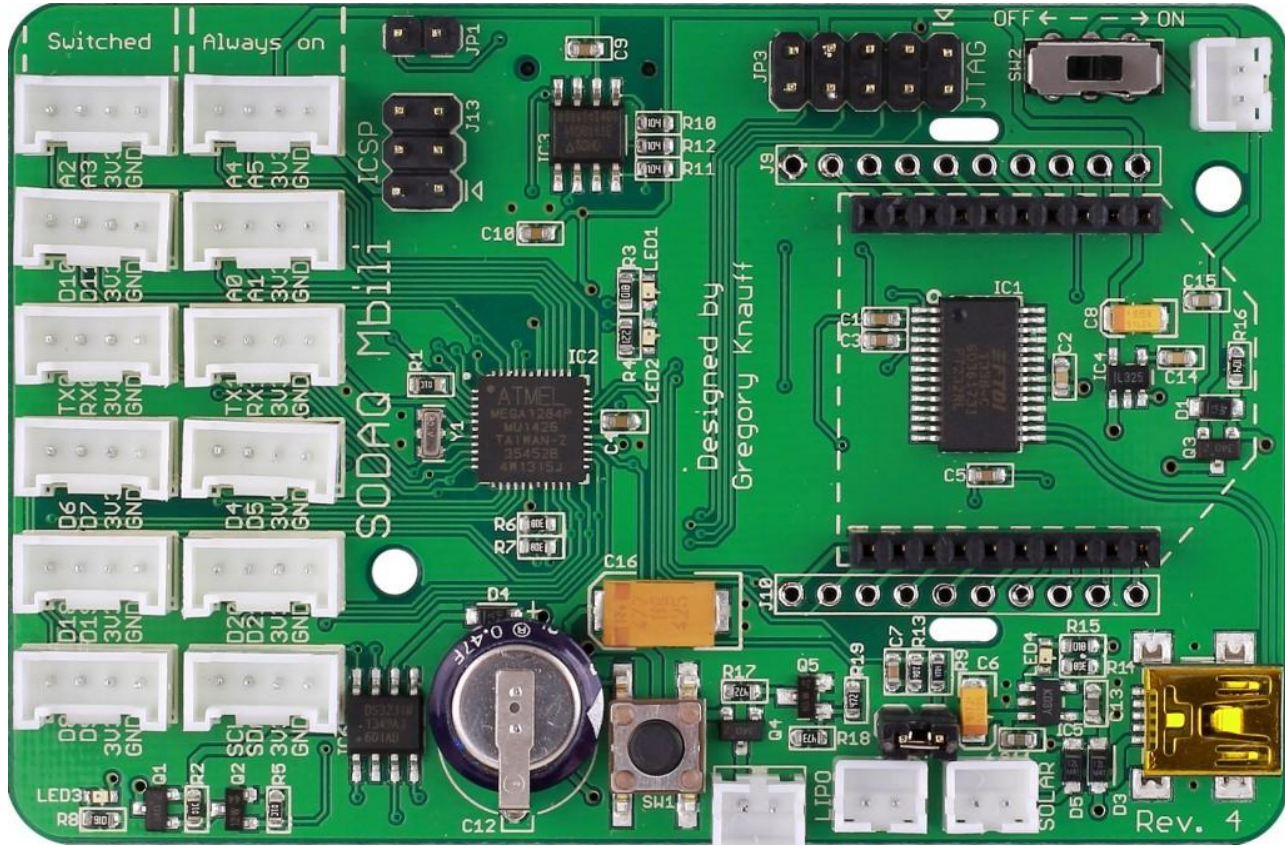
Smart Citizen Kit



Smart Citizen Kit



SODAQ Mbili



SODAQ Mbili - features

The Atmega 1284P is the 'big brother' of the 328P.

128kB flash for your programs (that's 4x more than the 328P)

16kB memory (that's 8x more!)

Two hardware serials (allowing USB and the Bee module to work at the same time).

