

# Wireless System Labs

Low Power Wide Area Network Solution



# Introduction

- Founded in 2014, based in Rennes
- 10 people – 75 % R&D
- LPWAN solution designer
- LoRaWAN and 6LoWPAN expert
- Big Data application enable
- 5 innovation contest winner
- 10 customers in France and 2 in Europe
- Hosted by STMicroelectronics
- Power management research with Inria
- LORA alliance member



## **Ulrich Rousseau – CEO**

Management – Strategy - Business development  
Wavecom – Technicolor - Renesas

## **Anthony Crolais - COO**

Operation management – Software team  
Management  
Alcatel – Mitsubishi – Renesas



## **Jeremy Ardouin - CTO**

Technical director – Hardware team Management  
Wavecom – Mitsubishi – Renesas

Source : Innov360

Category	Market Size (Md)
IDC	212
Idate	80
Cisco	50
Gartner	30
GSMA	24

- Very small amount of data
- Real time is not mandatory
- Bidirectional communication
- Battery operated
- Good indoor radio communication

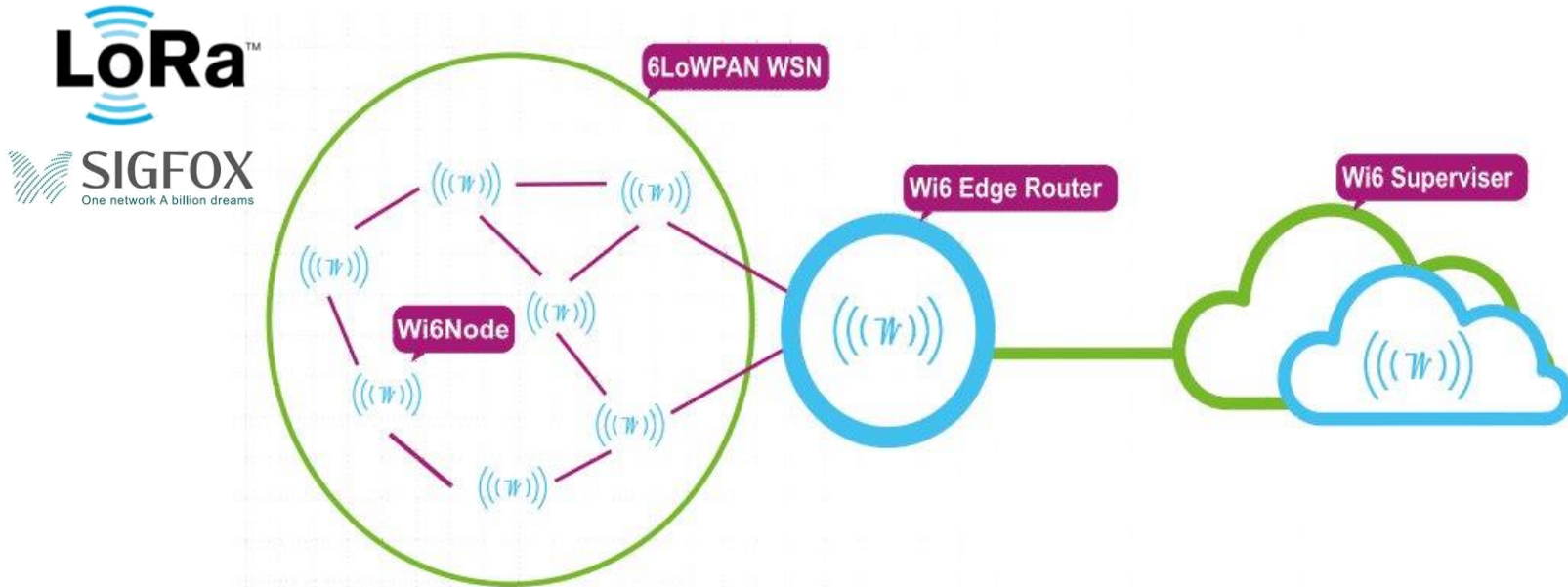
# Solution

“If you cannot measure it, you cannot improve it”

