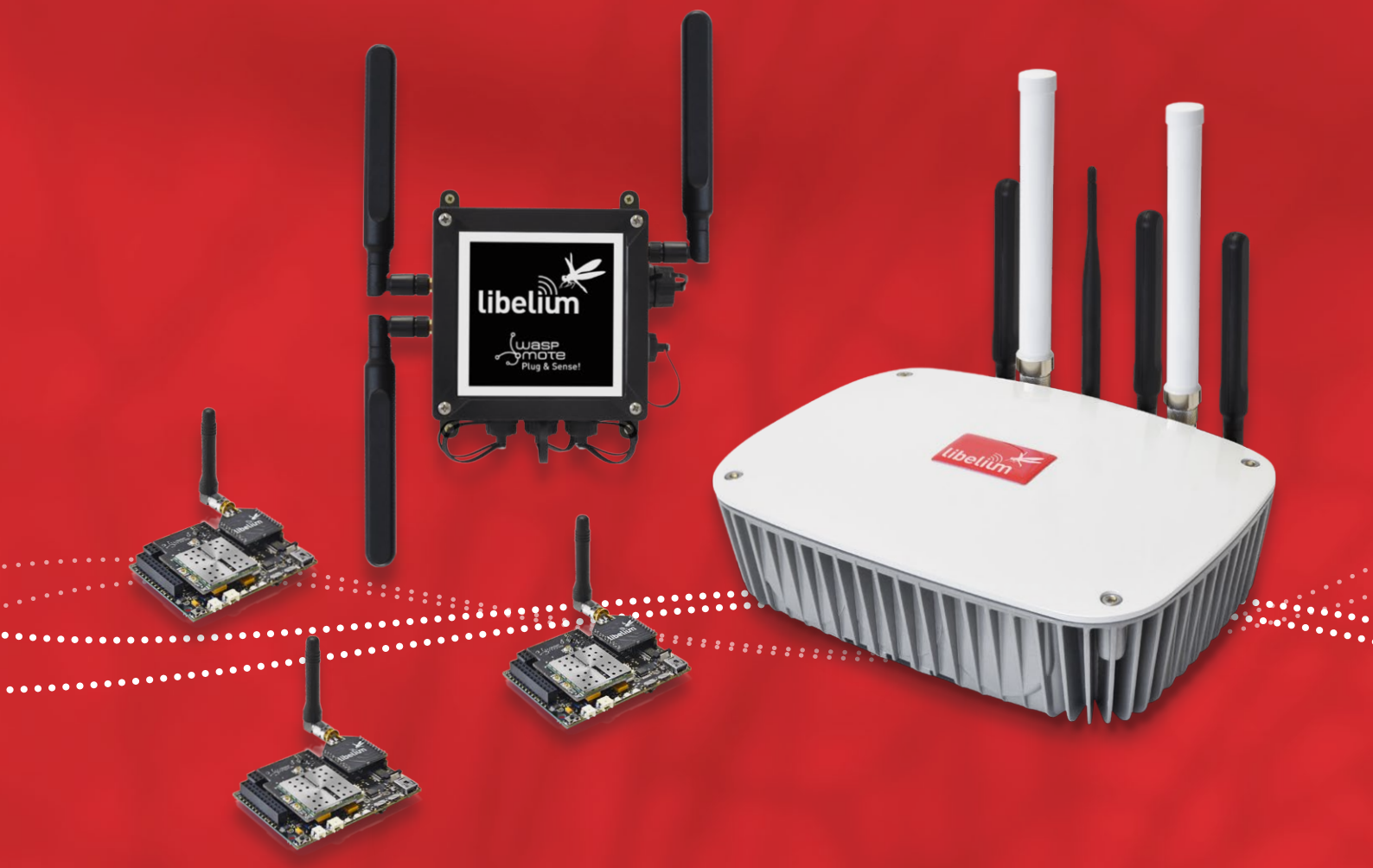
New Generation of Libelium Product Lines. 2016.



libelium

Document version: v1.2 - 10/2016

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1. New Generation of our Main Product Lines

1.1. Technical Introduction

Dear Customer,

The current versions of Waspmote (v1.2) and Plug & Sense! (v1.2) were released in 2012. Since then, more than 10,000 developers have been using the platform, posting suggestions and informing of possible improvements via our forum and Technical Service mailings.

We have carefully listened to all of them and updated both the Waspmote API and hardware architecture in order to include the most important and useful improvements and suggestions. The result is the new version **1.5** that sees the light in October 2016.

In the current document you can find what changes have been made related to the API, SDK and hardware designs and what implications they have compared with the previous version.

The good news are that most of the code of v12 will be compatible with v15, so it will be pretty easy to move your source codes to the new version. Only minimum changes will be needed, anyway we will be happy to support you in the migration process. For this purpose, we have created a special thread in our forum: https://www.libelium.com/forum/.

Our IoT Gateway Meshlium also moves from 3.5 to **4.0** version and gets also a new hardware and software architecture, making it more powerful and easy to use.

As well as the technical improvements, we made a big effort in getting the new products ready for the major markets in the World. So we are proud to say that both Plug & Sense! and Meshlium are the first IoT platforms to be fully certified: CE (Europe) / FCC (US) / IC (Canada) / ANATEL (Brazil) / RCM (Australia) / PTCRB (US) / AT&T (US).

We want to specially thank all developers that have given us their feedback to improve the platform and encourage them to keep on doing the same with the current Waspmote, Plug & Sense! and Meshlium versions. We hope developers can take advantage of all these new features to perform easily any IoT project.

Best regards.

David Gascón
Libelium CTO

1.2. Timeline and Sales Information

Dear Customer,

It has been a while since the first versions of Waspmote and Meshlium were launched in 2009. Thousands of companies like yours are successfully using them worldwide in all kinds of projects. As evolving products, we keep on adding useful features, new sensors according to market demands, and cutting-edge connectivity radios. Waspmote and Meshlium are alive products with a full-time team dedicated to improve them and integrate our customers feedback. As a result, we made a major revision in 2012 (including the born of Plug & Sense!) and this is the second one. IoT is a new and growing market and the fact that our platform has been serving it from its beginnings and counts with these revisions shows nothing but its market approval, maturity and robustness.

