FIT IoT-lab

A large Scale IoT Testbed
www.iot-lab.info

Emmanuel Baccelli & Cédric Adjih

informatics *mathematics*
Inria

EclipseCon, Oct 24, 2016,
Ludwigsburg, Germany

Challenges for real IoT deployment

- **Build new applications/protocols**
  - Specification / Design
  - Simulation
  - Implementation / Experimentation
- **Large scale experimentation is a nightmare**
  - Fastidious for a dozen of nodes
  - Manual handling / time consuming / boring

➢ **Need for large scale scientific tools for scientific & reproducible experiments**
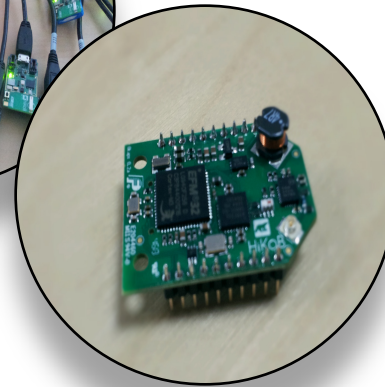
FIT IoT-lab

- **Federated IoT Testbed for large scale experimentation**

- **More than 2700+ IoT wireless nodes**

  - microcontrollers

  - IEEE 802.15.4 or sub-GHz

  - Distributed on 8 sites
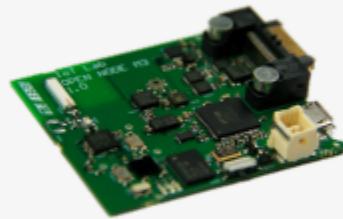
- **Total Remote Access**

- **Total Open Access**

FIT IoT-lab **www.iot-lab.info**

IoT-LAB Hardware

> WSN430 node : TI MSP430
>> 48 kB Flash, 10 kB RAM
>> Radio TI CC1101 / CC2420
>> Ambiant light, Temp
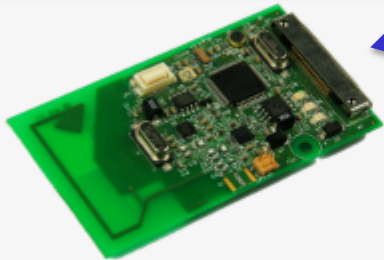
WSN430 Node

based on MSP430F1611 MCU and communication with 802.15.4 PHY Layer (800 MHz or 2.4 GHz)

