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TECHNOLOGY

Sensors with a Purpose

Libelium's
Smart Sensors
Aim to Change
the World—
One Node
at a Time

➤ **Automotive
Signal
Conditioning
Sensors**

➤ **Beehive Sensors
Monitor Global
Pollination**





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Interview with David Gascón – Libelium

Libelium is a smart sensor manufacturer based in Zaragoza, Spain. Founded over ten years ago by David Gascón and Alicia Asín, Libelium began developing devices for what we now know as IoT devices—years before the trend started gaining traction. The original intent for the company was to make a horizontal sensor platform that can be applied to a variety of different vertical markets. Now, with the proliferation of IoT platforms and an abundance of wireless protocols, Libelium's unique sensor technology is being used to power the IoT Revolution. The applications appear to be

boundless—from monitoring soil moisture levels in vineyards to air quality in major cities—and this is only the beginning. Libelium has recently announced initiatives to release open-source devices at a low price to universities and educational institutions to engage with the next generation of engineers and IoT devices—all with the intent of changing the world for the better. EEWeb spoke to David Gascón about some of the unique sensors the company has been developing and why it is more important than ever to engage with young engineers.

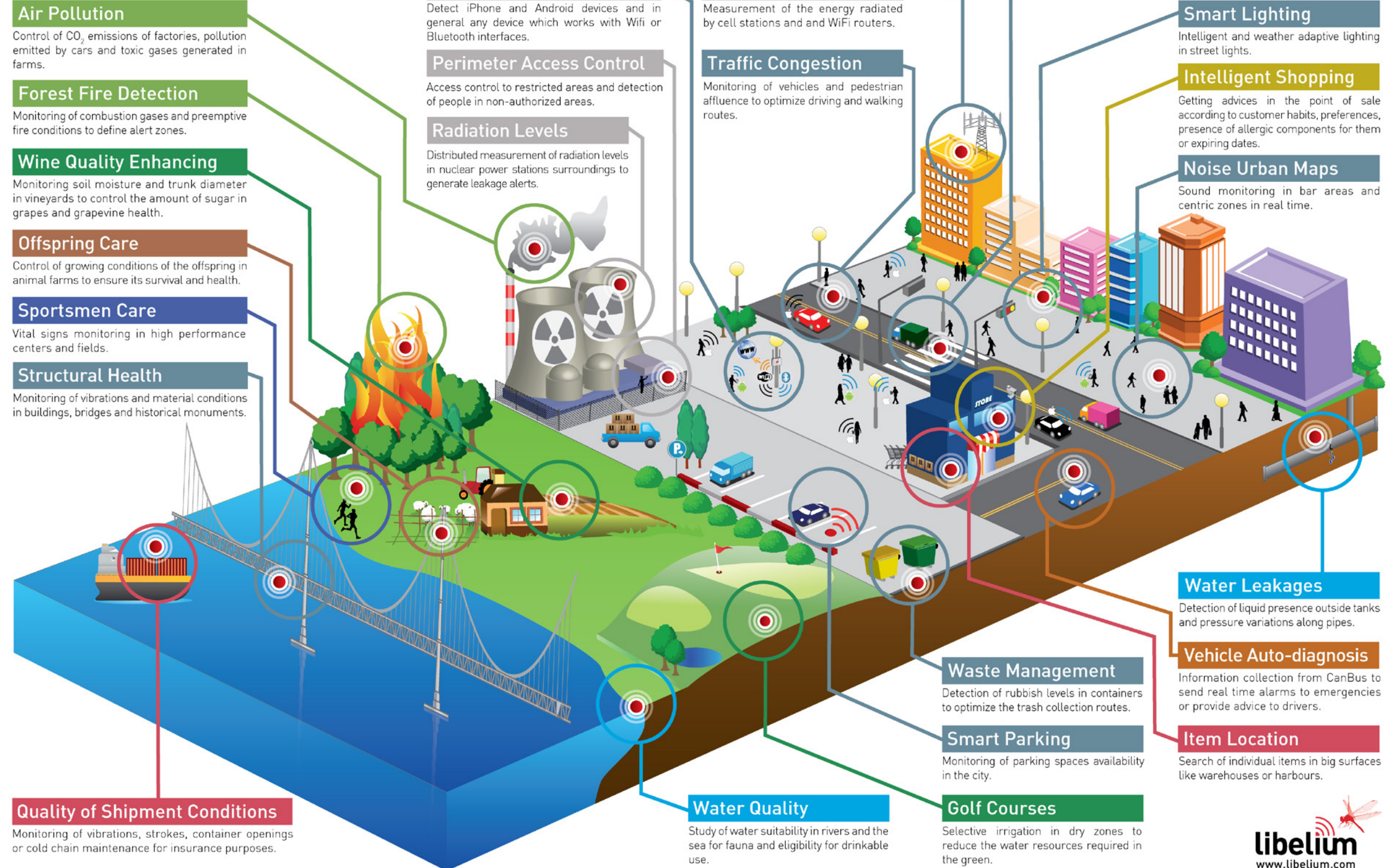
ONE OF THE
MOST PROMISING
MARKETS FOR
LIBELIUM IS THE
“SMART CITY.”