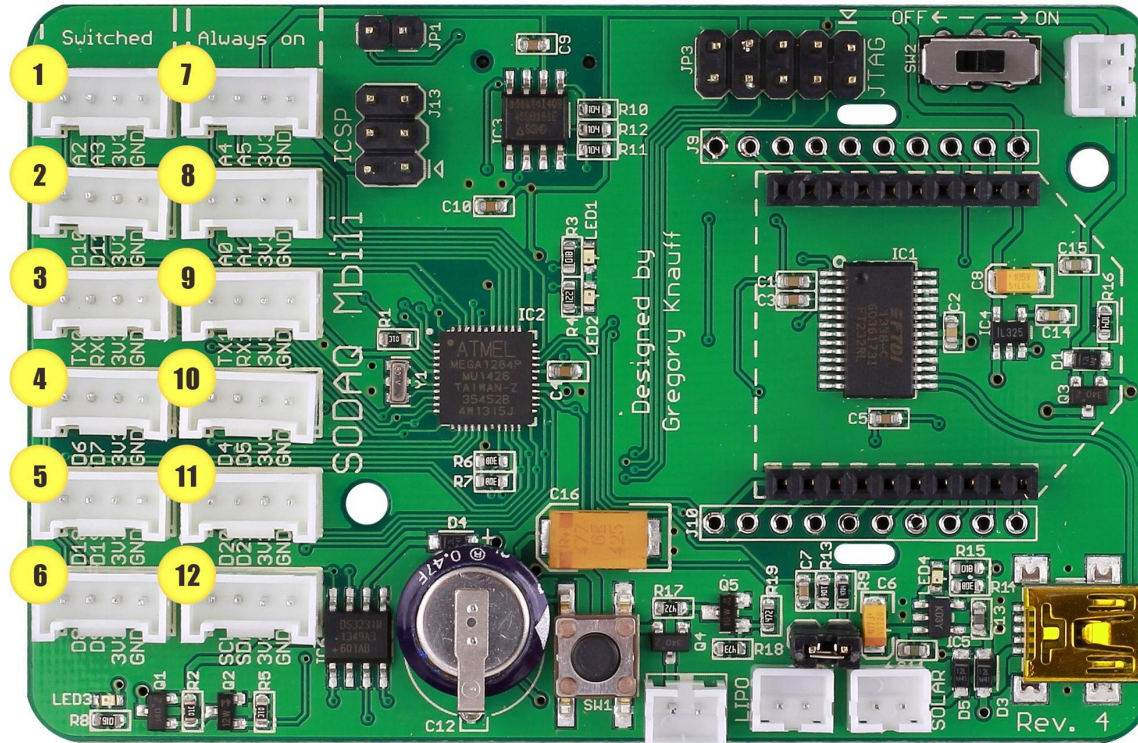
SODAQ Mbili - features

Micro SD card slot has been added for storage (as well as the existing 16Mb Flash memory).

A super-capacitor has been added for the Real Time Clock. This allows the RTC to remain ticking (for several days) after the battery has been removed.

The board still runs on 8MHz and at 3.3V.

SODAQ Mbili - Grove

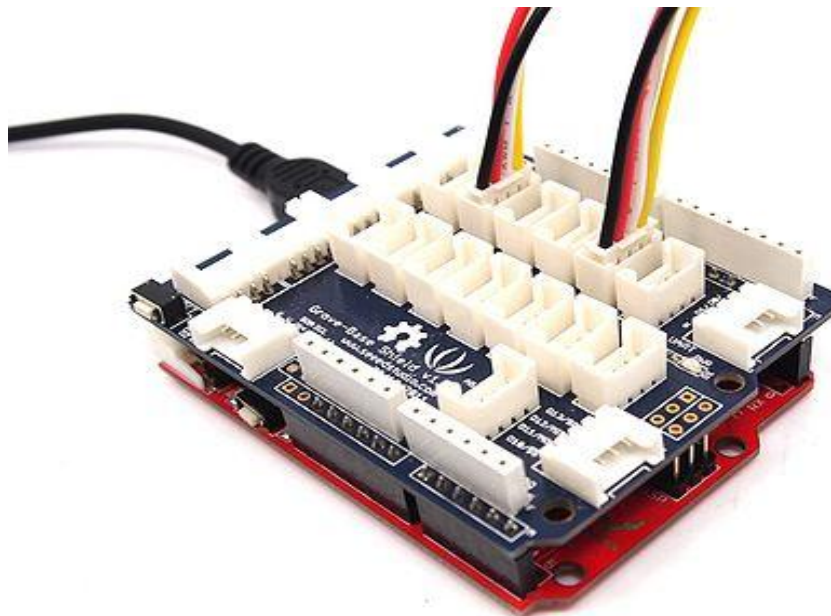


Grove switched row now switches.