Lord Kelvin

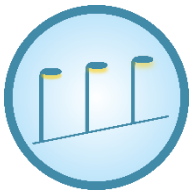
# Our solution

Wi6<sub>LABS</sub>



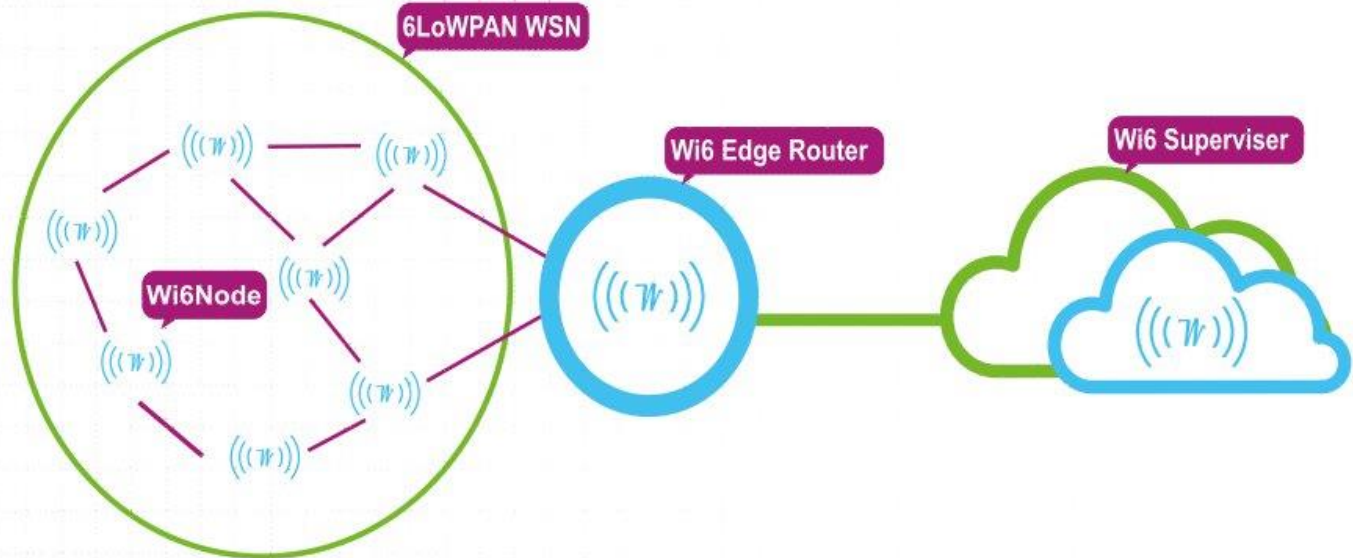
Turnkey solution:

from sensor design and integration to data delivery in difficult and diffuse environment.



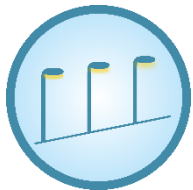
Smart City : 25% energy saving in small town ROI < 5 years

# Our solution



The Internet Protocol could and should be applied even to the smallest devices

Geoff Mulligan

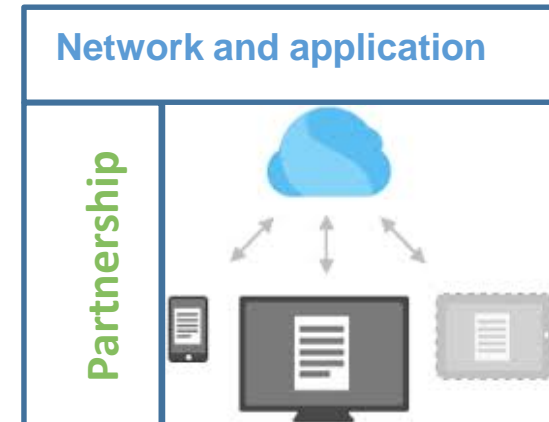
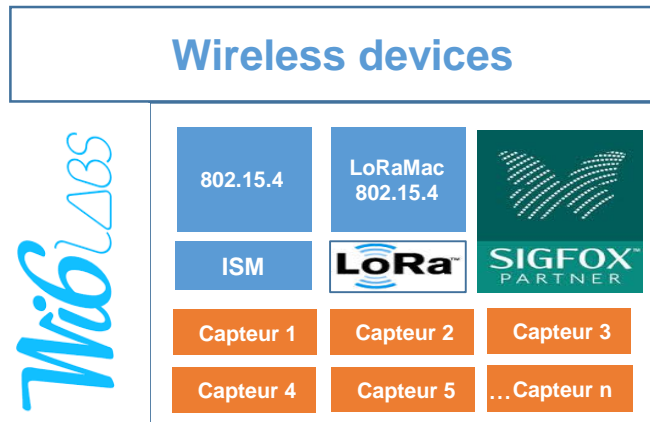