In addition to the technical document provided, we hereby describe the chronology of the product transition from a purchase perspective, and the ordering process involved:

- **August 22nd, 2016**: Announcement of Waspmote, Plug & Sense! and Meshlium new generation and End of Life of the current products.
- **From August 22nd to November 30th**: all our current products will be available for purchase in the usual and standard terms.
- **November 30th**: End of the standard purchase period of the current products.
- **From December 1st to December 31st**: all the current products will be only available on demand, with a Minimum Order Quantity of one hundred (100) units.
- **December 31st, 2016**: End of Life of the current products.

Do not hesitate to contact us if you have any doubt in the transition process, we are here to help. To order products, you can contact your usual Key Account Manager, or our Inside Sales Team at sales@libelium.com.

Thank you for the confidence in our technology.

Javier Martínez
Libelium VP Business Development & Sales

2. Technical Comparisons

2.1. How to know what is the version of my devices and boards

That is simple: orders created from the release date include the new versions. Just in case you want to check each one of the devices, please take a look to the sections below.

2.1.1. Waspmote

Waspmote v15 has some visible modifications:

- You can read "v1.5" clearly on the top layer, instead of "v1.2".
- There are 3 switches close to the USB connector, instead of 2.
- There is a new vertical female gray connector close to those switches (its use is only for Plug & Sense!).
- Some components were relocated, there are new components, the SD card holder was turned, etc.

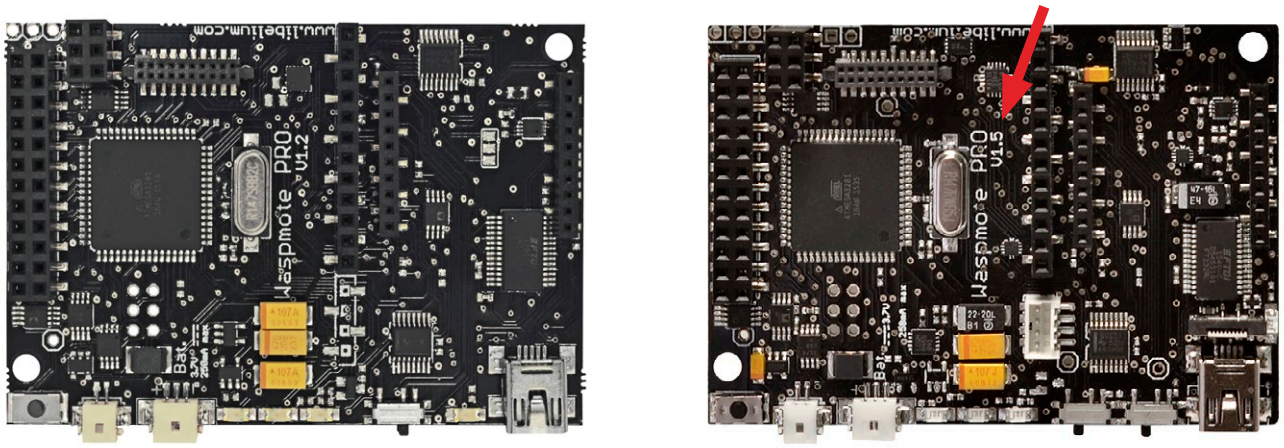

Figure : Waspmote v12 and Waspmote v15

If the user wants to use software instead of visual inspection, it is possible to call the function `utils.getVersion()`, available in the IDE from API v025. This function will return `v12` or `v15` via USB.

2.1.2. Plug & Sense!

There are not any external changes in Plug & Sense! v15, with few exceptions:

- Plug & Sense! Smart Water has 5 metallic connectors for sensor probes instead of 4 (just the same than Plug & Sense! Smart Water Ions v12 or v15).
- Plug & Sense! devices with 4G connectivity have 3 antenna connectors.

We also changed the format of the sticker on the back. Now that sticker looks like the following image.

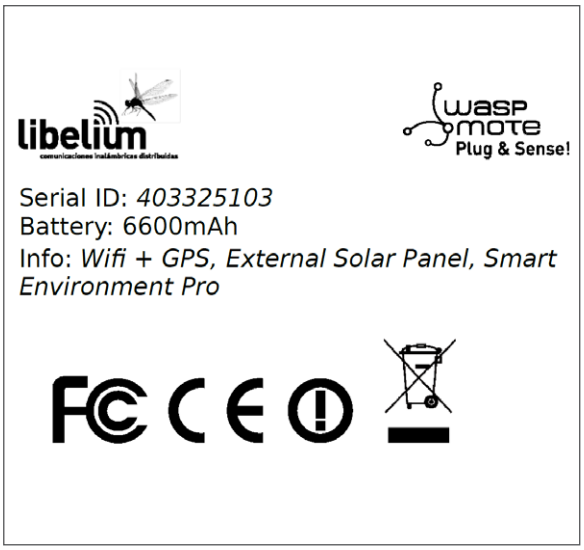

Figure : Plug & Sense! v12 sticker example

Figure : Plug & Sense! v15 sticker example

Another way of checking the version (this time from the code of a program) is to use the `utils.getVersion()` function explained above.

2.1.3. Meshlium

The new enclosure is a little bigger and clearly different to the previous version, as shown below.

Figure : Meshlium 3.5

Figure : Meshlium 4.0

Also notice that the new Meshlium 4.0 has connectors only on the lower side.

It is also possible to check the Meshlium version on the Manager System: in the Help section you can read if the version is higher than 4.0.