M3 Node

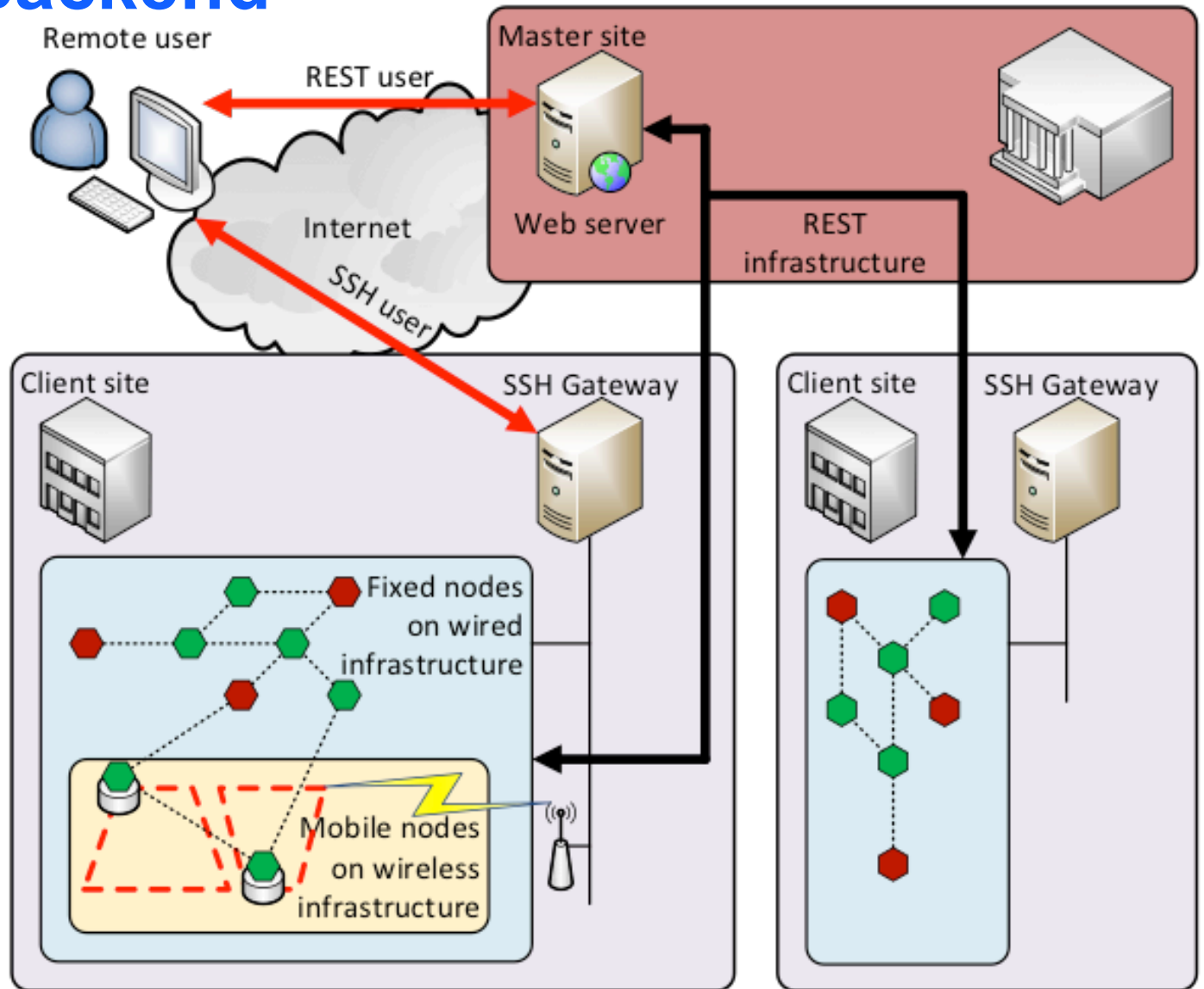based on STM32F103REY MCU and communication with 802.15.4 PHY Layer (2.4 GHz)

A8 Node

based on TI SITARA AM3505 (Arm Cortex A8) allows to run Linux. This node embeds also a M3 Node with 802.15.4 comm.
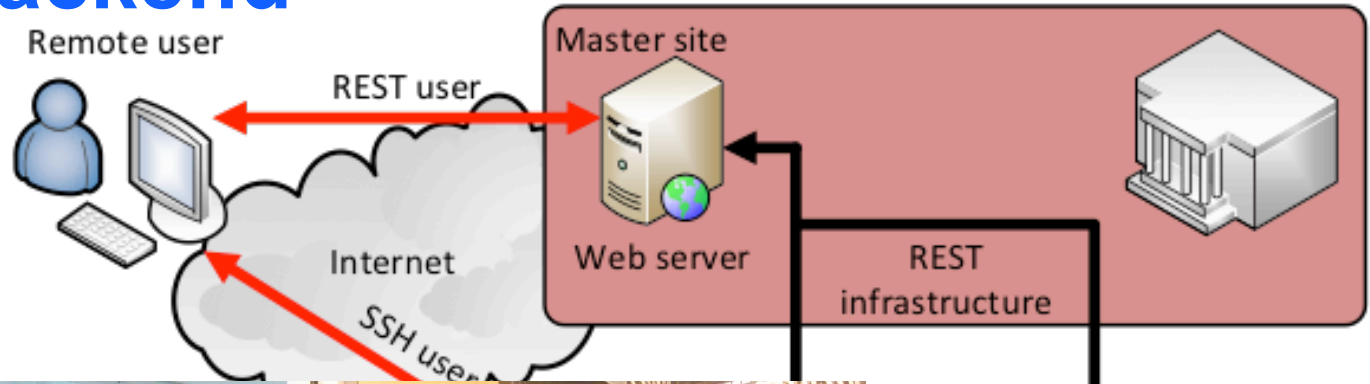
Mobile M3

> M3 node : STM32 (Cortex-M3)
>> 512 kB Flash, 64 kB RAM
>> Radio Atmel AT86RF231
>> Ambiant light, Temp, IMU, Pressure

> A8 node : TI-SITARA AM3505
>> 256 MB RAM / 600 MHz
>> Ethernet, USB
>> Linux
>> Indoor GPS for accurate clock