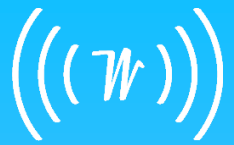
Smart lighting solution : fast integration IP based solution

# Our unique business value

Wi6LABS

- ❖ Design House Services
- ❖ LPWAN devices integration
- ❖ Communication server private and public network
- ❖ Data transport and delivery
- ❖ **Partnership** with 3rd party for data analysis and visualisation





# What is 6LowPan?

*“The Internet Protocol could and should be applied even to the smallest devices”*

Geoff Mulligan



- Because 6LoWPAN

## Why Choose Contiki?

Contiki is an open source operating system for the Internet of Things. Contiki connects tiny low-cost, low-power microcontrollers to the Internet.

### Internet Standards

Contiki provides powerful low-power Internet communication. Contiki supports fully standard IPv6 and IPv4, along with the recent low-power wireless standards: 6lowpan, RPL, CoAP. With Contiki's ContikiMAC and sleepy routers, even wireless routers can be battery-operated.

### Active Community

Contiki is developed by a [world-wide team of developers](#) with contributions from Atmel, Cisco, ETH, Redwire LLC, SAP, Thingsquare, and many others, led by [Adam Dunkels of Thingsquare](#).

[Contiki community »](#)

### Rapid Development

With Contiki, development is easy and fast: Contiki applications are written in standard C, with the Cooja simulator Contiki networks can be emulated before burned into hardware, and Instant Contiki provides an entire development environment in a single download.

[Contiki development introduction »](#)

### Open Source Software

Contiki is open source software: Contiki can be freely used both in commercial and non-commercial systems and the full source code is available.

[Contiki open source license »](#)

### A Selection of Hardware

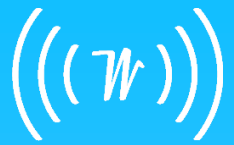
Contiki runs on a range of low-power wireless devices, many of which can be easily purchased online.

[Contiki platforms »](#)

### Commercial Support

Contiki provides both community support, through the [Contiki developer community](#), and commercial support.

[Contiki support »](#)

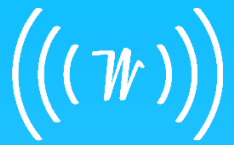


# What is 6LowPan?

*“The Internet Protocol could and should be applied even to the smallest devices”*

Geoff Mulligan

- 6LoWPAN makes network intégration easier
- 6LoWPAN with sub1GHz to extand network range
- Highway to Thread Group
- Global Cheap Network connectivity solution for mass market
- Scalable @module level or @chipset level



# 6LowPan solution

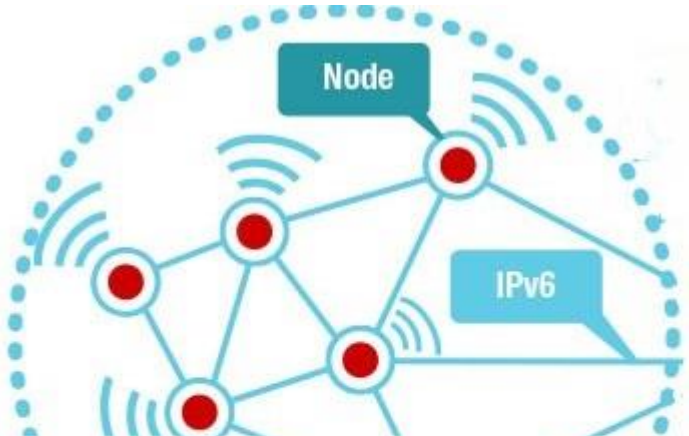
“Don’t re-invent the wheel, just re-align it”