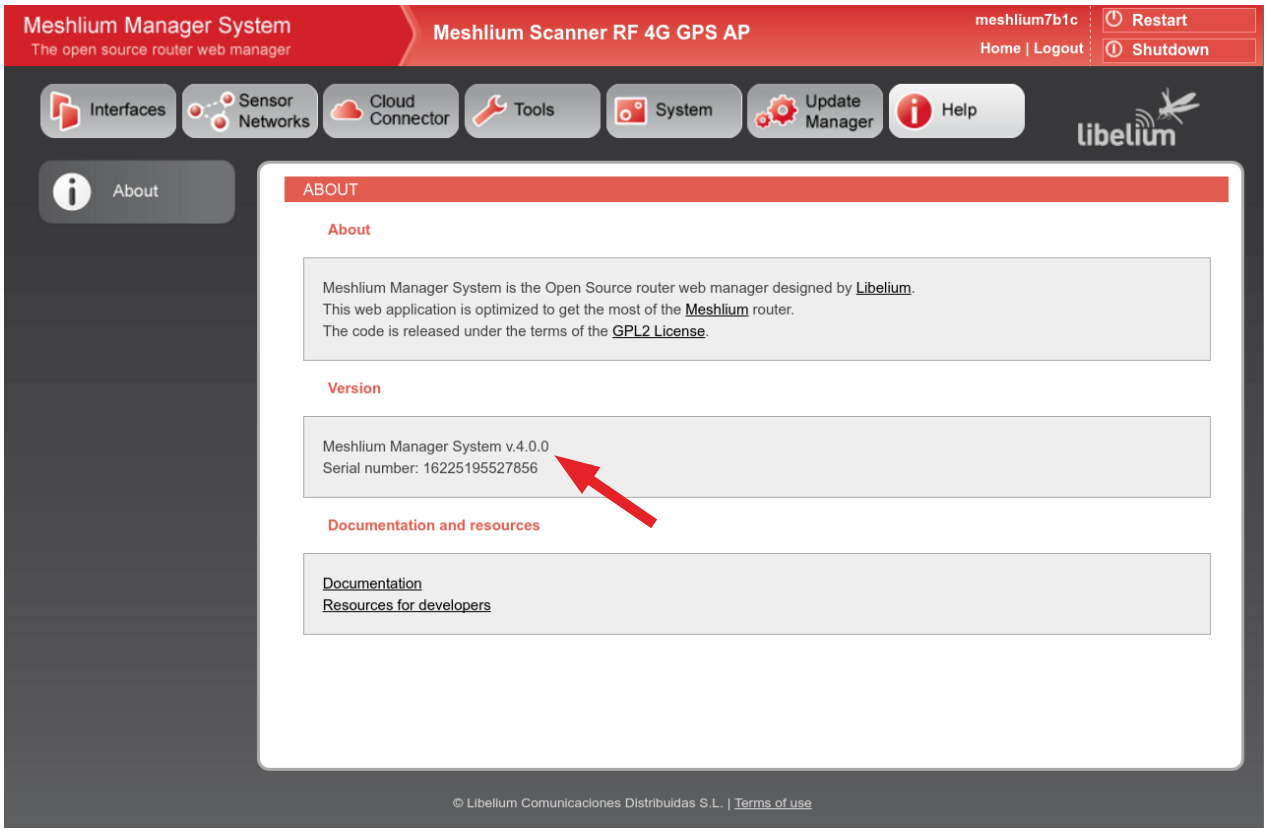

Figure : Checking Meshlium version on the Manager System (main menu and Help menu)

2.2. [Waspmote v12 / Plug & Sense! v12] vs [Waspmote v15 / Plug & Sense! v15]

Waspmote is a key product for Libelium, because it is the IoT node. Waspmote must allow advanced features, total modularity and maximum flexibility, while keeping reliability high and complexity low, so it has been a big challenge to create this new version. We collected many suggestions from customers and colleagues and selected the best ones. We are really satisfied with our new version and hope you enjoy it in your next IoT projects.

We created the following improvements:

- An RTC Watchdog has been implemented for reseting Waspmote if it gets stuck. That periodical reset avoids erratic behaviour.
- The power consumption has been significantly improved: in sleep mode, the power consumption of Waspmote v15 is now just 30 µA (instead of 55 µA) and in deep-sleep mode, just 33 µA (instead of 55 µA).
- The battery charging current is improved: from 100 to 480 mA when using the USB, and from 280 to 330 mA when using the solar panel.
- Now Waspmote is able to know if its battery is being charged, thanks to a charging battery indicator.
- The current from the solar panel can be measured (in mA) by Waspmote.
- The Serial ID chip has been upgraded. Waspmote v15 has a new security chip, with a unique identifier. The chip provides hardware-based key storage, in its fast, high-security 32 kB EEPROM, which enables authentication and confidential non-volatile data storage. The chip also supports Advanced Encryption Standard (AES).
- The power supply lines are isolated from the microcontroller and other parts (radios, sensors, accelerometer, SD, etc). With this feature we avoid possible unexpected resets of the microcontroller, especially when switching on the radios.
- The I2C and SPI lines now are isolated from the microcontroller. When Waspmote is in sleep or deep-sleep mode, the I2C and SPI devices are isolated from the microcontroller.
- The SPI lines of Socket 0 are isolated when this socket is not selected. Now, SPI modules (LoRa, RS-485 and CAN Bus) can be connected on Socket 0 without hardware modifications.
- Implemented ESD and electrical noise protection in the USB port.
- The I2C lines (SDA and SCL) are available in a new, dedicated socket (not soldered by default).
- The power supply is separated for multiplexers of UART 0 and UART 1. Now the power supply of the multiplexers can be controlled individually and the use of one UART does not affect to the other one.
- The SD socket has been rotated 90º. The USB connector is no longer an obstacle for inserting / extracting the SD card.