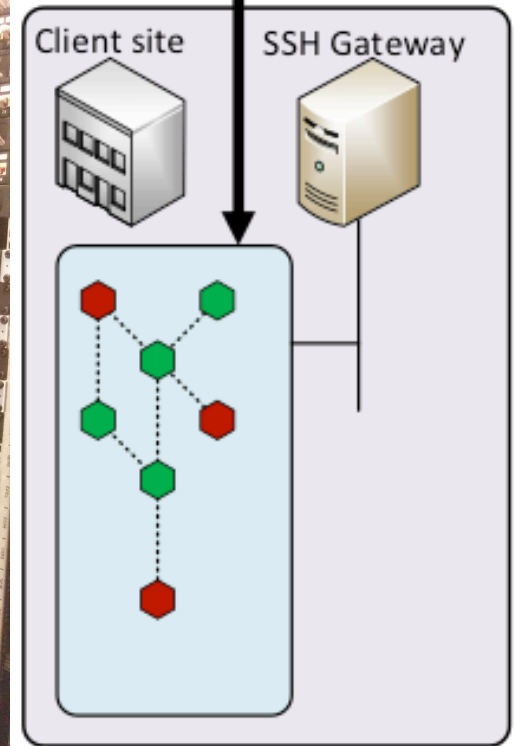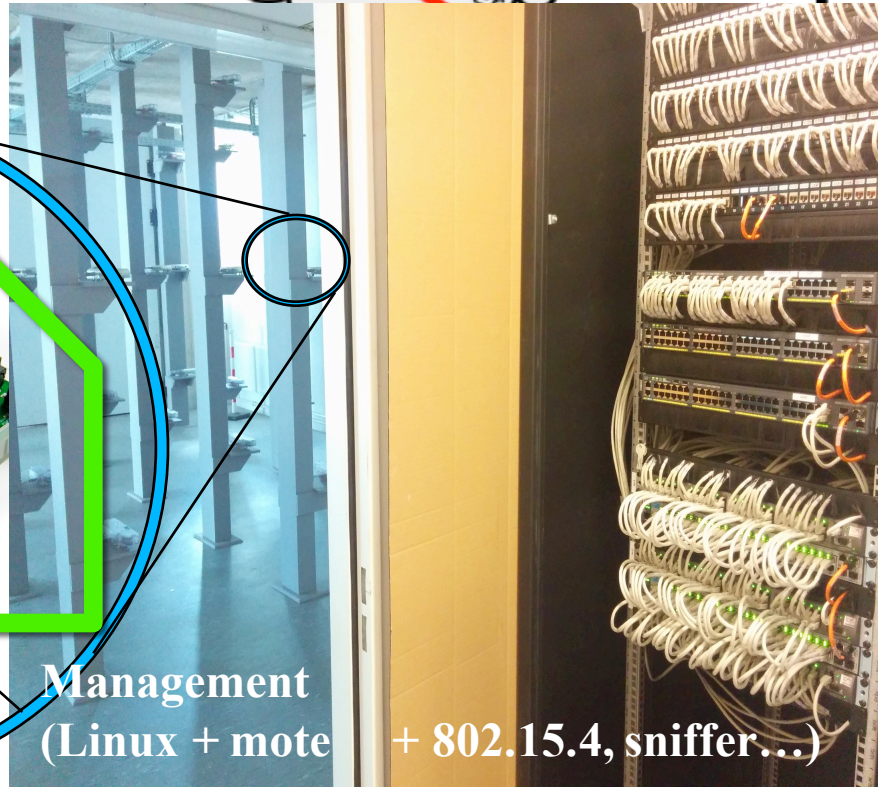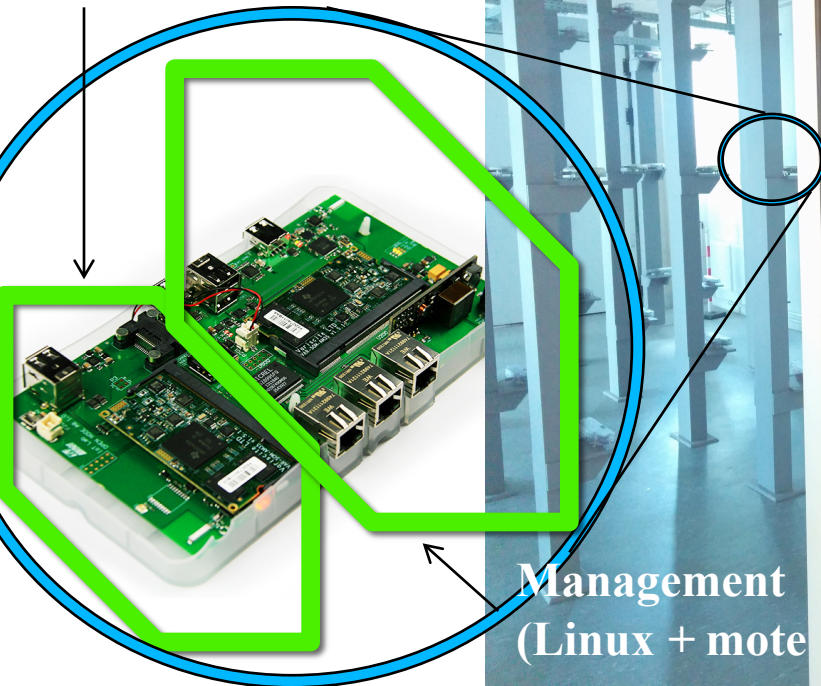FIT IoT-lab   **www.iot-lab.info**

