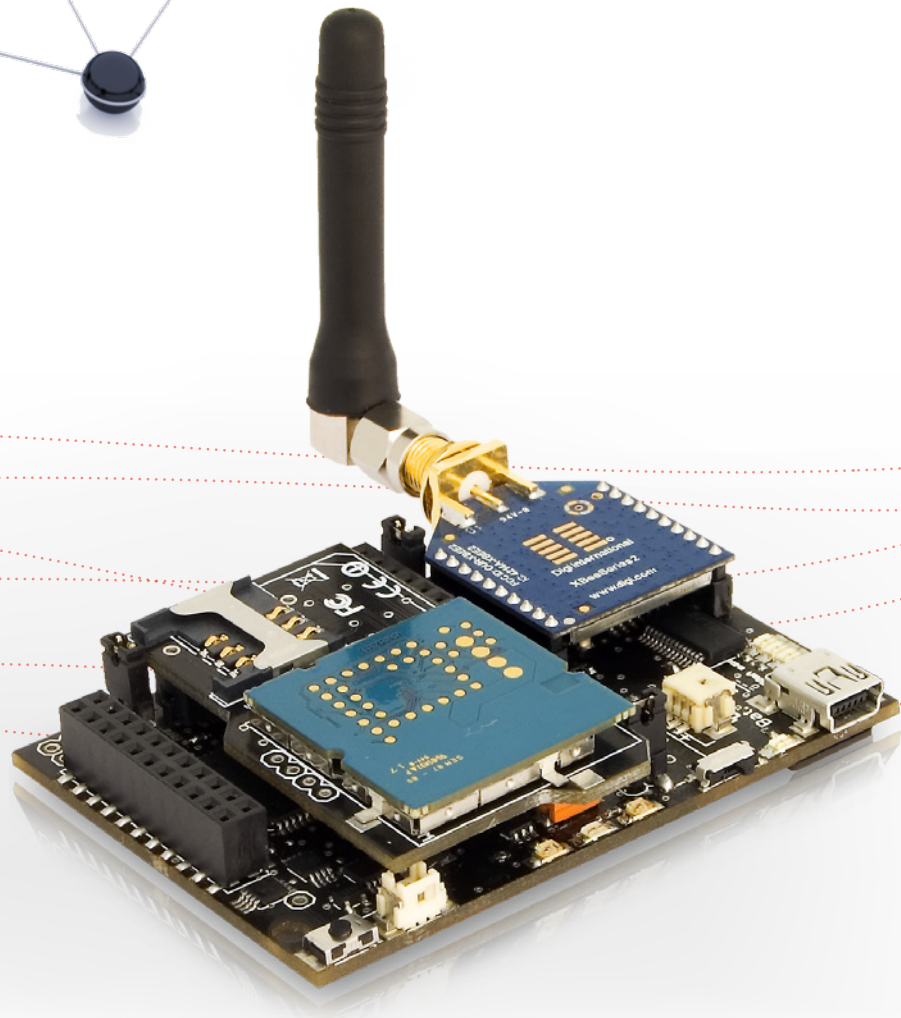
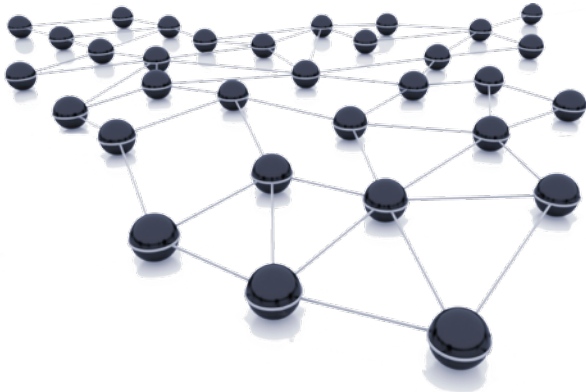


# Waspote

## Datasheet



# Waspmote

## General data:

<b>Microcontroller:</b>	ATmega1281
<b>Frequency:</b>	8MHz
<b>SRAM:</b>	8KB
<b>EEPROM:</b>	4KB
<b>FLASH:</b>	128KB
<b>SD Card:</b>	2GB
<b>Weight:</b>	20gr
<b>Dimensions:</b>	73.5 x 51 x 13 mm
<b>Temperature Range:</b>	[-20°C, +65°C]
<b>Clock:</b>	RTC (32KHz)

## Consumption:

<b>ON:</b>	9mA
<b>Sleep:</b>	62µA
<b>Deep Sleep:</b>	62µA
<b>Hibernate:</b>	0.7µA

**Operation without recharging:** 1 year \*

\* Time obtained using the Hibernate mode as the energy saving mode

## Inputs/Outputs:

7 Analog (I), 8 Digital (I/O), 1 PWM,  
2 UART, 1 I2C, 1 USB

## Electrical data:

<b>Battery voltage:</b>	3.3 V - 4.2V
<b>USB charging:</b>	5 V - 100mA
<b>Solar panel charging:</b>	6 - 12 V - 280mA
<b>Auxiliary battery voltage:</b>	3V

## Built-in sensors on the board:

**Temperature** (+/-): -40°C , +85°C. Accuracy: 0.25°C  
**Accelerometer:** ±2g (1024 LSb/g) / ±6g (340LSb/g)  
 40Hz/160Hz/640Hz/2560Hz