Note: *Now we can also actuate and control DC units such as irrigation valves, thermostats, illumination systems, motors, PLCs, etc. A specific IP67 sensor probe has been designed to control external DC units (< 30 VDC, <1 A). More info in the section "Events / Smart Security".*

Specification comparative table:

	Waspmote v12 / Plug & Sense! v12	Waspmote v15 / Plug & Sense! v15
General data		
Microcontroller	ATmega 1281	
Microcontroller frequency	14.7456 MHz	
SRAM	8 kB	
EEPROM	4 kB (1 kB reserved)	
Flash	128 kB	
SD card	2 GB	
Weight	20 g	
Dimensions	73.5 x 51 x 13 mm	
Temperature range	From -10 to 65 ºC	
Clock	RTC (32 kHz)	
RTC Watchdog reset	No	Yes
Crypto-authentication feature	No	Yes Unique identifier. Secure 32 kB EEPROM. AES-128 support.
Charging indicator	LED	LED Measurable by software
Charging current monitor	No	Yes, from solar panel
Power consumption		
On	15 mA	17 mA
Sleep	55 µA	30 µA
Deep-sleep	55 µA	33 µA
Hibernate	1 µA	7 µA
Inputs / outputs	7 analog inputs 8 digital I/Os 2 UARTs 1 I2C 1 SPI 1 USB Specific default socket for "basic sensors": Temperature, Humidity, Light (LDR)	
Electrical data		
Battery voltage	3.3-4.2 V (lithium-ion)	
USB charging	5 V @ 100 mA	5 V @ 480 mA
Solar panel charging	6-12 V @ 280 mA	6-12 V @ 330 mA
Built-in sensors on the board		
Temperature	RTC sensor -40 ºC - 85 ºC. Accuracy: 0.25 ºC	No

	Waspmote v12 / Plug & Sense! v12	Waspmote v15 / Plug & Sense! v15
Accelerometer	±2 g (1024 LSB/g) | ±6 g (340 LSB/g) 40 / 160 / 640 / 2560 Hz	

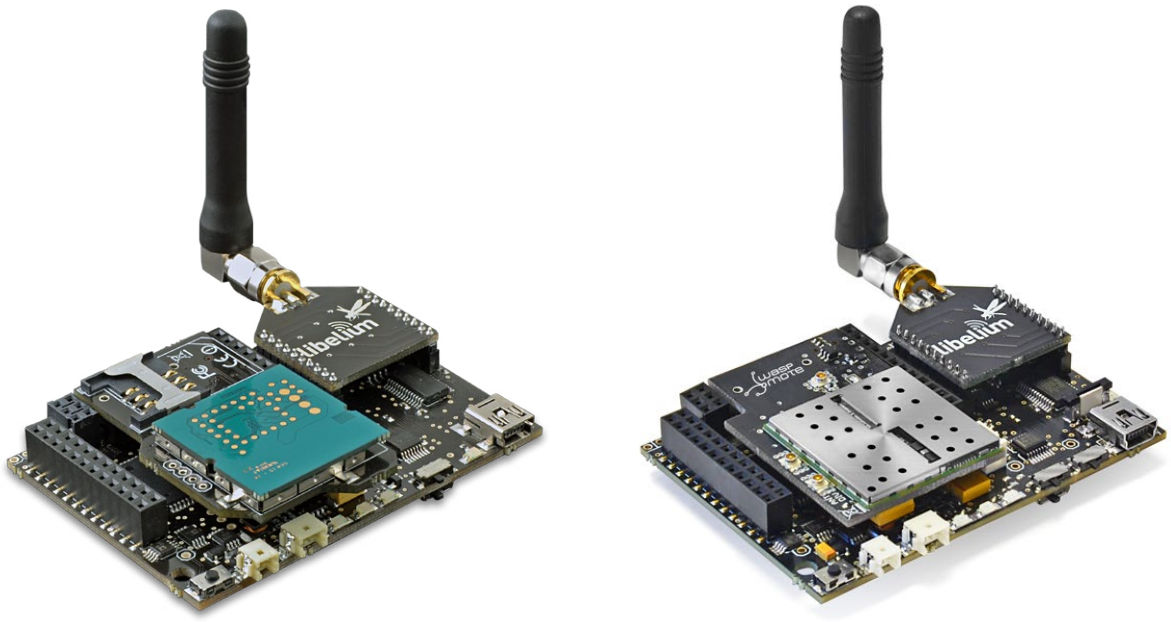

Figure : Waspmote v12 and Waspmote v15

	Plug & Sense! v12	Plug & Sense! v15
Certifications	CE / FCC / IC	CE (Europe) / FCC (US) / IC (Canada) / ANATEL (Brazil) / RCM (Australia) / PTCRB (US) / AT&T (US)

Figure : Plug & Sense!

Figure : Plug & Sense! 4G, with 3 antennas

2.3. WiFi vs WiFi PRO

The new WiFi PRO module for Waspmote improves lots of features from the old WiFi module:

- The new chipset is more robust and reliable than the former module from the hardware point of view.
- The transmission power is greater so the range may be improved.
- The new module improves the HTTP stack to perform both GET and POST requests.
- The new module permits to perform the secured version of the HTTP protocol, the module supports the SSL3/TLS1 protocol for secure HTTPS: GET and POST requests.
- It permits to store a maximum of 10 different SSID profiles to join to. However, the old module only stores one single SSID.
- It is possible to set up 10 TCP/UDP simultaneous connections. The old module permits only one single connection.
- It is possible to enable the roaming mode, so the device will not lose connection when changing from one access point to another.
- Major changes are needed for adapting old WiFi codes to the new WiFi PRO module. As the hardware is completely new, most of the functions have changed.

Features comparison:

Feature:	[v12] WiFi	[v15] WiFi PRO
Simultaneous TCP/UDP sockets	1	10
HTTP GET	Yes	Yes
HTTP POST	No	Yes
HTTPS GET	No	Yes
HTTPS POST	No	Yes
FTP	Yes	Yes
Multiple SSID	No	Yes
Roaming mode	No	Yes
Max Tx power	12 dBm	17 dBm
Max power consumption	120 mA	350 mA

WiFi PRO compatibility:

Item	Compatible	Notes
Waspmote 12	Yes	New Waspmote API needed (v025 or newer)
Waspmote 15	Yes	New Waspmote API needed (v025 or newer)
Old WiFi codes	No	The new WiFi module provides new improved examples and libraries