IoT-LAB Backend

IoT-LAB Backend

Remote user

REST user

Master site

Web server

REST infrastructure

Internet

SSH user

Open A8 + M3 mote

Client site

SSH Gateway

Management (Linux + mote + 802.15.4, sniffer…)

FIT I●T-lab **www.iot-lab.info**
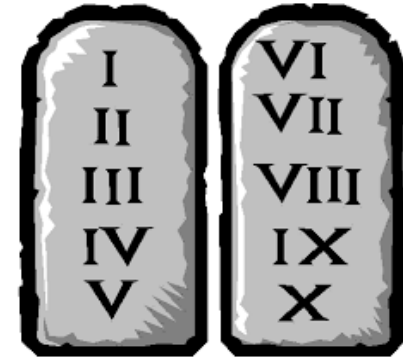
Ten Rules of IoT-LAB

OPEN Nodes == NO CONSTRAINTS AT ALL

   I.   Total remote access to open nodes

   II. Direct access to debugger

   III. Access to serial port / aggregator

   IV. On the global Internet (IPv6 end-to-end)

External Monitoring == NO APP MODIFICATION

   V. Packet sniffer

   VI. Precise end-to-end synchronisation (GPS)

   VII. Accurate power consumption

Easy to use / Advance features

   VIII. OS support, tutorials, Open-source …

   IX. Fleet of robots (40 + 60 + 10)

   X. Free open slots for specific hardware (usb node)

FIT IoT-lab **www.iot-lab.info**

IoT-LAB Software Support

- **Bare metal access…**

- **But also additional software**

  - Low level drivers

  - Libraries (communication)

  - Operating systems
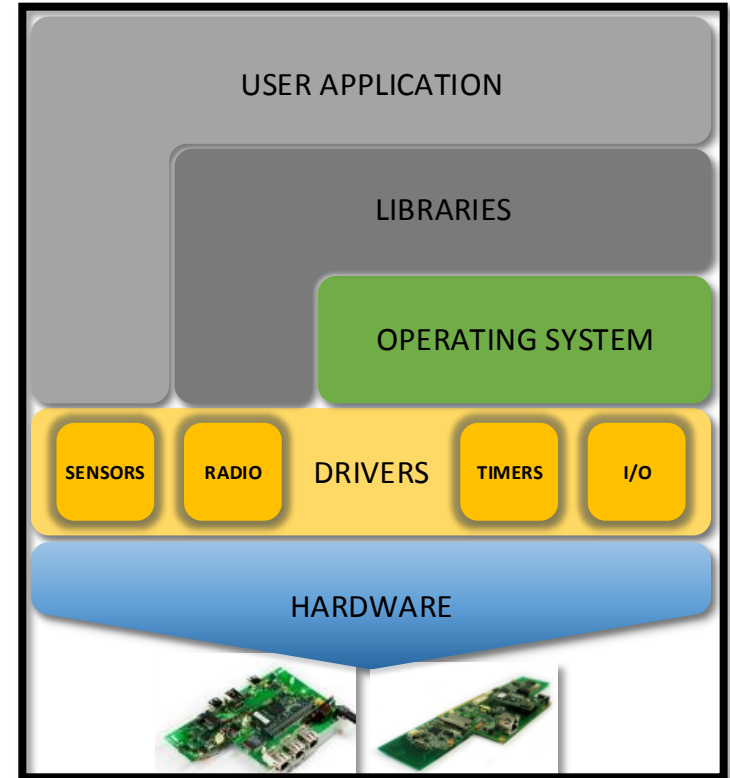
How to run an experiment