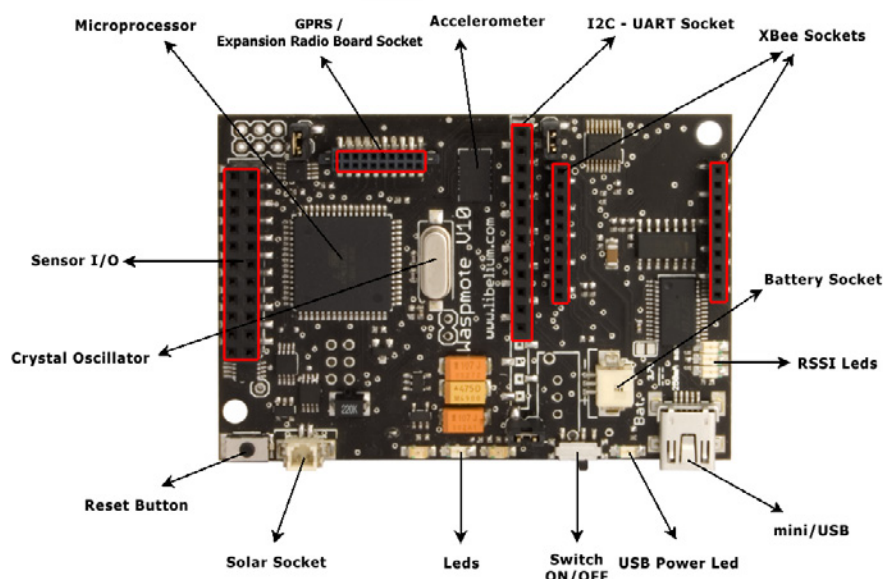


Figure 1: Waspmote Board Top

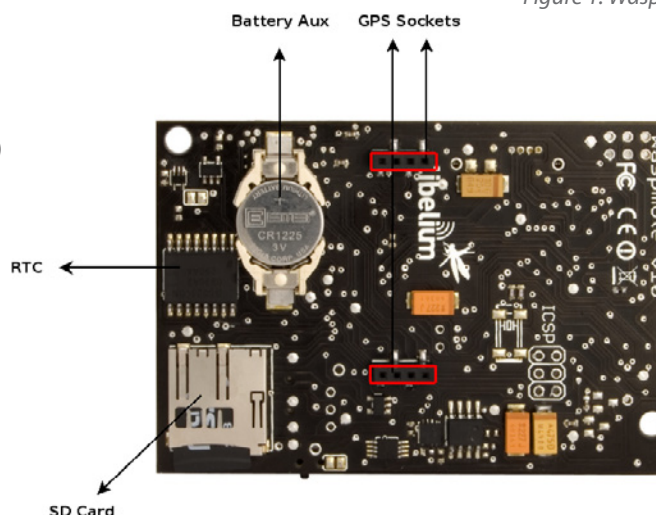


Figure 2: Waspmote Board Bottom

# 802.15.4/ZigBee

Model	Protocol	Frequency	txPower	Sensitivity	Range *
XBee-802.15.4	802.15.4	2.4GHz	1mW	-92dB	500m
XBee-802.15.4-Pro	802.15.4	2.4GHz	100mW	-100dBm	7000m
XBee-ZB	ZigBee-Pro	2.4GHz	2mW	-96dBm	500m
XBee-ZB-Pro	ZigBee-Pro	2.4GHz	50mW	-102dBm	7000m
XBee-868	RF	868MHz	315mW	-112dBm	12km
XBee-900	RF	900MHz	50mW	-100dBm	10km
XBee-XSC	RF	900MHz	100mW	-106dBm	12km