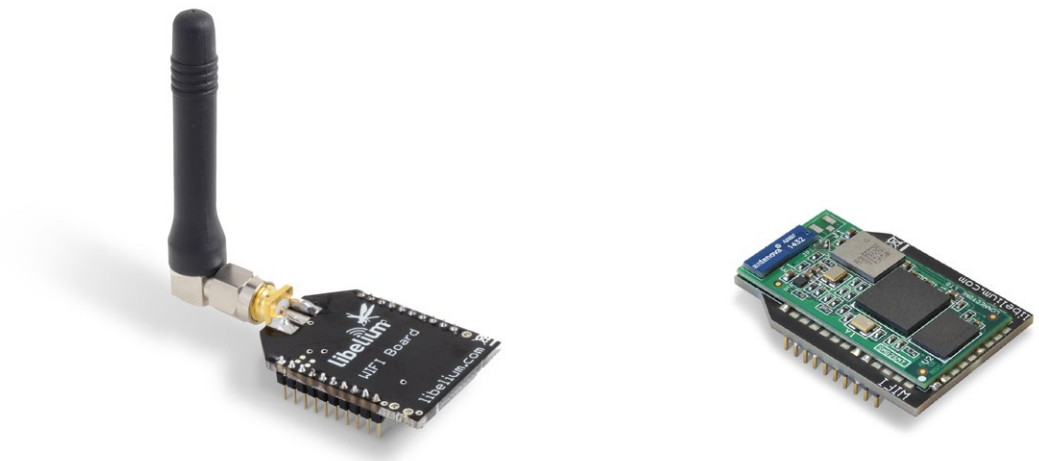

Figure : WiFi and WiFi PRO radio modules

2.4. XBee-PRO 868 vs XBee 868LP

The new XBee 868LP module supports some changes:

- It finds a perfect balance between range and network capacity thanks to an optimized RF data rate, lower than other XBee radios. This allows the signal to reach long ranges without the need of increasing the Tx power.
- The new XBee 868LP operates between 863 and 870 MHz, making it deployable in several regions throughout the world including approved European countries and India by utilizing a software selectable channel masking feature.
- The XBee 868LP is also the industry's first RF module using 868 MHz and surrounding frequencies for LBT + AFA (Listen Before Talk and Adaptive Frequency Agility). This virtually eliminates interference by listening to the radio environment before any transmission starts, and automatically shifting to a new channel when interference is detected. This patent-pending frequency scan occurs automatically and in a matter of microseconds so as not to impact performance.
- Minor changes could be needed for adapting old XBee-PRO 868 codes to the new module. Now, the XBee 868LP module provides the function to select the list of channels to be used for transmitting/receiving. However, the rest of the features work the same: sending/receiving, scanning other modules, etc.

Features comparison:

Feature	[v12] XBee-PRO 868	[v15] XBee 868LP
Tx power	25 dBm	14 dBm
Frequency band	868 MHz (1 channel)	863 to 870 MHz (32 channels)
RF data rate	24 kbps	10 kbps
Indoor/Urban range	Up to 550 m	Up to 112 m
Outdoor/line-of-sight range	Up to 40 km	Up to 8.4 km
Transmit power	25 dBm	14 dBm
Receive sensitivity	-112 dBm	-106 dBm
Transmit current	500 mA	48 mA
Receive current	65 mA	27 mA
LBT + AFA	No	Yes

XBee 868LP compatibility:

Item	Compatible	Notes
Waspmote 12	Yes	New Waspmote API needed (v025 or newer)
Waspmote 15	Yes	New Waspmote API needed (v025 or newer)
Old XBee-PRO 868 codes	Depends	Minor changes: The XBee-PRO 868 library is capable of sending/receiving packets with the new XBee 868LP. However, configuring channels can only be done by the newest API version.

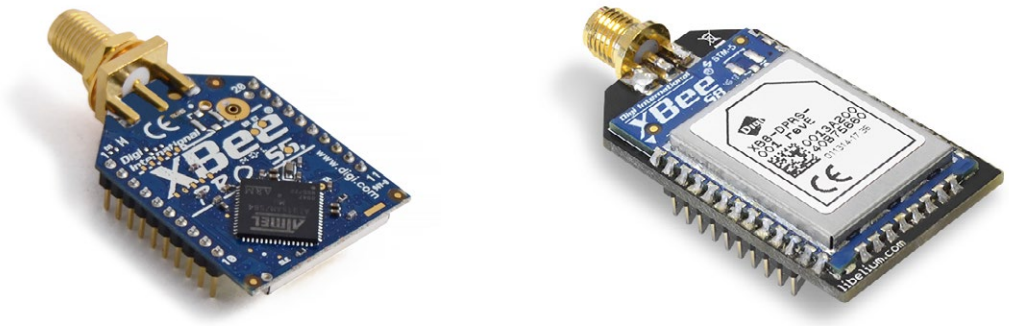

Figure : XBee-PRO 868 vs XBee 868LP radio modules

2.5. XBee-PRO 900 vs XBee 900HP

The new XBee 900HP module supports some changes:

- The new XBee-PRO 900HP uses higher power transmission compared to the old version.
- The new XBee-PRO 900HP uses slower RF data rate for transmission compared to the old version.
- Thanks to the high power transmission and low data rate, the ranges achieved by these new modules are larger than before.
- The XBee-PRO 900HP modules are certified for use in multiple countries: Brazil, Australia, US. Through the new channel selection it is possible to enable/disable the preferred frequency channels within the 902-928 MHz band.
- The power consumption has been improved compared to the old modules. Better ranges have been achieved with almost the same TX power. On the other hand, the receiving power consumption has been reduced.
- Minor changes could be needed for adapting old XBee-PRO 900 codes to the new module. Now, the XBee 900HP module provides the function to select the list of channels to be used for transmitting/receiving. However, the rest of the features work the same: sending/receiving, scanning other modules, etc.