Anthony J. D’Angelo

# Contiki based implementation



Wi6LABS



Contiki Application

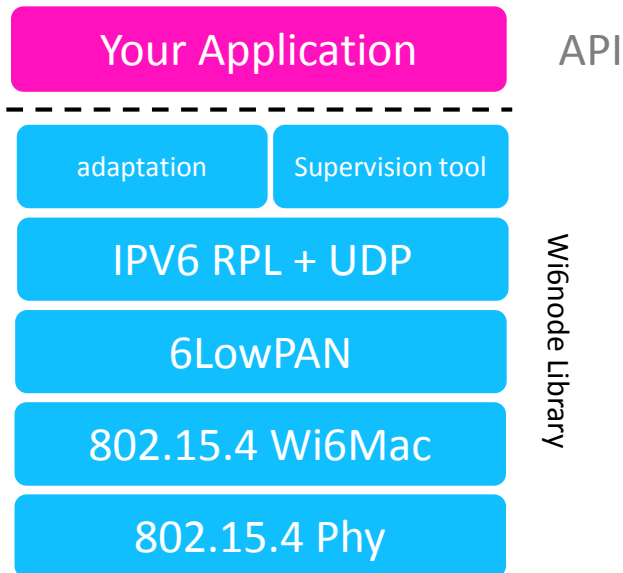
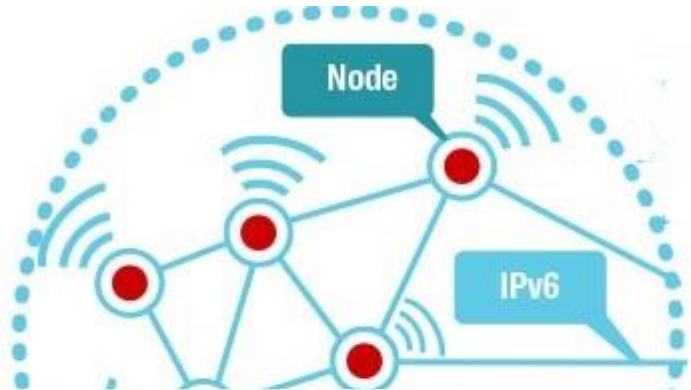
IPV6 RPL + UDP

6LowPAN

802.15.4 Mac

802.15.4 Phy

- Hardware platform
  - STM32 MCU + Spirit RF
- Network Layer Protocol
  - Contiki 3.0 based
  - 6LowPan
  - RPL
- Security
  - Not supported
- Power management
  - Not supported



- Hardware platform
  - STM32 MCU + Spirit RF
  - Custom porting available
- Dev Tools
  - GNU Tools for ARM Embedded
  - Customer toolchain adaptation is possible
- Network Layer Protocol
  - Contiki 3.0 based
  - 6LowPan – Max Packet size 127 bytes
  - RPL – Neighbor discovery – Route over
  - TSCH like protocol
- API
  - BSD Style API for application
- Security
  - AES 128
  - 802.15.4 ciphering & integrity