Additional I/O lines have been added, in total there are: 6 analog lines, 10 digital lines, two serial ports and the I²C which are available through the Grove sockets.

Grove system

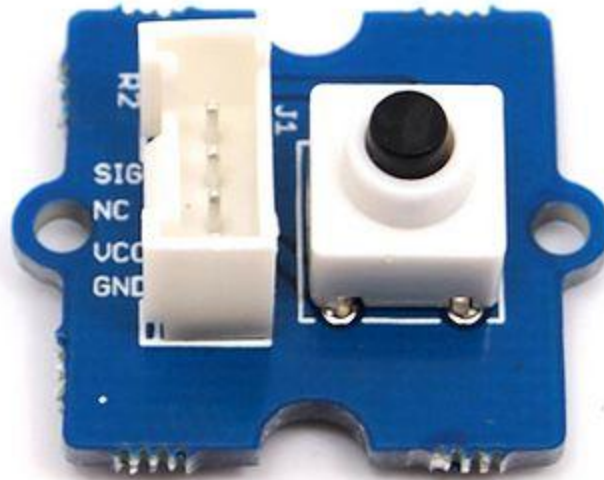
The Grove system is a modular, safe and easy to use group of items that allow you to minimise the effort required to get started with microcontroller-based experimentation and learning.