Features comparison:

Feature	[v12] XBee-PRO 900	[v15] XBee 900HP
Frequency band	902 to 928 MHz (8 hopping patterns on 12 channels)	902 to 928 MHz (64 channels)
RF data rate	156 kbps	10 kbps
Indoor/Urban range	Up to 140 m	Up to 610 m
Outdoor/line-of-sight range	Up to 3 km	Up to 15.5 km
Transmit power	17 dBm	24 dBm
Receive sensitivity	-100 dBm	-110 dBm
Transmit current	210 mA	215 mA
Receive current	80 mA	29 mA

XBee 900HP compatibility:

Item	Compatible	Notes
Waspmote 12	Yes	New Waspmote API needed (v025 or newer)
Waspmote 15	Yes	New Waspmote API needed (v025 or newer)
Old XBee-PRO 900 codes	Depends	Minor changes: The old XBee-PRO 900 examples are capable of sending/receiving packets with the new XBee 900HP. However, configuring channels can only be done by the newest API version.

2.6. XBee-PRO ZigBee vs XBee ZigBee/Thread

The new XBee ZigBee/Thread module supports some changes:

- The new module is compatible with ZigBee and Thread at the same time. ZigBee is a well-known protocol, which leads the IoT world since 10 years ago. Thread is a new protocol also focused on Smart Home and short-range communications. It is based on 802.15.4 and is IPv6-capable. Big companies support Thread as a very promising technology.
- The new module permits faster RF transmissions as the RF data rate is greater than before. This is a good option for populated networks or applications where the major challenge is a high data rate despite of the range.
- Although the link ranges decrease with the new ZigBee/Thread modules, the same happens to the power consumption without decreasing the receiving sensitivity.
- Minor changes could be needed for adapting old ZigBee codes to the new module. Now, the ZigBee/Thread module provides the function to select which module will act as Coordinator of the network. However, the rest of the features work the same: sending/receiving, joining to the coordinator, etc.

Features comparison:

Feature	[v12] XBee-PRO ZigBee	[v15] XBee ZigBee/Thread
Frequency band	ISM 2.4 GHz	ISM 2.4 GHz
RF data rate	156 kbps	250 kbps
Indoor/Urban range	Up to 90 m	Up to 60 m
Outdoor/line-of-sight range	Up to 3200 m	Up to 1200 m
Transmit power	17 dBm	8 dBm
Receive sensitivity	-102 dBm	-102 dBm
Transmit current	295 mA	45 mA
Receive current	45 mA	31 mA

XBee ZigBee compatibility:

Item	Compatible	Notes
Waspmote 12	Yes	New Waspmote API needed (v025 or newer)
Waspmote 15	Yes	New Waspmote API needed (v025 or newer)
Old XBee-PRO ZigBee codes	Depends	Minor changes: The old XBee-PRO ZigBee examples are capable of sending/receiving packets with the new XBee ZigBee/Thread. However, the coordinator configuration is slightly different in the new modules and a new function is needed for that purpose.

2.7. 3G (SIM5215) vs 4G (LE910)

The new 4G module introduces some changes with respect to the 3G module:

- The new 4G counts with many different models, one specifically designed for each market:
  - LE910-EU (Europe / Brazil): CE, GCF, ANATEL
  - LE910-NAG (US / Canada): FCC, IC, PTCRB, AT&T Approved
  - LE910-SKG (South Korea): KCC, SK Telecom Approved
  - LE910-AU V2 (Australia): RCM, Telstra Approved
  - LE910-JN V2 / LE910-JK V2 (Japan): NTT DoCoMo, KDDi [available in 2017]
- The GPS module also makes it possible to perform geo-location services using NMEA sentences, offering information such as latitude, longitude, altitude and speed, what makes it perfect for tracking applications.
- The new 4G module offers the maximum performance of the 4G network as it uses two different antennas (normal + diversity) for reception (MIMO DL 2x2), choosing the best received signal at any time and getting a maximum download speed of 100 Mbps.

Features comparison:

Features	[v12] 3G module (SIM5215)	[v15] 4G module (LE910)
Chipset manufacturer	SIMCom	Telit
Cellular protocols	3G / GPRS / GSM	4G / 3G / GPRS / GSM
Certifications	CE, GCF, FCC, IC, PTCRB	CE, GCF, ANATEL, FCC, IC, PTCRB, AT&T Compliant, KCC, RCM, NTT DoCoMo, KDDi
GPS	No	Yes
Camera option	Yes	No
SD card	Yes	No
USB connectivity	Yes	Yes
Download max speed	384 kbps	100 Mbps
Upload max speed	384 kbps	50 Mbps
Antenna diversity	No	Yes
Cellular carriers (mobile network operator)	Any	Any + Specially tested with AT&T, SK Telecom, Telstra, NTT DoCoMo or KDDi
FTP	Yes	Yes
FTPS (Secure)	Yes	No
HTTP	Yes	Yes
HTTPS (Secure)	Yes	No
TCP/UDP sockets	Yes	Yes
SSL sockets	No	Yes
Mails	Yes	Yes

4G compatibility:

Item	Compatible	Notes
Waspmote 12	Yes	New Waspmote API needed (v025 or newer)
Waspmote 15	Yes	New Waspmote API needed (v025 or newer)
Old 3G codes	No	The new 4G module provides new improved examples and libraries

2.8. Other Radios

The rest of the current communication modules for Waspmote v12 and Plug & Sense! v12 just continue in the new generation:

Wireless radio modules:

- Mid-range:
  - XBee-PRO 802.15.4
  - XBee-PRO DigiMesh
- LPWAN:
  - Sigfox
  - LoRaWAN
  - LoRa
- Cellular:
  - GPRS
  - GPRS+GPS
  - 3G
- Bluetooth:
  - Bluetooth PRO
  - Bluetooth Low Energy
- Short-range, identification:
  - NFC/RFID 13.56 MHz

Industrial Protocols, wired modules:

- RS-232 / Modbus
- RS-485 / Modbus
- CAN Bus

2.9. Sensor Boards Upgrades

2.9.1. Gases PRO / Smart Environment PRO

- New electronic circuits added to ensure more accurate readings.
- New line of advanced sensors from Alphasense is compatible now: CO, NO, NO_2 and SO_2. The accuracy of these sensors is improved too.
- Internal changes on the sensor connectors to improve the placement on the board.
- New connectors to improve the Plug & Sense! wiring, making it more robust.

