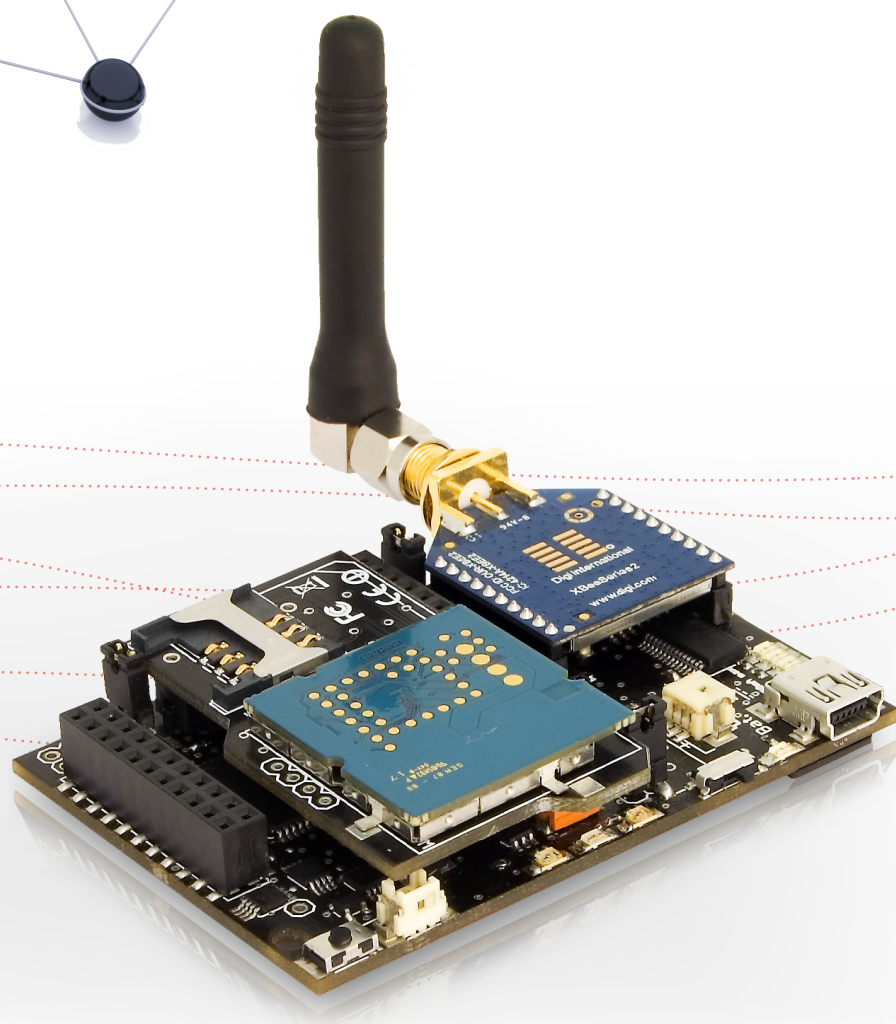
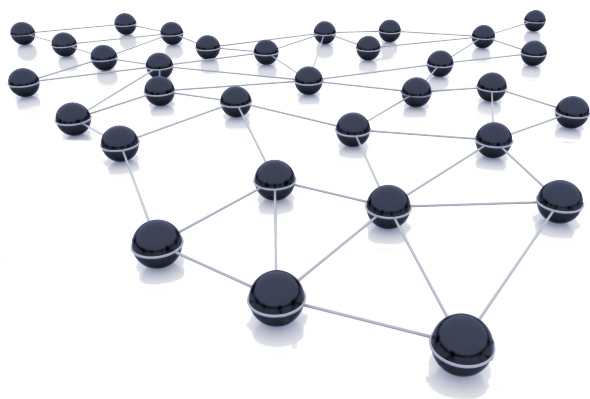


Wasp mote

Wireless Sensor Networks with Wasp mote and Meshlium



Wireless Sensor Networks with Waspote and Meshlium

• How can the data acquired in a wireless sensor network be sent out?

The wireless sensor networks created with Waspote can send acquired data out using 2 methods: a **Waspote Gateway** device or a multi gateway router such as **Meshlium**.