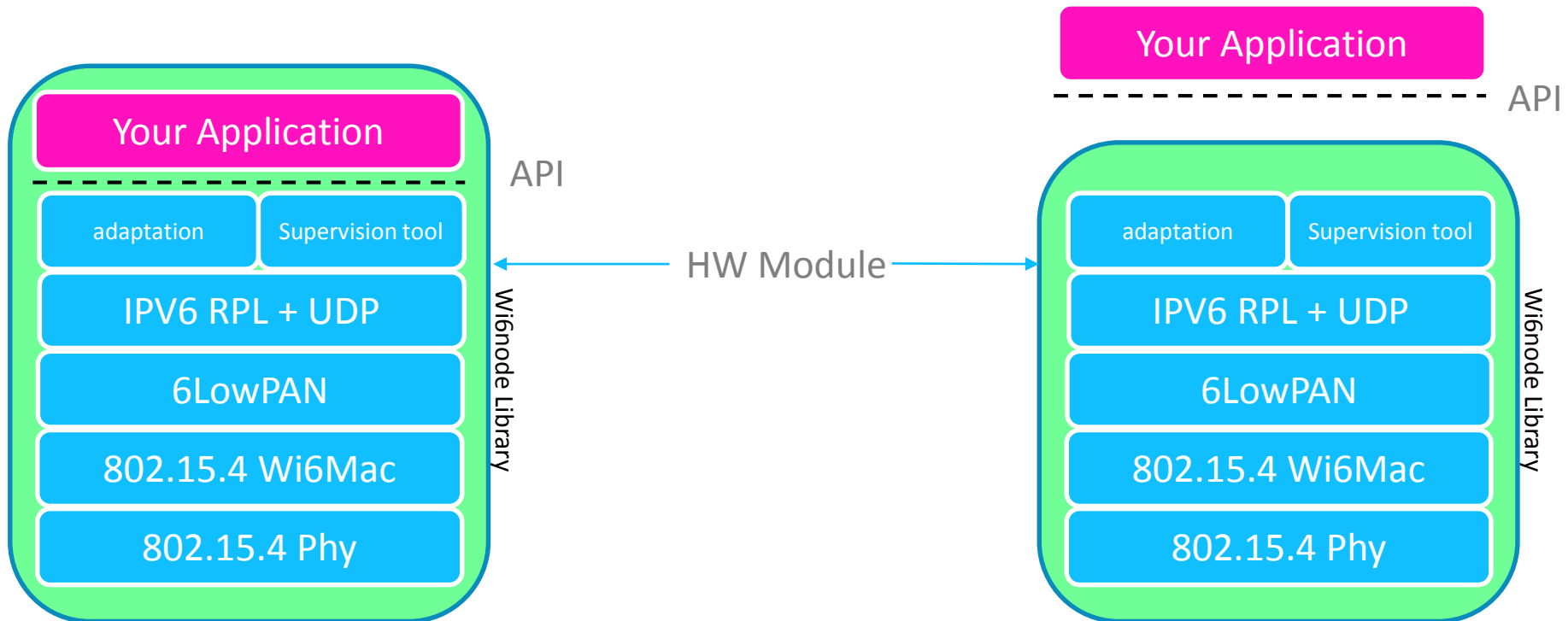
# Wi6Node Standalone VS Slave mode

- Standalone mode











- Embedded Application
- BOM optimized
- Embedded dev needed

- Slave mode

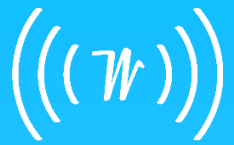
- External controller
- Scalable
- 6LowPan as a modem



# Wi6node comparison

	Spirit support	Security	Supervision	Optimized mac layer	Power Mngt	Intégration	number of devices	Support / Maintenance
 open source		Customer Implementation				Contiki OS and 6lowpan skill needed	Customer Implementation	Community support
<b>Wi6node library</b>		CRC /CCM CBC_MAC 				Easy (BSD Style API)	100 Depending of application	Consulting / maintenance