\* Line of sight and 5dBi dipole antenna

**Antennas:** 2.4GHz: 2dBi / 5dBi  
868/900MHz: 0dBi / 4.5dBi

**Connector:** RPSMA

**Encryption:** AES 128b

**Control Signal:** RSSI

**Standards:** XBee-802.15.4 - 802.15.4 Compliant / XBee-ZB - ZigBee-Pro v2007 Compliant

**Topologies:** star, tree, mesh



Figure 3: XBee

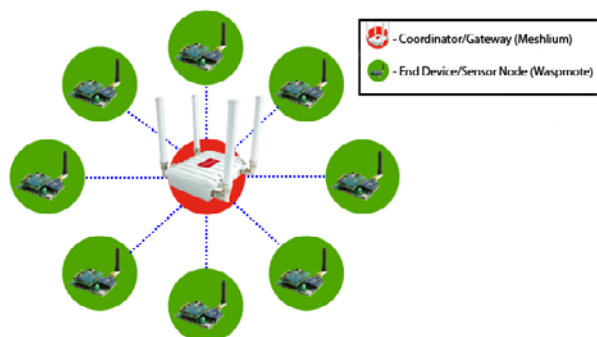


Figure 4: Star

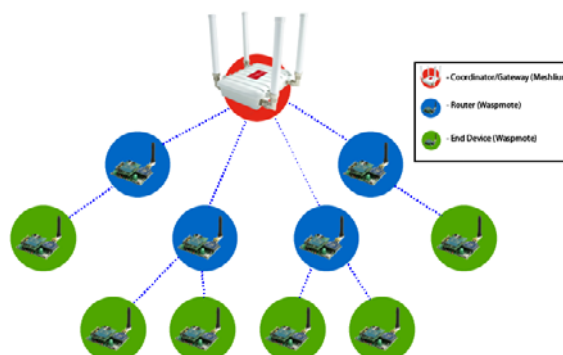


Figure 5: Tree

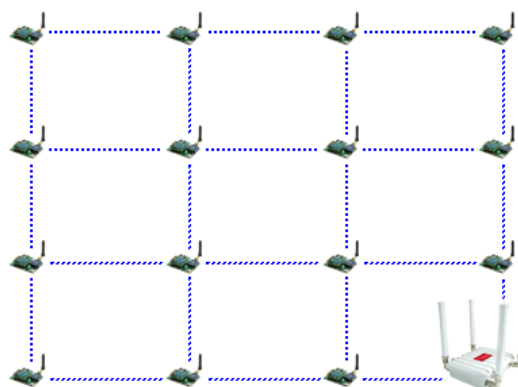


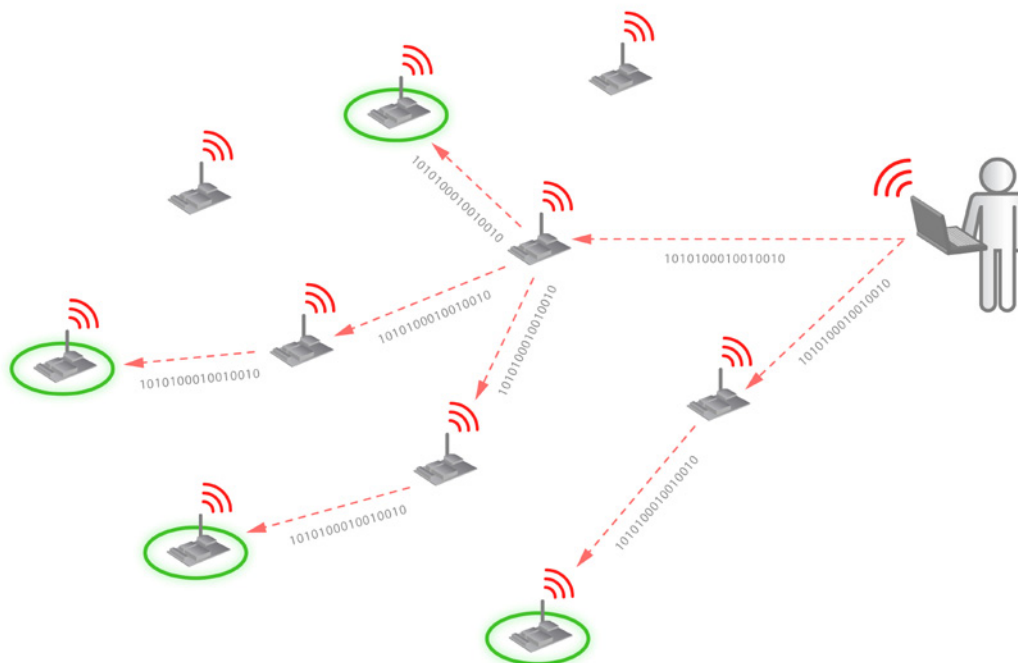
Figure 6: Mesh

# Over the Air Programming (OTA)

## Benefits:

- Enables the upgrade or change of firmware versions without physical access
- Enables to recover to any sensor node which gets stuck
- Discover nodes in the area just sending a broadcast discovery query
- Upload new firmware in just a couple of minutes
- No interferences: OTA is performed using a change of channel between the programmer and the desired node so no interferences are generated to the rest of the nodes

## Over The Air Programming with 802.15.4 / ZigBee



## Topologies:

- Direct access: when the nodes are accessed in just one hop (no forwarding of the packets is needed).
- Multihop: when the nodes are accessed in two or more hops. In this mode some nodes have to forward the packets sent by the Gateway in order to reach the destination.

## Modes:

- Unicast: Reprogram an specific node
- Multicast: Reprogram several nodes at the same time sending the program just once
- Broadcast: Reprogram the entire network sending the program just once

## Wifi

**Protocols:** 802.11b/g - 2.4GHz

**TX Power:** 0dBm - 12dBm (variable by software)

**RX Sensitivity:** -83dBm

**Antenna connector:** RPSMA

**Antenna:** 2dBi/5dBi antenna options

**Security:** WEP, WPA, WPA2

**Topologies:** AP and Adhoc

**802.11 roaming capabilities**

**Actions:**

- TCP/IP - UDP/IP socket connections
- HTTP and HTTPS (secure) web connections
- FTP and FTPS (secure) file transfers
- Direct connections with iPhone and Android
- Connects with any standard Wifi router
- DHCP for automatic IP assignation
- DNS resolution enabled

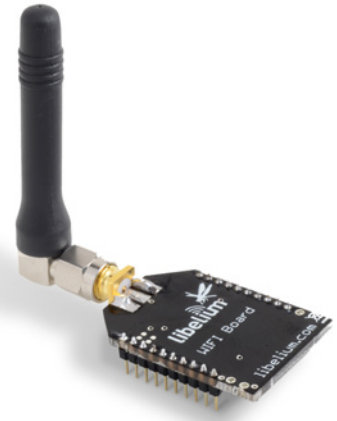


Figure 7: Wifi Module

## Bluetooth

**Bluetooth Chip:** eUnistone 31308/2

**Version:** Bluetooth 2.0 + EDR (Configurable BT 1.2)

**TX Power:** 2.5dBm

**RX Sensitivity:** -86dBm

**Antenna:** 2dBi / 5dBi

**Antenna Connector:** RPSMA

**Outdoor Range:** 250m

**Indoor Range:** 30m

**Actions:**

- Scanning of new devices
- Security - PIN mode
- Adaptive Frequency Hopping (AFH)
- Serial Port Profile (SPP)
- Trusted nodes management



Figure 8: Bluetooth Module

## GSM/GPRS

**Model:** SIM900 (SIMCom)

**Quadband:** 850MHz/900MHz/1800MHz/1900MHz

**TX Power:** 2W(Class 4) 850MHz/900MHz, 1W(Class 1) 1800MHz/1900MHz

**Sensitivity:** -109dBm

**Antenna connector:** UFL

**External Antenna:** 0dBi

**Consumption in power down mode:** 30µA

### Actions:

- Making/Receiving calls
- Making 'x' tone missed calls
- Sending/Receiving SMS
- Single connection and multiple connections TCP/IP and UDP/IP clients
- TCP/IP server
- HTTP Service
- FTP Service (downloading and uploading files)



Figure 9: GSM/GPRS

## Bluetooth module for device discovery

**Protocol:** Bluetooth 2.1 + EDR. Class 2

**TX Power:** 3dBm

**Antenna:** 2dBi

**Max Scan:** Up to 250 unique devices in each inquiry

**Power levels:** 7 [-27dBm, +3dBm]

### Application

- Vehicular and pedestrian traffic monitoring

### Features:

- Received Strength Signal Indicator (RSSI) for each scanned device
- Scan devices with maximum inquiry time
- Scan devices with maximum number of nodes
- Scan devices looking for a certain user by MAC address
- Class of Device (CoD) for each scanned device



Figure 10: Bluetooth module for device discovery



# RFID/NFC

## 13.56MHz

- **Compatibility:** Reader/writer mode supporting ISO 14443A / MIFARE / FeliCaTM / NFCIP-1
- **Distance:** 5cm
- **Max capacity:** 4KB
- **Tags:** cards, keyrings, stickers

### Applications

- Located based services (LBS)
- Logistics (assets tracking, supply chain)
- Access management
- Electronic prepaid metering (vending machines, public transport)
- Smartphone interaction (NFCIP-1 protocol)