Grove system



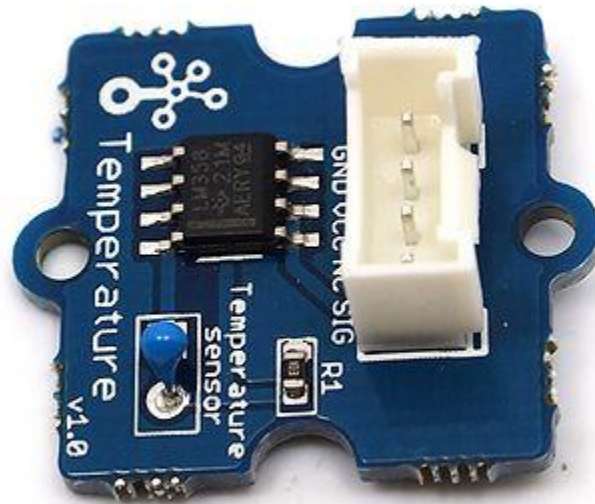
Grove units: button



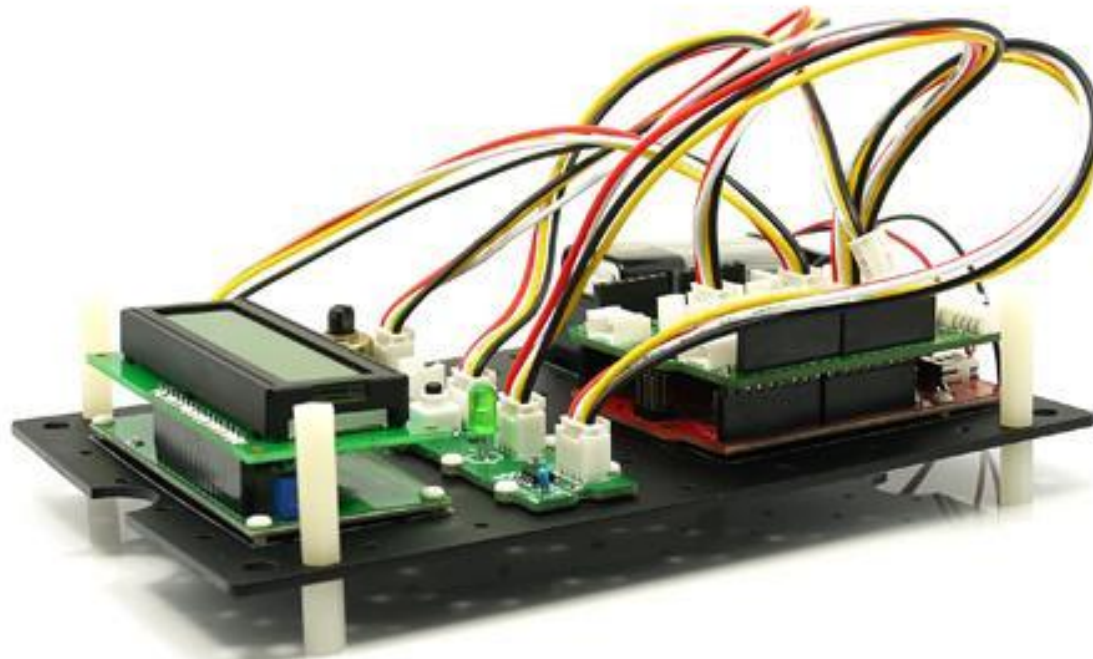
Grove units: LED



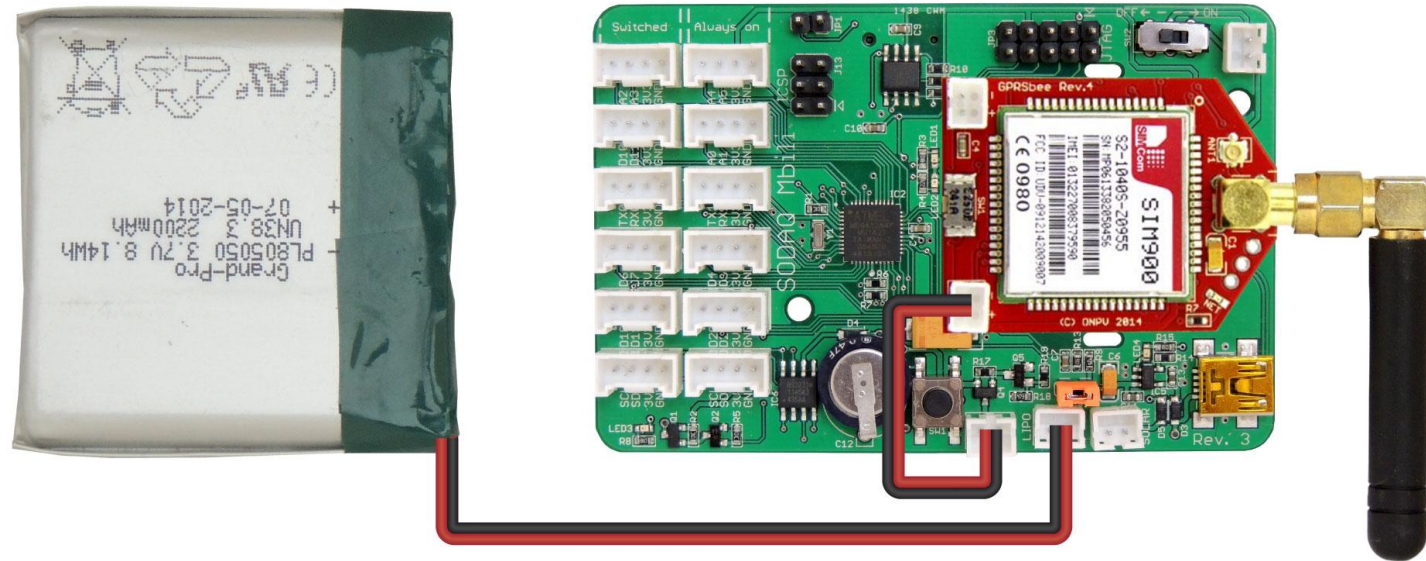
Grove units: Temperature



Grove units



SODAQ Mbili - Xbee



Switchable power supply for the GPRSbee. Allowing for better control and complete power down of the GPRSbee module (saving several μ Amps).

Xbee



IoT training schedule

The schedule and training material (pdf of lectures, code examples, etc) are available here:

http://wireless.ictp.it/rwanda_2015/

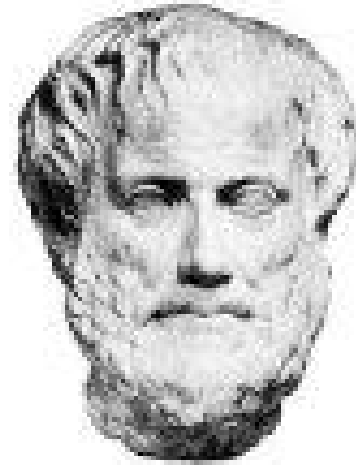
We will have 3 hours in the morning (9-12:30, with a tea break at 10:00) and 3 hours in the afternoon (14-17:30, with a tea break at 15:30).

The workshop is hands-on! Please make sure you test, experiment and learn!

Philosophy

"What we have to
learn to do,
we learn by **doing**."

Aristotle



Thanks

Marco Zennaro

mzennaro@ictp.it

<http://wireless.ictp.it>