Internet

IoT-LAB server

1) Experiment configuration

2) Experiment results
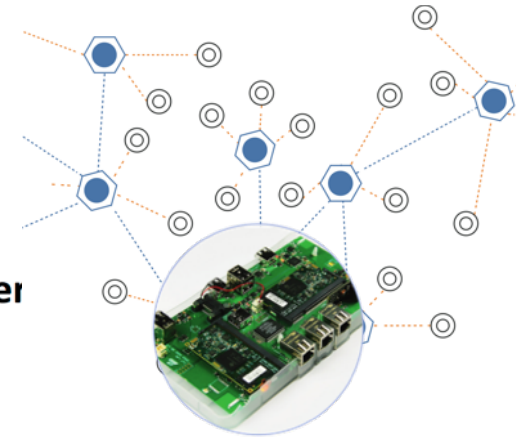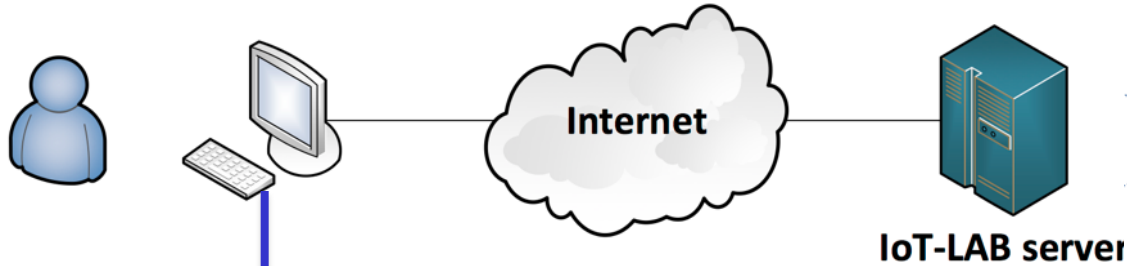
Open systems
with IETF protocols
(RPL/COAP/6TiSCH/…
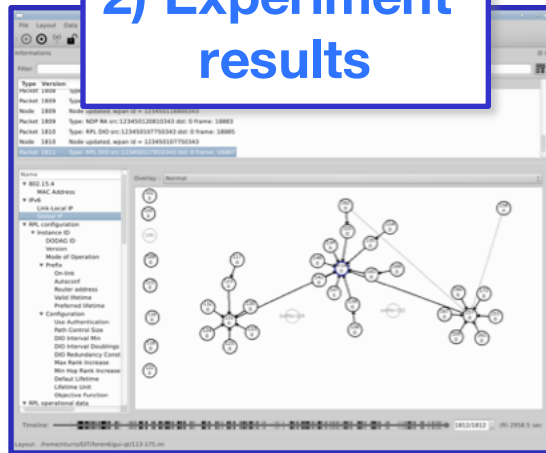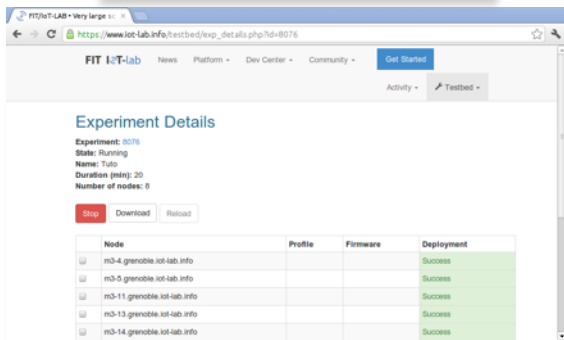
How-to IoT-Lab: Video Demo

