# Title: "Sensing Capabilities Go Wireless"

## Description (max 10 lines)

**W**ireless **S**ensor **N**etworks **(**WSNs**)** will be an integral part of a wide variety of CIs, for a number of reasons, and in particular:

- Technical - Since they have the potential of significantly improving the sensing capabilities of SCADA sub-systems, as well as of increasing the resilience of the overall SCADA architecture;
- Political - Governments have recognized the importance of WSNs as a key technology for the protection of CIs, and have issued formal directives - as well as funded specific programs - for favoring the development of WSN technology in the context of CI protection.

Mastering this technology is a definite plus for researchers and practitioners of the CI domain.

## Objectives (max three objectives)

### State of the art

Provide an overview of the main products currently available on the market.

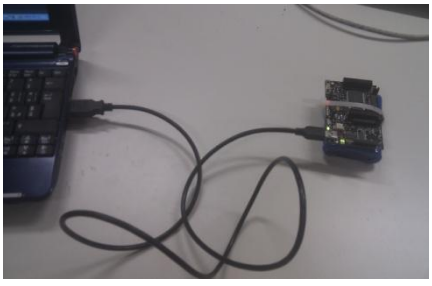
### Gap analysis

Highlight uncovered features and open issues wrt to SOTA offerings.

### Practical implementation

Try the following:

1. Switch the mote on;
   Connect the mote to the USB port of a computer (Figure 1a);
   Launch and configure the Waspmote IDE to communicate with the mote via USB port;
   Choose an ID for your sensor and for the sensor network zone and program the mote device to generate the following message every 2 seconds:
   "Hello World! My ID is x and my WSN zone is y"
   Open the serial monitor (from the IDE interface, Figure 1b) and show the communications on the USB serial port just configured.



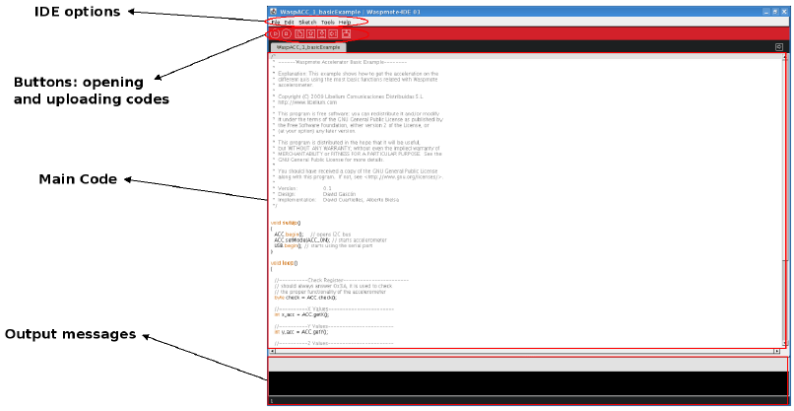
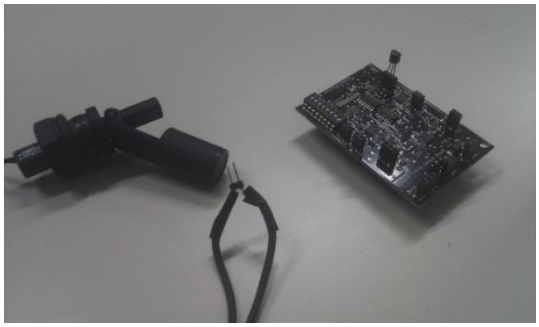



Figure 1 – (a) PC-Mote connection via USB (b) Waspmote IDE

2. Connect a temperature and a water level sensor to the Event sensor board (Figure 2a);
   Configure the switches on the Event sensor board (Figure 2b);
   Program the mote which is attached to the USB port of a computer in order to obtain the temperature value and the water level flag every 2 seconds; the mote should produce a message formatted as follows:

   SensorID=x&SensorZone=y&TemperatureValue=z&WaterLevelFlag=t

   Mount the Event sensor board attached to the sensors on the mote;
   Open the serial monitor and show the communication on the USB serial port;



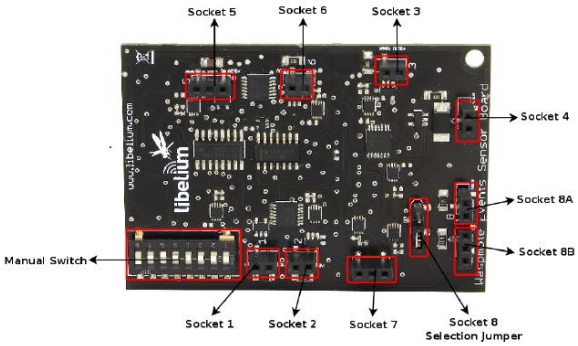



Figure 2 – (a) Temperature, liquid level sensors and event sensor board

(b) Event sensor board details

3. Connect the WSN gateway to the PC (Figure 3);
   Unmount the Event sensor board from the mote device;
   Connect the mote to the PC via the USB port;
   Program the mote to send the messages built during step 2 to the gateway; choose the 802.15.4 protocol;
   Remove the USB connection from the mote device;
   Mount a Wireless Module on the mote device and the Event sensor board;
   Monitor the USB of the WSN gateway.

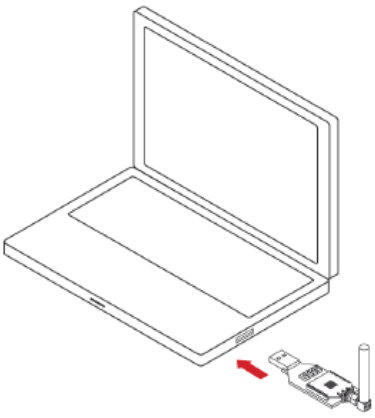


Figure 3 - Gateway to PC connection

4. Implement security within the communications: add data encryption and data authenticity by means of AES-128 on the 802.15.4 protocol;
5. Take another mote and configure it to obtain temperature measurements;
   Implement a Wireless Network between the 2 motes and collect data through the gateway;
   Monitor the USB of the WSN gateway.

## Resources that can be accessed from there

The following resources will be made available on-site:

- Laptop: Acer Aspire One ZG5 with Windows XP sp3 (user: SDCI 2012 – no password)
- Wireless Gateway: Libelium Waspmote Gateway 802.15.4-PRO SMA 5dBi
- Wireless motes: Libelium Waspmote 802.15.4-PRO SMA 5dB with Battery Li - Ion rechargeable
- Sensor board: Libelium Events sensor board
- Sensors for the sensor board: Temperature Sensor (MCP9700A); Liquid Level Sensors (PTFA0100)
- IDE: Libelium Waspmote IDE v0.1 with API v0.21

## List of useful links, references, and resources

Libelium homepage: http://www.libelium.com/

Libelium Waspmote page: http://www.libelium.com/products/waspmote/

Wireless Sensor Networks - research group (maintained by Libelium): http://www.sensor-networks.org/

Libelium Waspmote support page: http://www.libelium.com/support/waspmote/

Libelium Waspmote development page: http://www.libelium.com/development/waspmote/

Libelium API libraries: http://www.libelium.com/api/waspmote/

Waspmote datasheet: http://www.libelium.com/documentation/waspmote/waspmote-datasheet_eng.pdf

Wasomote technical guide: http://www.libelium.com/documentation/waspmote/waspmote-technical_guide_eng.pdf

Waspmote networking guide: http://www.libelium.com/documentation/waspmote/waspmote-802.15.4-networking_guide.pdf

Event sensor board manual: http://www.libelium.com/documentation/waspmote/events-sensor-board_eng.pdf