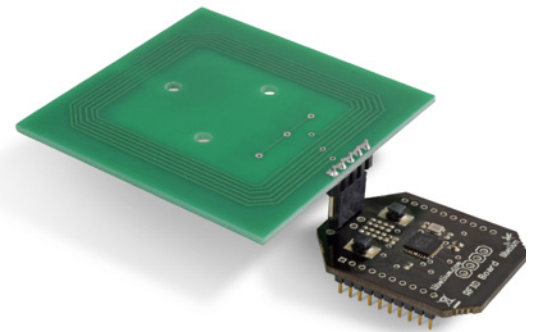


Figure 11: 13.56MHz RFID/NFC module

## 125KHz

- **Compatibility:** Reader/writer mode supporting ISO cards - T5557 / EM4102
- **Distance:** 5cm
- **Max capacity:** 20B
- **Tags available:** cards, keyrings

### Applications

- Located based services (LBS)
- Logistics (assets tracking, supply chain)
- Product management
- Animal farming identification

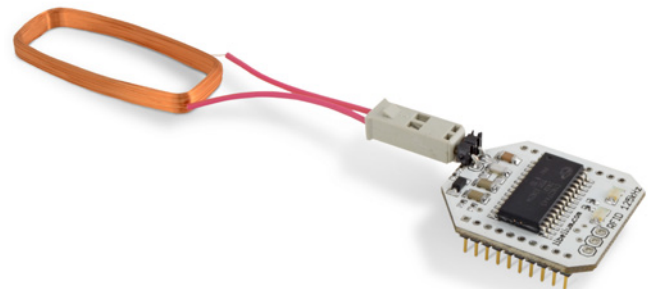


Figure 12: 125KHz RFID module



Figure 13: RFID cards



Figure 14: RFID keyrings



Figure 15: RFID sticker

## Expansion Radio Board

The Expansion Radio Board allows to connect two radios at the same time. This means a lot of different combinations are now possible using any of the six radios available for Waspote: 802.15.4, ZigBee, Bluetooth, RFID, Wifi, 3G/GPRS, 868 and 900.

### Some of the possible combinations are:

- ZigBee - Bluetooth
- ZigBee - RFID
- ZigBee - Wifi
- ZigBee - 3G/GPRS
- Bluetooth - RFID
- RFID - 3G/GPRS
- etc.

*Remark: the 3G/GPRS module does not need the Expansion Board to be connected to Waspote. It can be plugged directly in the 3G/GPRS socket.*

### Applications:

- Multifrequency Sensor Networks: (2.4GHz - 868/900MHz)
- Bluetooth - ZigBee hybrid networks
- NFC (RFID) applications with 3G/GPRS
- ZigBee - Wifi hybrid networks

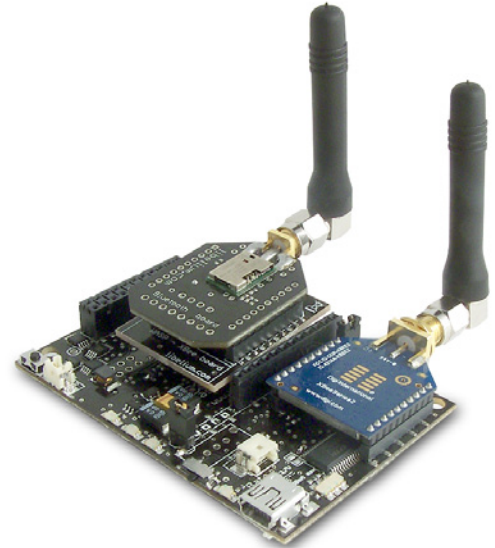


Figure 16: Expansion Radio Board

## GPS

**Model:** A1084 (Vincotech)

**Movement sensitivity:** -159dBm

**Acquisition sensitivity:** -142dBm

**Hot Start Time:** <1s

**Warm Start Time:** <32s

**Cold Start Time:** <35s

**Antenna connector:** UFL

**External antenna:** 26dBi

**Available information:** latitude, longitude, height, speed, direction, date/time and ephemerids management.

### Programmable interruptions:

- **Asynchronous**
  - Sensors (programmable threshold)
  - Low Battery (programmable threshold)
  - Accelerometer: Free-fall, impact (programmable threshold)
  - Arrival of SMS, calls and data
- **Synchronous:**
  - Watchdog: programmable alarms: from 32ms to 8s
  - RTC: programmable alarms: from 1s to days

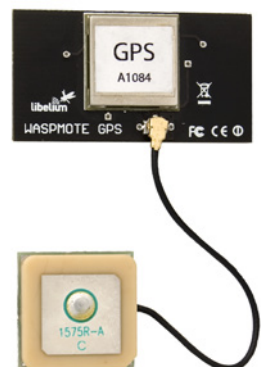


Figure 17: GPS



# Sensor Boards

## GASES



Figure 18: Gases Board

## APPLICATIONS

- **City pollution**  
CO, CO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>
- **Emissions from farms and hatcheries**  
CH<sub>4</sub>, H<sub>2</sub>S, NH<sub>3</sub>
- **Control of chemical and industrial processes**  
C<sub>4</sub>H<sub>10</sub>, H<sub>2</sub>, VOC
- **Forest fires**  
CO, CO<sub>2</sub>

## SENSORS

- Carbon Monoxide – CO
- Carbon Dioxide – CO<sub>2</sub>
- Oxygen – O<sub>2</sub>
- Methane – CH<sub>4</sub>
- Hydrogen – H<sub>2</sub>
- Ammonia – NH<sub>3</sub>
- Isobutane – C<sub>4</sub>H<sub>10</sub>
- Ethanol – CH<sub>3</sub>CH<sub>2</sub>OH
- Toluene – C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>
- Hydrogen Sulfide – H<sub>2</sub>S
- Nitrogen Dioxide – NO<sub>2</sub>
- Ozone – O<sub>3</sub>
- Hydrocarbons – VOC
- Temperature
- Humidity
- Pressure atmospheric

## EVENTS



Figure 19: Events Board

## APPLICATIONS

- **Security**  
Vibration, hall effect (doors and windows), person detection PIR
- **Emergencies**  
Presence detection and water level sensors, temperature
- **Control of goods in logistics**  
Vibration and impact sensors

## SENSORS

- Pressure/Weight
- Bend
- Vibration
- Impact
- Hall Effect
- Tilt
- Temperature (+/-)
- Liquid Presence
- Liquid Level
- Luminosity
- Presence (PIR)
- Stretch