- **Available on YouTube at https://www.youtube.com/watch?v=VgtTV_NI5k8**

- **Hands-on tutorials available on https://www.iot-lab.info/tutorials/**

Communities

www.iot-lab.info

IoT-LAB - testbeds of Equipex FIT

- **Funded project: Equipex FIT (https://fit-equipex.fr/)**

- **FIT: a initial set of testbeds (IoT, Wi-Fi, SDN, SDR, …)**
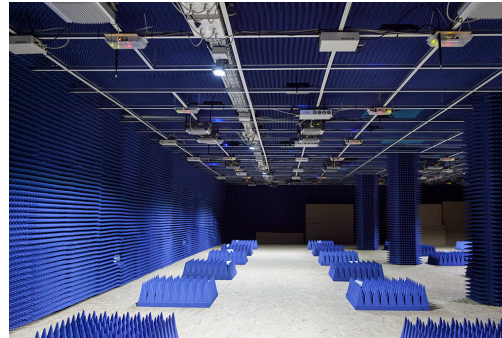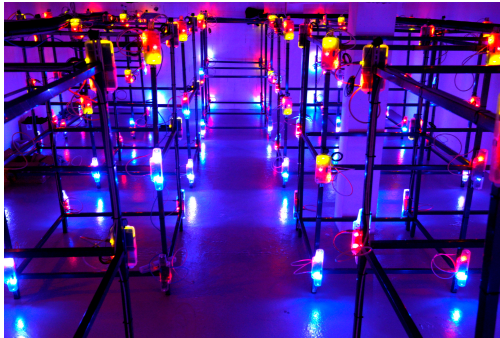
- **Partners**

FIT: part of the OneLab Federation
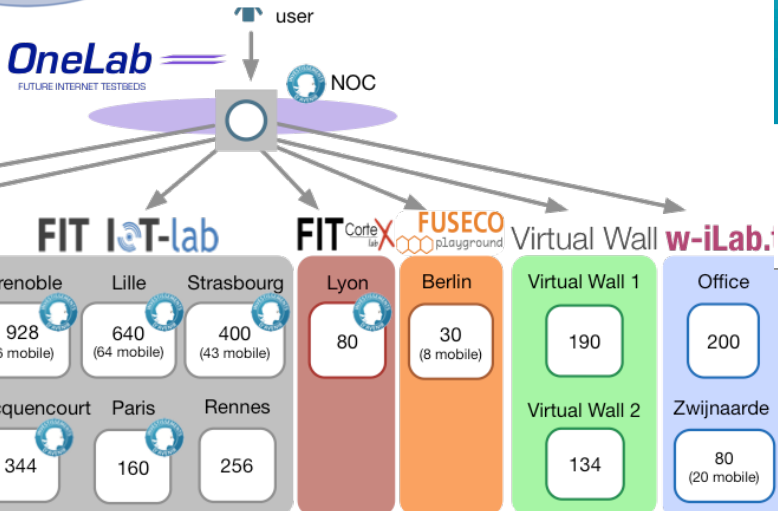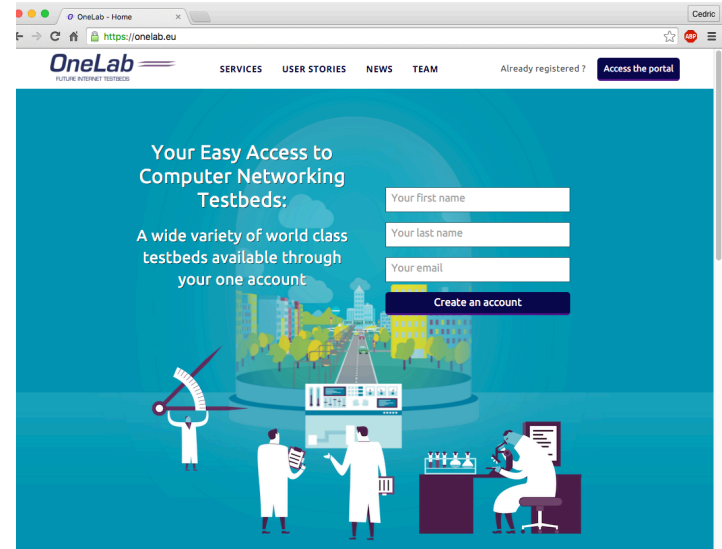
OneLAB.eu

Time to use it !

more than 1000 users registered in more than 45 countries

https://www.iot-lab.info

Videos, YouTube channel "FIT IoT-LAB"

Contact: admin@iot-lab.info

**Thank you!
Danke schön!
Questions?**