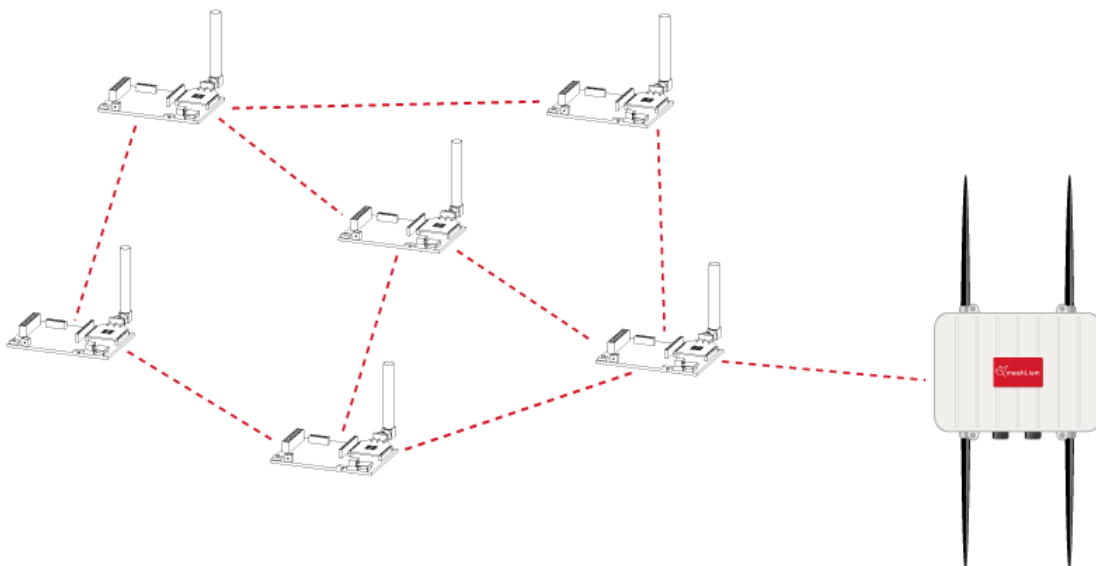
Meshlium is the router developed by Libelium. It is the first **Multiprotocol** router that allows **Wifi (2.4GHz, 5GHz), 802.15.4/ZigBee, GPRS, Bluetooth** and **GPS** technologies in the same device.

It is designed to be the gateway to the outside World for the wireless sensor networks created with Waspote.

Meshlium has an embedded Linux system which allows a large number of high level services to be managed. Its internal control software is Meshlium Manager System 2.0, an **open source** platform that allows to control and configure of any internal parameter directly through a web browser. This system facilitates the addition of new plugins and functionalities with a view to enabling specific applications development. It can also allow the creation of **Mesh Networks** using the OLSR open protocol as well as the creation of portals for secure access to stored sensor data by services such as HTTPS, WEP, WPA, WPA2, (EAP-TLS, EAP-TTLS, EAP-PEAP), MAC filter and RADIUS server.

• How can hybrid networks using Waspote and Meshlium be created?

The data captured by the wireless sensor networks created with Waspote can be acquired by the **802.15.4/ZigBee** communication module integrated in **Meshlium**. The idea is that Meshlium is configured with the same communication module that has been used to create the sensor network so that it is possible to select the protocol and desired frequency (**802.15.4 - 2.4GHz, ZigBee - 2.4GH, 868MHz and 900MHz**).



• What can Meshlium do with the captured data?

Once Meshlium captures the data sent by the Waspote sensor nodes, several actions can be carried out:

- 1- **Resend it** using the communication interfaces: **Wifi (2.4GHz, 5GHz), Ethernet, GPRS, Bluetooth** to a network to which it has access to computers and servers. In the same way, it could also be sent directly to the **Internet**, to be published on a website or in a database accessed through IP. Meshlium also allows alarms and information **emails** to be sent, as well as the generation of **SMS** alarm messages using the GSM/GPRS network.

2 - **Processing.** The accumulation of information supplied by hundreds of nodes at a single point provides a **global vision** of the network and allows complex “**data mining**” tasks to be carried out so that alarms can be generated using warning patterns based on a combination of dozens of parameters. For this purpose, Meshlium has one of the highest performance processors to be found in an embedded device (500MHz).

3 - **Store it** in internal databases (**MySQL** and **Postgre**) or in a file on its hard drive for later analysis. This enables data storage over months or even years in difficult to access places, where it is not possible to send the information out in real time. The storage capacity of up to **32GB** ensures this.

4 - **Publish it** on Web 2.0 systems. The distribution applications for content integrated in Meshlium allow direct publication of data in content portals such as **Twitter** or **Wordpress**.

For more information consult the Waspote Technical Guide in the Support section of the website as well as the Meshlium Development section.

• What advantages are there for using Meshlium as a sensor network information gateway?

Each one of the actions dealt with above (resending, processing, storage and publication) can be easily implemented as Meshlium has 2 specially designed tools:

1 - **Meshlium Manager System:** this application allows background configuration of all the Meshlium parameters, so that it is easy to integrate it in any already existing network. It should be noted that this application is **open source**, so developers can add their own **plugins** or applications with a view of obtaining a final application that is better adapted to the developed project.

2 - **Programming libraries (API):** with a view of facilitating the work of developers who implement applications for sensor networks, a series of libraries has been created for Meshlium which make best use of the information coming from the sensor network. Through this API we can send **emails** to a particular destination, send alarm **SMS** to one or more mobile telephones, store the information in the databases integrated into Meshlium or even “post” the information captured on Web “2.0” sites such as **Twitter** or **Wordpress**.



In this way, an environment (a field, a wood, a crop, a house) could have its own “blog” which is updated in real time according to the parameters obtained by the sensor network. Just like the Manager System, the Meshlium **API** is also **open source**, therefore there is total control of the platform for development of third party applications.