Do you consider Libelium a sensor company or a mesh network company?

Our focus is on getting as many sensors integrated as possible by controlling them and sending information using any kind of wireless technology. Basically, we are one of the few companies in the world that are quite agnostic in terms of sensors and radio technologies. We use what we call a horizontal platform—meaning, we never focus entirely on a specific vertical market, but we try to build a modular platform that could make any sensor work with any kind of wireless protocol. Today, we have around 15 different radio technologies working out of the box with our sensor platform—protocols like ZigBee or 802.15.4 to newer technologies like 4G and Bluetooth low-energy (BLE), LoRaWAN, Sigfox, etc. We never force our clients to use any particular protocol—we give some recommendations, but the good thing is that our platform is modular, meaning they can choose what radio technology they want for their projects.

Regarding the sensors, we have integrated more than one-hundred different sensors for different vertical applications, from environmental applications like CO₂, NO₂, O₃, particle matter (PM10) monitors for smart cities to water quality sensors such as pH, dissolved oxygen (DO), ORP, etc. The only thing that these sensor nodes have in common is the core platform, which is comprised of our main microcontroller board called Waspote with the inputs and outputs and the low-consumption algorithms that we run into our core. Waspote controls

Libelium Smart World



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the inputs, which are the sensors, and the outputs, which are the radios.

So Libelium essentially acts as an interface company between the sensors and the network, allowing them to communicate no matter what sensors are used and what protocols are implemented?

Yes. Libelium’s core technology allows exactly that. However, we do not wait for the client to ask us for a specific sensor or radio technology; we give a solution out of the box, so we choose the sensors and integrate them and create an API to program them. We provide an out-of-the-box product, so sometimes the client wants their own sensors to be integrated, but most of the time, they just choose from our wide list of available sensors (+100). It is a complete solution, but the main development was in the low consumption algorithms and the actual hardware that are a part of the core.

What have been the most popular sensors used in your networks?

There are three vertical markets that are really big right now. One of the most promising markets for Libelium is the “smart city.” Many cities all over the world are working to become “smart,” meaning the ability to send vital information to the citizens about the quality of the air, the quality of the water, and other important measurements like ultraviolet radiation. Another part of the smart cities is the smart parking sensors, which let drivers know where and when parking spots become available around the city.

“Smart water” sensing, which determines quality of water, is another big area for Libelium. This is something that could never be measured before in an autonomous way. Normally, you have many products used by field engineers that are put into the water to make measurements and are then brought back to the city. We came out with a new product that has allowed us to make these measurements autonomously that can be deployed in rivers, lakes, or the ocean. The user can deploy hundreds of sensor points to get data in real-time with all of the parameters for water quality coming from the field.

The third major area for us is “smart agriculture.” This has been a popular area for a lot of our customers who want to prevent pest and diseases on vineyards, for example. We have a lot of clients that are integrating soil moisture and leaf humidity sensors to see what are the real conditions of the plants. The idea is that these farmers can build

a map of probabilities not only when they have to irrigate the fields, but also if the conditions that are facing them at the moment make the probability of suffering from plant disease. The goal is to use the proper chemicals to prevent disease at the exact moment when they are needed. The customers are producing better crops as a result while simultaneously saving money.