2.9.2. Gases / Smart Environment

- Many internal changes have been made on the board circuitry to reduce the BoM. Now some sensors are multiplexed, avoiding duplicate parts.
- Added an I2C isolator chip to avoid affecting to the Waspmote I2C bus.
- The temperature sensor and humidity sensors are replaced by the BME280, a digital sensor which measures temperature, humidity and air pressure in a single package with better accuracy.
- The library has been improved to make easier the sensor reading.
- New connectors to improve the Plug & Sense! wiring, making it more robust.

2.9.3. Smart Agriculture (Standard and PRO)

- Include the new BME280 temperature, humidity and air pressure sensor.
- Many internal changes have been made on the board circuitry to reduce the BoM.
- Clearer silkscreen for easier connection.
- I2C socket allows the connections of digital sensors.
- Added an I2C isolator chip to avoid affecting to the Waspmote I2C bus.
- The library has been improved to make easier the board handling.
- New connectors to improve the Plug & Sense! wiring, making it more robust.

2.9.4. Smart Cities PRO

- I2C sockets allow the connection of digital sensors, even gas sensors from Gases PRO, or Luxes and Ultrasound.
- Added an I2C isolator chip to avoid affecting to the Waspmote I2C bus.
- The Particle Matter – Dust Sensor (PM1 / PM2.5 / PM10) is now available on this board.
- New connectors to improve the Plug & Sense! wiring, making it more robust.

New Noise Level Sensor:

- New and more accurate system for the Noise Level Sensor:
  - The system is able to read the equivalent noise level in dBA (LeqA), according to the standard IEC 61672.
  - Thanks to a more stable calibration and sampling at 44 kHz, with 16-bit resolution, the system gets an accuracy of ±2 dBA.
  - Besides, the new microphone is protected with a waterproof windscreen.

Feature	Old Noise Level Sensor	New Noise Level Sensor
Sensitivity	-35 dBv	-38 dBV
S/N ratio	60 dB	66 dB

Figure : Comparison between old and new Noise Sensor

***NOTE:** All the new Noise Level Sensor probes come with the test and calibration documents performed and signed by an external Test Laboratory.*

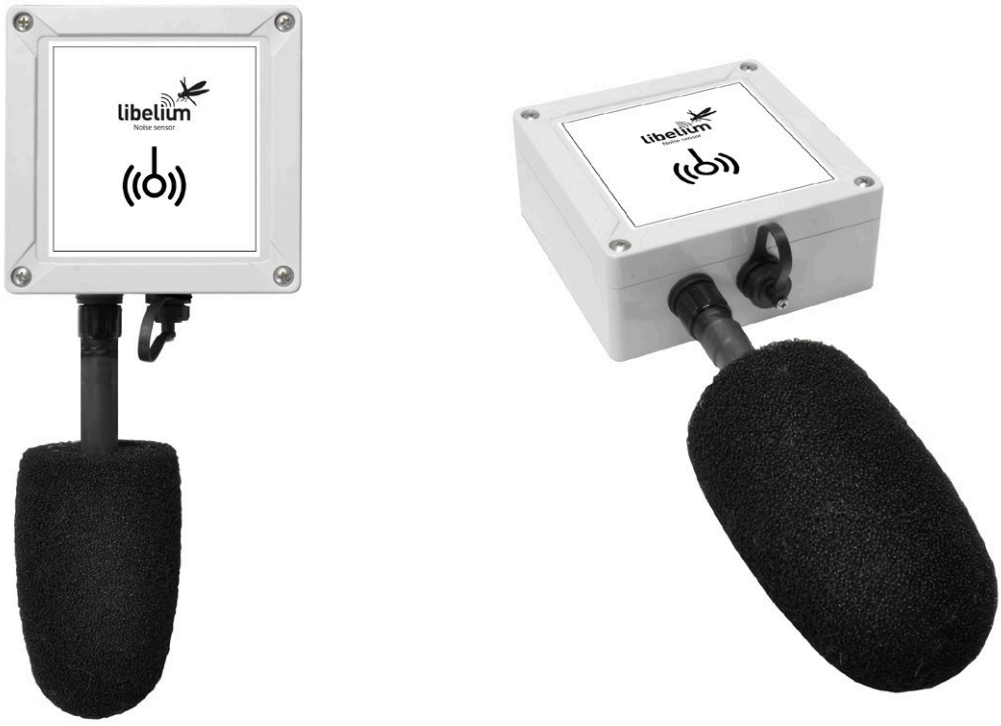

Figure : New Noise Level Sensor

2.9.5. Smart Water

- The previous ion sensor circuitry is removed. Now these sensors have their dedicated Sensor Board: Smart Water Ions.
- Now the turbidity sensor circuitry is added directly to the Smart Water board, avoiding the need of using an external module to use the turbidity sensor. This fact simplifies the sensor connection and leaves free the socket 0 of Waspmote to include another radio module.
- The connector for the Conductivity sensor has been replaced by an SMA connector to ease its connection and to reduce the electrical noise in the measurements.

2.9.6. Events / Smart Security

- New I2C sockets have been added to allow the connection of I2C sensors, such the digital temperature, humidity and air pressure sensor.
- Added an I2C isolator chip to avoid affecting to the Waspmote I2C bus.
- Now the board includes a new relay output to control small external loads or even other relays.
- A potential-free relay input is included to detect the state of external switches like other relays, etc.
- The library has been improved to make easier the board handling.
- New connectors to improve the Plug & Sense! wiring, making it more robust.

Now we can also use the Events Sensor Board (OEM) / Plug & Sense! Smart Security model to actuate and control DC units such as irrigation valves, thermostats, illumination systems, motors, PLC's, etc. A specific IP67 sensor probe has been designed to control external DC units (< 30 VDC, <1 A).