## SMART CITIES

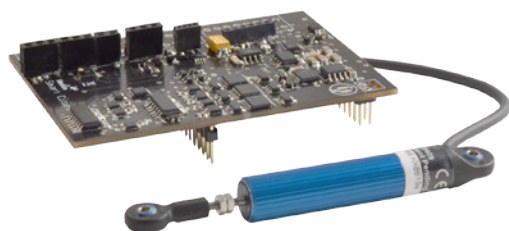


Figure 20: Smart Cities Board

## APPLICATIONS

- **Noise maps**  
Monitor in real time the acoustic levels in the streets of a city
- **Structural health monitoring**  
Crack detection and propagation
- **Air quality**  
Detect the level of particulates and dust in the air
- **Waste management**  
Measure the garbage levels in bins to optimize the trash collection routes

## SENSORS

- Microphone (dBSPLA)
- Crack detection gauge
- Crack propagation gauge
- Linear displacement
- Dust - PM-10
- Ultrasound (distance measurement)
- Temperature
- Humidity
- Luminosity

## SMART PARKING

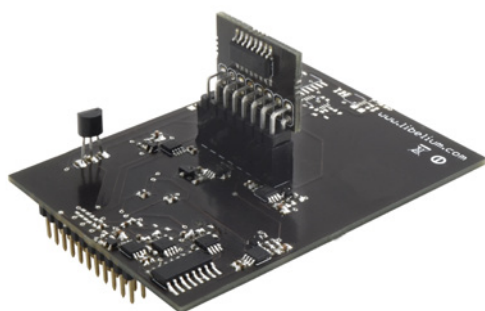


Figure 21: Smart Parking Board

## APPLICATIONS

- Car detection for available parking information
- Detection of free parking lots outdoors
- Parallel and perpendicular parking slots control

## SENSORS

- Magnetic Field

## AGRICULTURE

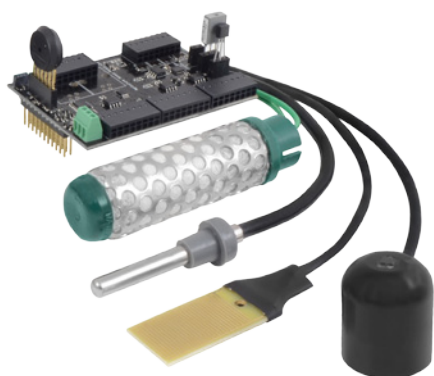


Figure 22: Agriculture Board

## APPLICATIONS

- **Precision Agriculture**  
Leaf temperature, fruit diameter
- **Irrigation Systems**  
Soil moisture, leaf wetness
- **Greenhouses**  
Solar radiation, humidity, temperature
- **Weather Stations**  
Anemometer, wind vane, pluviometer

## SENSORS

- Air Temperature / Humidity
- Soil Temperature / Moisture
- Leaf Wetness
- Atmospheric Pressure
- Solar Radiation - PAR
- Ultraviolet Radiation - UV
- Trunk Diameter
- Stem Diameter
- Fruit Diameter
- Anemometer
- Wind Vane
- Pluviometer
- Luminosity


RADIATION	APPLICATIONS	SENSORS
	<ul style="list-style-type: none"> <li>Monitor the radiation levels wirelessly without comprising the life of the security forces</li> </ul>	<ul style="list-style-type: none"> <li>Geiger tube [ <math>\beta</math>, <math>\gamma</math> ] (Beta and Gamma)</li> </ul>
	<ul style="list-style-type: none"> <li>Create prevention and control radiation networks in the surroundings of a nuclear plant</li> <li>Measure the amount of Beta and Gamma radiation in specific areas autonomously</li> </ul>	

Figure 23: Radiation Board

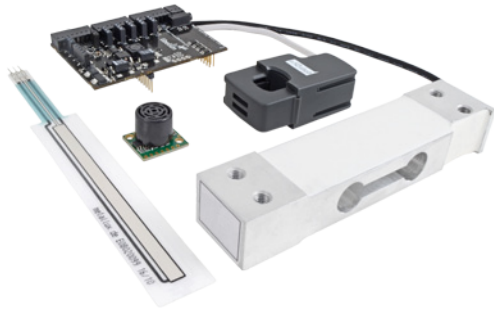
SMART METERING	APPLICATIONS	SENSORS
	<ul style="list-style-type: none"> <li>Energy measurement</li> <li>Water consumption</li> <li>Pipe leakage detection</li> <li>Liquid storage management</li> <li>Tanks and silos level control</li> <li>Supplies control in manufacturing</li> <li>Industrial Automation</li> <li>Agricultural Irrigation</li> </ul>	<ul style="list-style-type: none"> <li>Current</li> <li>Water flow</li> <li>Liquid level</li> <li>Load cell</li> <li>Ultrasound</li> <li>Distance Foil</li> <li>Temperature</li> <li>Humidity</li> <li>Luminosity</li> </ul>

Figure 24: Smart Metering Board

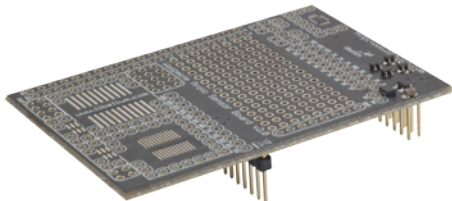
PROTOTYPING SENSOR	APPLICATIONS	SENSORS
	<ul style="list-style-type: none"> <li>Prepared for the <b>integration of any kind of sensor.</b></li> </ul>	<ul style="list-style-type: none"> <li>Pad Area</li> <li>Integrated Circuit Area</li> <li>Analog-to-Digital Converter (16b)</li> </ul>

Figure 25: Prototyping Sensor Board

## Power supplies

- 1150mA/2300mA/6600mA Li-Ion rechargeable // 13000mAH **non - rechargeable**
- Solar Panel: rigid (7V – 500mA) and flexible (7.2V – 100mA)
- USB (220V-USB, car lighter USB)

## USB-PC interface

Model: Wasp mote Gateway \*

Communication: 802.15.4/ZigBee - USB PC

Programmable buttons and leds

*\*Included in the developers Kit*

### Compiler:

- IDE-Wasp mote (open source)
- Language: C++
- Versions Windows, Linux and Mac-OS



Figure 26: Wasp mote Gateway

## Wasmote Plug & Sense! - Encapsulated Line

The new Wasmote Plug & Sense! line allows you to easily deploy wireless sensor networks in a easy and scalable way ensuring minimum maintenance costs. The new platform consists of a robust waterproof enclosure with specific external sockets to connect the sensors, the solar panel, the antenna and even the USB cable in order to reprogram the node. It has been specially designed to be scalable, easy to deploy and maintain.