Why did Libelium target these particular sensor areas?

When we started Libelium ten years ago, there was nothing related to the Internet of Things (IoT). At the time, we knew about wireless sensors and connecting sensors to the Internet, but we didn’t anticipate what vertical markets would comprise our business. We decided not to go to any specific vertical markets, so we developed a horizontal platform in a way that we could deliver technology to any company that wouldn’t want to build their own products, and use off-

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the-shelf products for their particular applications. For the horizontal platform, we focused on the hardware and on the SDK. We built hundreds of APIs that were ready to work out of the box. We released them as open-source, so clients became interested in our products because it gave them control of the libraries and they can alter some of the things to fit their needs. At that time, there were around ten large companies that were working on horizontal platforms, and nowadays, there are only a couple left—some closed or were acquired, although the most of them changed to become vertical market suppliers.



WE ARE WORKING ON MANY INDUSTRIAL PROJECTS THAT USE OUR SENSORS TO MONITOR THE FACTORY CONDITIONS.

Does Libelium provide any indoor sensing solutions?

Definitely. All of our sensors are built to work indoors and outdoors. Obviously, we focus a lot on the outdoor enclosure to make it more safe and durable to use. We are working on many industrial projects that use our sensors to monitor the factory conditions. We have also worked on sensors that measure how many people carrying Bluetooth or WiFi devices pass through a certain point. This is not a typical sensor; it is a Linux machine that is tied to our Meshlium network with a more complex software that is able to count the packages sent from smartphones to count the people passing through a specific area.

Where is Libelium headed next with its technology?

We are currently working on several new interesting product lines. We recently launched LoRaWAN and Sigfox radios, which are protocols known as Low Power Wide Area Networks (LPWAN) they can be used with public and private

base stations and will have massive deployments in both Europe and the U.S. On the one side, we will be upgrading our sensor lines to work with the new radio technologies, but we are also working on the 4G cell of radios because smart cities will be using these mobile base stations, so we have to move the technology to that new wireless technology. We keep on integrating more complex sensor—in fact, we are working on a new pollen sensor that will be released in 2016. This is a big problem in many cities with people that are allergic to pollen. Cities want to measure the amount of pollen and from what type of plant, so we have had many requests for these sensors.

What recent initiatives has Libelium launched to help energize young engineers and developers?

Libelium has an educational side called Cooking Hacks. This is a site we created to sell starter kits and development products for people that want to start making their own IoT products, but who cannot afford professional solutions. We created different development

and starter kits at an affordable price so that anybody who is interested can develop an IoT solution.

We will also be launching a program called IoT Spartans. Basically, we want to find the best 300 IoT developers, because it will be a big challenge in the industry for companies to find people able to program and make IoT applications at every level. In this case, we are looking for the best IoT developers at universities because we are looking for new, young engineers. This is a program we will be promoting in conjunction with many universities and research centers that already have shown interest. This will be fun because we will be giving them starter kits and seeing what they can do with them. In some way, we will be preparing these young engineers to get into the new IoT revolution.

The other project we are working on is the first e-health sensor platform in the world that is open-source. We created a device with fifteen biometrical sensors to measure user's conditions, such as pulse, ECG, oxygen levels, blood pressure,



temperature and many others. At the moment it is at a starter-kit level with just a PCB and some electronics, but in 2016, we will be launching a program to get this product to a professional level. We will be making an open call to engineering companies, research centers, and universities to get into this program to help us build a professional medical device. We have the core of the device, but we need the help from the engineering community to help make it not only an electronic device, but also a useful medical device with FDA certifications. Our product is 100-times less expensive than professional medical devices, so if we could make a professional e-health device at 100-times less, then it will truly change the health and medical industry, especially in developing countries that can't afford expensive equipment in their hospitals.

BASICALLY, WE WANT TO FIND THE BEST 300 IOT DEVELOPERS, BECAUSE IT WILL BE A BIG CHALLENGE IN THE INDUSTRY FOR COMPANIES TO FIND PEOPLE ABLE TO PROGRAM AND MAKE IOT APPLICATIONS AT EVERY LEVEL.

For more information about Libelium go to: <http://www.libelium.com>

For more information about David Gascón go to: <http://www.libelium.com/david-gascon/> 