Meshlium works with a **Linux** operating system based on the **Debian** distribution, so by using the standard packet system it can be installed in any working environment required when applications that monitor and control the sensor network are being developed (php, perl, python, C, C++, Java, ruby, jsp, etc.).

In addition Meshlium is an “**all terrain**” machine ready to be installed in any environment because of its features:

- **IP-65 protection:** allows it to endure outdoor atmospheric conditions such as rain and wind.
- **Solar Power:** Meshlium has a solar kit ready to work with the machine in places where there is no electrical power.

• **How can the Waspote-Meshlium combination be integrated in an Intranet and use an already existing database?**

Many circumstances require that captured information be integrated into previously existing databases. For this purpose, Meshlium allows the selection of destination databases where the captured information needs to be stored. Using the applications programming API included we can specify the **IP addresses** and destination **ports** required.

This would allow the use of both a **private** database inside an Intranet as well as a **public** one accessible from the Internet.

• **Why do both Meshlium and Waspote have a GPRS module?**

There is a **GSM/GPRS** communication module for each platform (**Waspote/Meshlium**). This is because in some cases the application requires that the mote itself launches the alarm using its built in battery. Typical cases are emergency systems and **high availability** sensor networks (critical applications) where each node is configured to be able to communicate with the outside independently of the status of the rest of the network.

In other cases it is preferred to centralize the output of these networks on the same router and not on each of the sensor monitoring points.

• **How can I share information between ZigBee and Bluetooth sensor networks?**

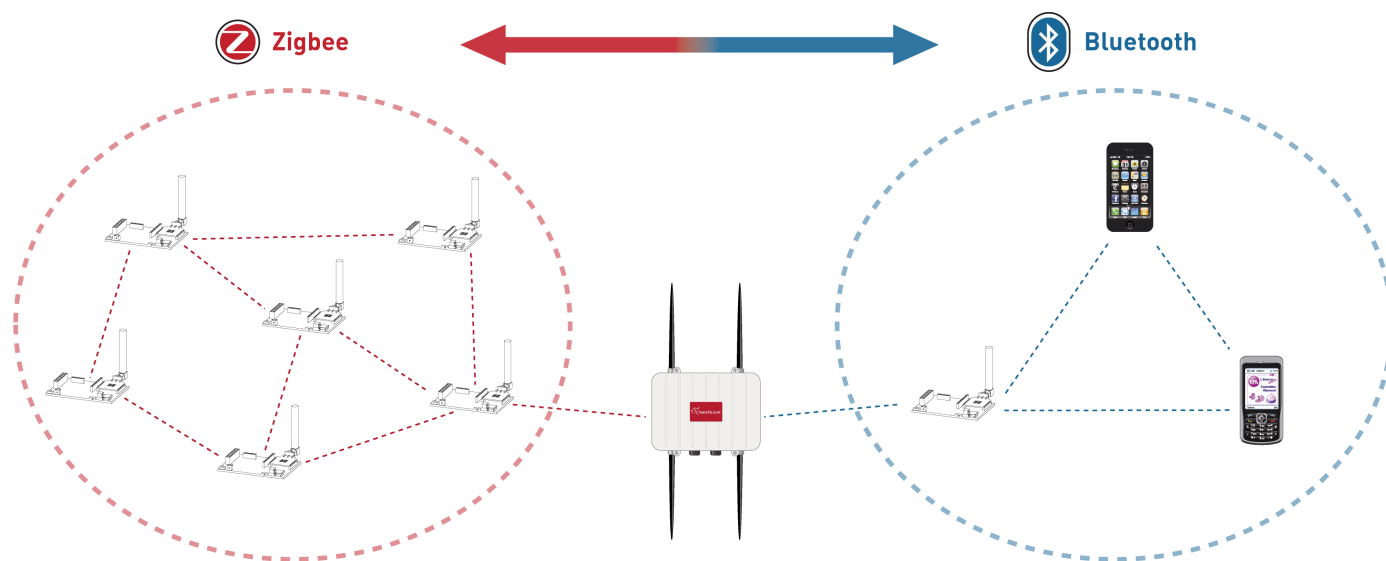
Meshlium can take the information coming from both the ZigBee and the Bluetooth networks and create a virtual **bridge** among them in order to share the **sensor** information coming from ZigBee interface to Bluetooth devices such as mobile phones, smart phones, PDA's, or Waspote's with the Bluetooth module.

In the **Meshlium Development** section on the Libelium website you can find the following manuals:

- “*Storing Bluetooth Sensor Data on a Database*”
- “*Storing ZigBee/802.15.4 Data on a Database*”

The source code needed to programm Waspote and Meshlium and how to use a Data Base as intermedium buffer between these two networks is included.





Further information:

<http://www.libelium.com/waspote>
<http://www.libelium.com/meshlium>

For any query contact us at:

<http://www.libelium.com/contact>