**Note:** For a complete reference guide download the “Wasmote Plug & Sense! Technical Guide” in the **Support section** of the **Libelium website**.

### Features

- Robust waterproof IP65 enclosure
- Add or change a sensor probe in seconds
- Solar powered with internal and external panel options
- Radios available: Zigbee, 802.15.4, Wifi, 868MHz, 900MHz and 3G/GPRS
- Over the air programming (OTAP) of multiple nodes at once
- Special holders and brackets ready for installation in street lights and building fronts
- Graphical and intuitive programming interface

### Sensor Probes

Sensor probes can be easily attached by just screwing them into the bottom sockets. This allows you to add new sensing capabilities to existing networks just in minutes. In the same way, sensor probes may be easily replaced in order to ensure the lowest maintenance cost of the sensor network.



Figure 27: Connecting a sensor probe to Wasmote Plug & Sense!



## Solar Powered

Battery can be recharged using the internal or external solar panel options.

The external solar panel is mounted on a 45° holder which ensures the maximum performance of each outdoor installation.



Figure 28: Waspote Plug & Sense! powered by an external solar panel

For the internal option, the solar panel is embedded on the front of the enclosure, perfect for use where space is a major challenge.



Figure 29: Internal solar panel





Figure 30: Waspote Plug & Sense! powered by an internal solar panel

## Programming the Nodes

Waspote Plug & Sense! can be reprogrammed in two ways:

The basic programming is done from the USB port. Just connect the USB to the specific external socket and then to the computer to upload the new firmware.



Figure 31: Programming a node

Over the Air Programming is also possible once the node has been installed. With this technique you can reprogram wirelessly one or more WaspMote sensor nodes at the same time by using a laptop and the WaspMote Gateway.



Figure 32: Typical OTA process

## Radio Interfaces

Model	Protocol	Frequency	txPower	Sensitivity	Range *
XBee-802.15.4	802.15.4	2.4GHz	1mW	-92dB	500m
XBee-802.15.4-Pro	802.15.4	2.4GHz	100mW	-100dBm	7000m
XBee-ZB	ZigBee-Pro	2.4GHz	2mW	-96dBm	500m
XBee-ZB-Pro	ZigBee-Pro	2.4GHz	50mW	-102dBm	7000m
XBee-868	RF	868MHz	315mW	-112dBm	12km
XBee-900	RF	900MHz	50mW	-100dBm	10Km
XBee-XSC	RF	900MHz	100mW	-106dBm	12Km

\* Line of sight and Fresnel zone with 5dBi dipole antenna

## Program in minutes

In order to program the nodes an intuitive graphic interface has been developed. Developers just need to fill a web form in order to obtain the complete source code for the sensor nodes. This means the complete program for an specific application can be generated just in minutes. Check the Code Generator to see how easy it is at:

[http://www.libelium.com/development/waspMote/code\\_generator](http://www.libelium.com/development/waspMote/code_generator)

### WaspMote - Plug & Sense! - Code Generator

**Select Model**

Board model:

Select

**Sleeping Time**

Time (seconds):

**Select sensor by socket**

A: Select B: Select C: Select

D: Select E: Select F: Select

**Additional information**

Add Accelerometer 3 Axis data: ☐ Add GPS coordinates: ☐ WaspMote identifier (nodeID): (Max 10 characters)

**Select Communication Module**

Communication Module: USB (Debugging)

**Generate Code**

Figure 33: Code Generator

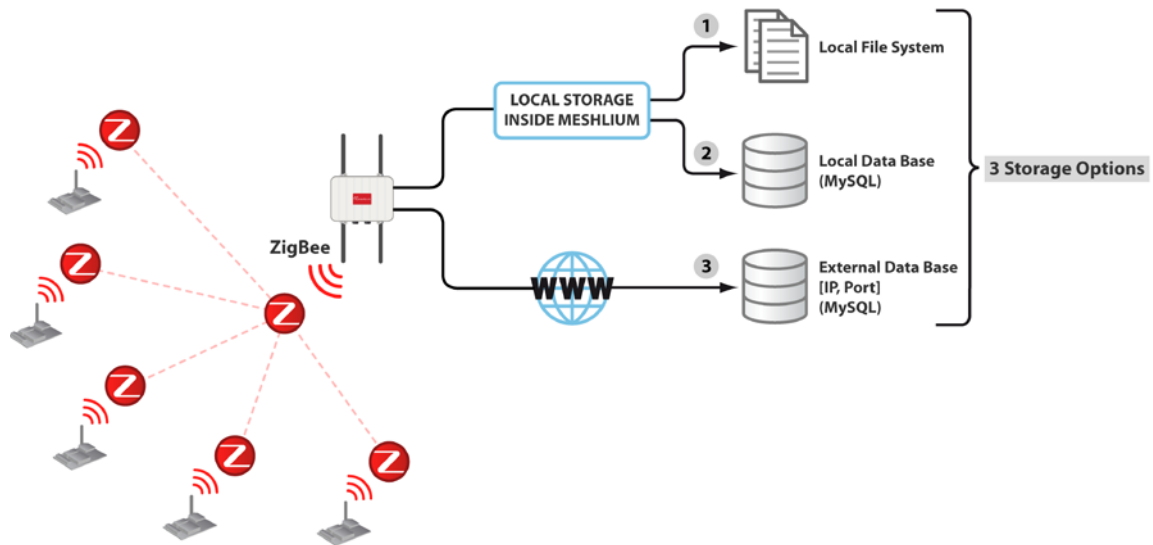
## Data to the Cloud

The Sensor data gathered by the Waspote Plug & Sense! nodes is sent to the Cloud by Meshlium, the Gateway router specially designed to connect Waspote sensor networks to the Internet via Ethernet, Wifi and 3G interfaces.