2.10. Meshlium 3.5 vs Meshlium 4.0

This evolution of Meshlium includes an important upgrade of the hardware capabilities. The most important changes are:

- A big step forward in performance: CPU performance 10 is times better and RAM capacity is 8 times bigger.
- The cellular connection has been upgraded to 4G for a very fast Internet connection and data synchronization.
- The WiFi access point is upgraded to WiFi-n (up to 144 Mbps).
- There are new models of RF modules for the 868 and 900 MHz bands.
- Up to two RF modules can be installed in the device now, working with the 4G radio at the same time (2.4 GHz and 868/900 MHz).
- The new 4G module features a GPS and GLONASS receiver for a faster global location.
- New improved design.
- The operating system has been updated, including new versions of programs and system.
- We included a new expansion port for future use of external I2C, USB or UART devices.
- New Meshlium is Microsoft Azure Certified.

Figure : Meshlium 3.5

Figure : Meshlium 4.0

Capabilities comparison:

	Meshlium 3.5	Meshlium 4.0
CPU cores	1	4
CPU architecture	32 bits	64 bits
CPU frequency	500 MHz	1 GHz
RAM	256 MB DDR	2 GB DDR3
Storing	Compact Flash 8 GB	SSD disk 16 GB
Linux Kernel	2.6	3.16
Simultaneous cloud services	2-4	15-20
Boot time	~2 minutes	Less than 1 minute
Wifi	a/b/g (up to 54 Mbps)	a/b/g/n (up to 144 Mbps)
Cellular connectivity	Up to 7.2 Mbps downlink (SIM5218) Up to 384 Kbps downlink (SIM5215)	Up to 42 Mbps downlink
Antenna connectors	4	6
RF module sockets	1	2
Geolocation	GPS	GPS + GLONASS
Root access	Yes	No
Power consumption	~10 W	~15 W (depending on number of radios)
Enclosure (mm)	210 x 190 x 60	300 x 220 x 80
Certifications	CE / FCC / IC	CE (Europe) / FCC (US) / IC (Canada) / ANATEL (Brazil) / RCM (Australia) / PTCRB (US) / AT&T (US)

Compatibility with Waspmote and Plug & Sense! nodes:

Old hardware	Compatible	Notes
Plug & Sense! (Waspmote v12) 802.15.4	yes	
Plug & Sense! (Waspmote v12) ZigBee	no	Old ZigBee modules are in EoL. Substituted by the new ZigBee/Thread radios.
Plug & Sense! (Waspmote v12) DigiMesh	no	
Plug & Sense! (Waspmote v12) 900	no	Old 900 MHz modules are in EoL. Substituted by the new 900HP radios.
Plug & Sense! (Waspmote v12) 868	no	Old 868 MHz modules are in EoL. Substituted by the new 868LP radios.
Plug & Sense! (Waspmote v12) WiFi	yes	
Plug & Sense! (Waspmote v12) 3G	yes	
Plug & Sense! (Waspmote v15) 802.15.4	yes	
Plug & Sense! (Waspmote v15) 900	yes	
Plug & Sense! (Waspmote v15) 868	yes	
Plug & Sense! (Waspmote v15) WiFi	yes	
Plug & Sense! (Waspmote v15) 4G	yes	
Plug & Sense! (Waspmote v15) ZigBee	no	Meshlium does not support this RF module

Compatibility with current cloud software:

Cloud software	Compatible	Notes
Amazon IoT	yes	
Esri	yes	Only ArcGIS online
IBM Bluemix	yes	
IoT-Ticket	yes	
Azure Event Hubs	yes	
Azure Service Bus	yes	
Azure IoT Hub	yes	New cloud, only available on new Meshlium 4.0
MQTT	yes	
Telefónica	yes	
ThingWorx	yes	
amplía	yes	
Simfony	yes	
Smart City Platform	yes	
B-Scada	yes	
DeviceLynk	yes	
Devicify	yes	
Eagle.io	yes	
ElementBlue	yes	
Extunda	yes	
IoTSens	yes	
Sentilo	yes	
Sofia2	yes	
Solvver	yes	
Thing+	yes	

Compatibility with other software:

Software	Compatible	Notes
External data base synchronization of sensor data.	yes	Some changes in the tables needed, can be done without losing data.

2.11. New Smart Parking Line

Smart Parking is probably the most immediate application of IoT for Smart Cities: many cities will join the connected world with a Smart Parking project in the next few years, enabling a more intelligent parking process. The searching time for a parking lot is dramatically reduced, so the quality of life of neighbours and visitors gets improved, saving fuel, minimizing traffic and keeping and the air pollution low.

Features comparison:

	Previous Smart Parking	New Smart Parking 2016
Installation type	Buried (works required, 30 mins)	On-road, surface (5 mins)
Out-of-the-box operation	No (programming required)	Yes
Optimized operation and detection accuracy	No	Yes
Extended battery life	No	Yes
Connectivity	General-purpose, medium-range radios	Sigfox and LoRaWAN
Frequency bands	2.4 GHz, 868 and 900 MHz	868 and 900 MHz
Remote management	No	Yes (bidirectional)
Certifications	CE / FCC / IC	CE (Europe) / FCC (US) / IC (Canada) / ANATEL (Brazil) [2017]/ RCM (Australia) [2017]

Figure : Previous Smart Parking solution and new Smart Parking 2016

3. Certifications

Libelium offers 2 types of IoT sensor platforms, Waspmote OEM and Plug & Sense!:

- **Waspmote OEM** is intended to be used for research purposes or as part of a major product so it needs final certification on the client side. More info at: www.libelium.com/products/waspmote
- **Plug & Sense!** is the line ready to be used out-of-the-box. It includes market certifications. See below the specific list of regulations passed. More info at: www.libelium.com/products/plug-sense

Besides, Meshlium, our multiprotocol router for the IoT, is also certified with the certifications below. Get more info at:

www.libelium.com/products/meshlium

List of certifications for Plug & Sense! and Meshlium:

- CE (Europe)
- FCC (US)
- IC (Canada)
- ANATEL (Brazil)
- RCM (Australia)
- PTCRB (cellular certification for the US)
- AT&T (cellular certification for the US)

Figure : Certifications of the Plug & Sense! product line

You can find all the certification documents at:

www.libelium.com/certifications