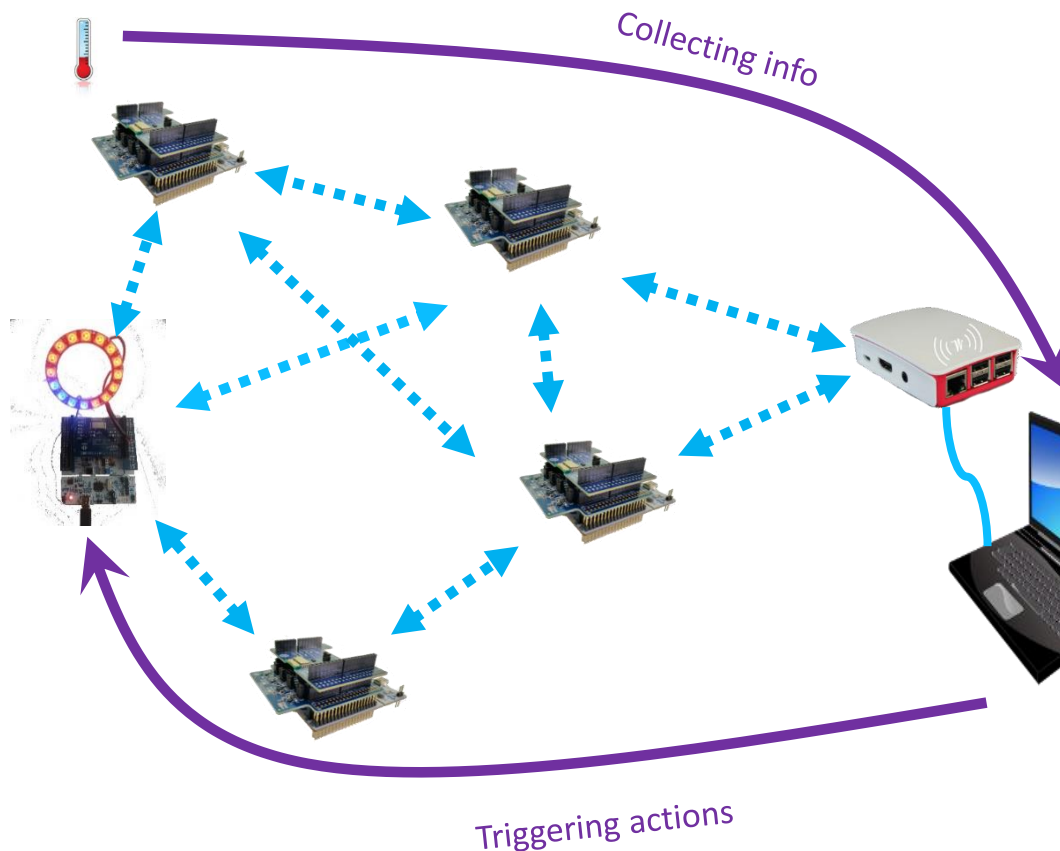


# Demo

“ Everything starts with making a LED blink ”

Ludovic Charpentier

# Mesh wireless network demo overview



Components :

- **5 Nodes:**

- NUCLEO STM32L152
- STM motion MEMS (Pressure + Humidity + Temperature + ...)
- STM RF SPIRIT1
- Wi6Labs 6LowPAN mesh SW stack

- **1 Border router :**

- Raspberry Pi
- STM SP1ML868 low power RF module
- Wi6Labs 6LowPAN router SW stack

- **1 Laptop :**

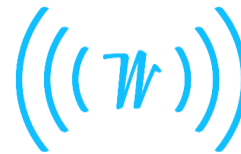
- Wi6Labs web application for wireless sensors network supervision

# Inside the Border router



- Turnkey solution for a complete Wireless Sensors Network

- Ability to both collect data and act on actuators
- Nodes and edge router configured through a web application
- Documented libraries easy to integrate in customer's environment
- Highly scalable with hundreds of nodes able to communicate in a same wireless network