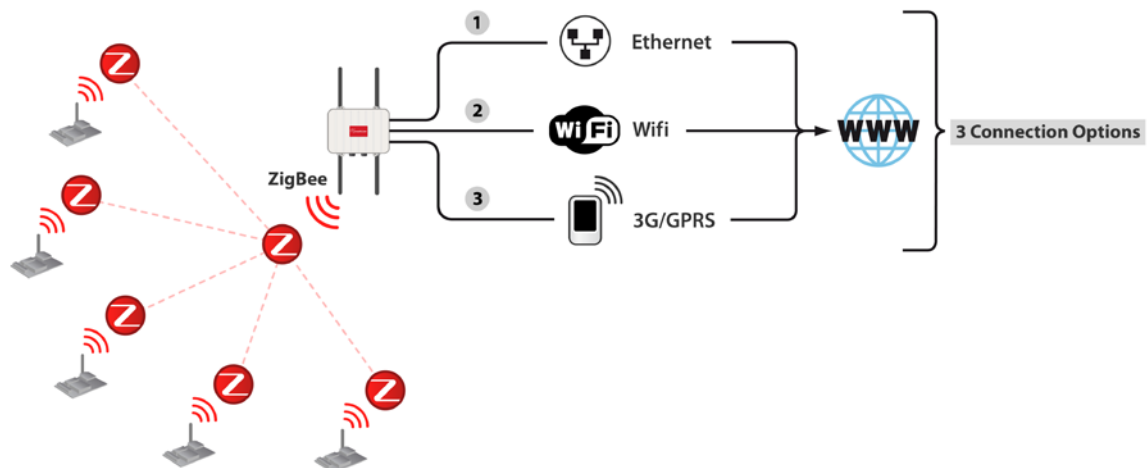
Figure 34: Meshlium

## Meshlium Storage Options



- Local File System
- Local Data Base
- External Data Base

## Meshlium Connection Options



- ZigBee -> Ethernet
- ZigBee -> Wifi
- ZigBee -> 3G/GPRS

## Models

There are some defined configurations of Waspote Plug & Sense! depending on which sensors are going to be used. Waspote Plug & Sense! configurations allows connecting up to six sensor probes at the same time.

Each model takes a different conditioning circuit to enable the sensor integration. For this reason each model allows to connect just its specific sensors.

This section describes each model configuration in detail, showing the sensors which can be used in each case and how to connect them to Waspote. In many cases, the sensor sockets accept the connection of more than one sensor probe. See the compatibility table for each model configuration to choose the best probe combination for the application.

It is very important to remark that each socket is designed only for one specific sensor, so **they are not interchangeable**. Always be sure you connected probes in the right socket, otherwise they can be damaged.

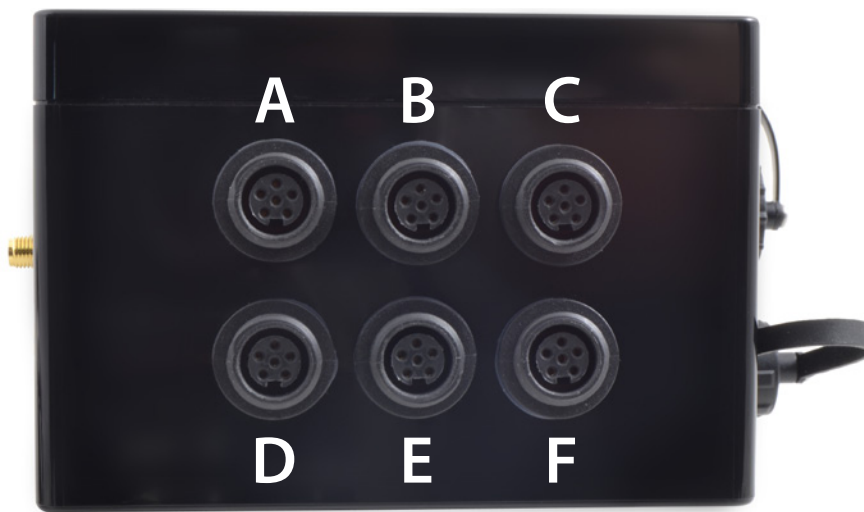


Figure 35: Identification of sensor sockets

## Smart Enviroment

Smart Environment model is designed to monitor environmental parameters such as temperature, humidity, atmospheric pressure and some types of gases. The main applications for this Waspote Plug & Sense! configuration are city pollution measurement, emissions from farms and hatcheries, control of chemical and industrial processes, forest fires, etc. Go to the application section in the [Libelium website](http://www.libelium.com) for a complete list of services.



Figure 36: Smart Environment Waspote Plug & Sense! model



Sensor sockets are configured as shown in the figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Temperature	9203
	Carbon monoxide - CO	9229
	Methane - CH <sub>4</sub>	9232
	Ammonia – NH <sub>3</sub>	9233
	Liquid Petroleum Gases: H <sub>2</sub> , CH <sub>4</sub> , ethanol, isobutene.	9234
	Air pollutants 1: C <sub>4</sub> H <sub>10</sub> , CH <sub>3</sub> CH <sub>2</sub> OH, H <sub>2</sub> , CO, CH <sub>4</sub>	9235
	Air pollutants 2: C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> , H <sub>2</sub> S, CH <sub>3</sub> CH <sub>2</sub> OH, NH <sub>3</sub> , H <sub>2</sub>	9236
	Alcohol derivates: CH <sub>3</sub> CH <sub>2</sub> OH, H <sub>2</sub> , C <sub>4</sub> H <sub>10</sub> , CO, CH <sub>4</sub>	9237
B	Humidity	9204
	Atmospheric pressure	9250
C	Carbon dioxide - CO <sub>2</sub>	9230
D	Nitrogen dioxide - NO <sub>2</sub>	9238
E	Ozone - O <sub>3</sub>	9258
	Hydrocarbons - VOC	9201
	Oxygen - O <sub>2</sub>	9231
F	Carbon monoxide - CO	9229
	Methane - CH <sub>4</sub>	9232
	Ammonia – NH <sub>3</sub>	9233
	Liquid Petroleum Gases: H <sub>2</sub> , CH <sub>4</sub> , ethanol, isobutene.	9234
	Air pollutants 1: C <sub>4</sub> H <sub>10</sub> , CH <sub>3</sub> CH <sub>2</sub> OH, H <sub>2</sub> , CO, CH <sub>4</sub>	9235
	Air pollutants 2: C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub> , H <sub>2</sub> S, CH <sub>3</sub> CH <sub>2</sub> OH, NH <sub>3</sub> , H <sub>2</sub>	9236
	Alcohol derivates: CH <sub>3</sub> CH <sub>2</sub> OH, H <sub>2</sub> , C <sub>4</sub> H <sub>10</sub> , CO, CH <sub>4</sub>	9237

Figure 37: Sensor sockets configuration for Smart Environment model

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Smart Security

The main applications for this Wasmote Plug & Sense! configuration are perimeter access control, liquid presence detection and doors and windows openings.