**Wi6LowPan**



**Spirit1 transceiver**



**Sensors**



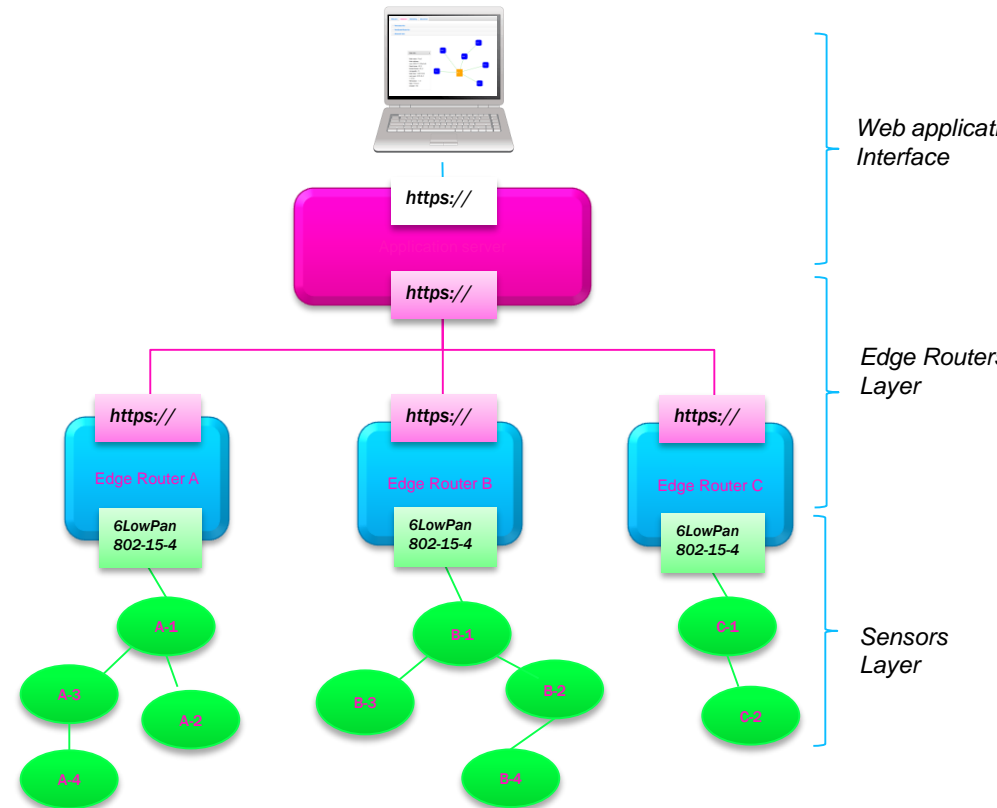
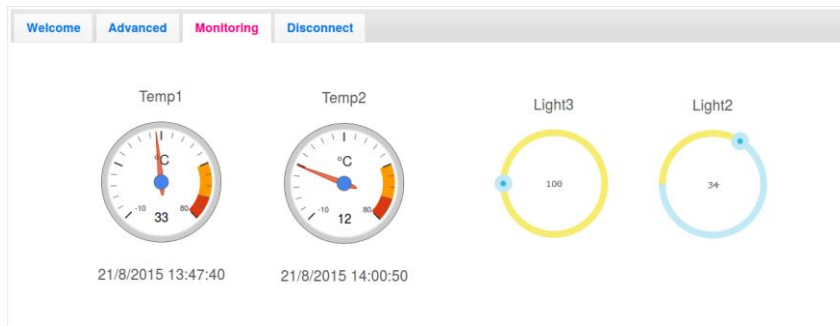
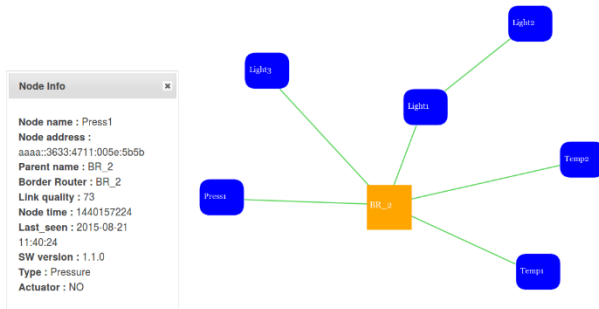
**STM32 MCU**

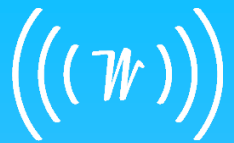
- Optimized for ST HW components

**STM32 MCU & RF SPIRIT**

- Optimized regarding footprint (90kB flash and 8kB ram including Contiki OS and RF driver)
- Optimized regarding power consumption

# A powerful supervising web application





# Thanks!

[contact@wi6labs.com](mailto:contact@wi6labs.com)

+33 (0)2 99 63 90 85

[www.wi6labs.com](http://www.wi6labs.com)

 [@wi6labs](https://twitter.com/wi6labs)

10 Rue de Jouanet

E-Park

35700 Rennes

France