Figure 38: Smart Security Wasmote Plug & Sense! model

**Note:** The probes attached in this photo could not match the final location. See next table for the correct configuration.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Temperature + Humidity (Sensirion)	9247
B	Liquid flow	9296, 9297, 9298
C	Presence - PIR	9212
D	Luminosity	9205
	Liquid level	9239, 9240, 9242
	Liquid presence	9243
	Hall effect	9207
E	Luminosity	9205
	Liquid level	9239, 9240, 9242
	Liquid presence	9243
	Hall effect	9207
F	Luminosity	9205
	Liquid level	9239, 9240, 9242
	Liquid presence	9243
	Hall effect	9207

Figure 39: Sensor sockets configuration for Smart Security model

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Smart Metering

The main applications for this Waspote Plug & Sense! model are energy measurement, water consumption, pipe leakage detection, liquid storage management, tanks and silos level control, supplies control in manufacturing, industrial automation, agricultural irrigation, etc. Go to the application section in the [Libelium website](http://www.libelium.com) for a complete list of services.



Figure 40: Smart Metering Waspote Plug & Sense! model

Sensor sockets are configured as shown in the figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Temperature	9203
	Soil temperature	86949*
B	Humidity	9204
C	Ultrasound (distance measurement)	9246
	Liquid flow	9296, 9297, 9298
D	Current sensor	9266
E	Ultrasound (distance measurement)	9246
	Liquid flow	9296, 9297, 9298
F	Luminosity	9205

Figure 41: Sensor sockets configuration for Smart Metering model

\* Ask Libelium **Sales Department** for more information.

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Smart Cities

The main applications for this Waspote Plug & Sense! model are noise maps (monitor in real time the acoustic levels in the streets of a city), air quality, waste management, structural health, smart lighting, etc. Refer to [Libelium website](http://www.libelium.com) for more information.



Figure 42: Smart Cities Waspote Plug & Sense! model



Sensor sockets are configured as shown in the figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Temperature	9203
	Soil temperature	86949*
	Ultrasound (distance measurement)	9246
B	Humidity	9204
	Ultrasound (distance measurement)	9246
C	Luminosity	9205
D	Noise sensor	9259
E	Dust sensor	9320
F	Linear displacement	9319

Figure 43: Sensor sockets configuration for Smart Cities model

\* Ask Libelium **Sales Department** for more information.

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Smart Parking

Smart Parking allows to detect available parking spots by placing the node under the pavement. It works with a magnetic sensor which detects when a vehicle is present or not. Waspmote Plug & Sense! can act as a repeater for a Smart Parking node.



Figure 44: Smart Parking enclosure

Sensor sockets are no used for this model.

There are specific documents for parking applications at [Libelium website](http://www.libelium.com). Refer to Smart Parking Technical guide to see typical applications for this model and how to make a good installation.

## Smart Agriculture

The Smart Agriculture models allow to monitor multiple environmental parameters involving a wide range of applications. It has been provided with sensors for air and soil temperature and humidity (Sensirion), solar visible radiation, wind speed and direction, rainfall, atmospheric pressure, etc.

The main applications for this Waspote Plug & Sense! model are precision agriculture, irrigation systems, greenhouses, weather stations, etc. Refer to [Libelium website](http://www.libelium.com) for more information.

Two variants are possible for this model, normal and PRO. Next section describes each configuration in detail.



Figure 45: Smart Agriculture Waspote Plug & Sense! model

## Normal

Sensor sockets are configured as shown in the figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Humidity + Temperature (Sensirion)	9247
B	Atmospheric pressure	9250
C	Soil temperature	86949*
	Soil moisture	9248
D	Weathermeters + pluviometer	9256
E	Soil moisture	9248
F	Leaf wetness	9249
	Soil moisture	9248

Figure 46: Sensor sockets configuration for Smart Agriculture model

\* Ask Libelium **Sales Department** for more information.

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## PRO

Sensor sockets are configured as shown in the figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Humidity + Temperature (Sensirion)	9247
B	Soil temperature	9255
C	Solar radiation	9251, 9257
D	Soil temperature	86949*
	Soil moisture	9248
E	Dendrometers	9252, 9253, 9254
	Soil moisture	9248
F	Leaf wetness	9249
	Soil moisture	9248

Figure 47: Sensor sockets configuration for Smart Agriculture PRO model

\* Ask Libelium **Sales Department** for more information.

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Ambient Control

This model is designed to monitor main environment parameters in an easy way. Only three sensor probes are allowed for this model, as shown in next table.



Figure 48: Ambient Control Wasp mote Plug & Sense! model

Sensor sockets are configured as it is shown in figure below.

Sensor Socket	Sensor probes allowed for each sensor socket	
	Parameter	Reference
A	Humidity + Temperature (Sensirion)	9247
B	Luminosity	9205
C	Not used	
D	Not used	
E	Not used	
F	Not used	

Figure 49: Sensor sockets configuration for Ambient Control model

**Note:** For more technical information about each sensor probe go to the [Support section](#) in Libelium website.



## Radiation Control

The main application for this Waspote Plug & Sense! configuration is to measure radiation levels using a Geiger sensor. For this model, the Geiger tube is already included inside Waspote, so the user does not have to connect any sensor probe to the enclosure. The rest of the other sensor sockets are not used.



Figure 50: Radiation Control Waspote Plug & Sense! model

Sensor sockets are not used for this model.

**Note:** For more technical information about each sensor probe go to the **Support section** in Libelium website.

## Certifications

- CE (Europe)
- FCC (USA)
- IC (Canada)

