IP CREW

Cognitive Radio Experimentation World

The w-iLab.t testbed

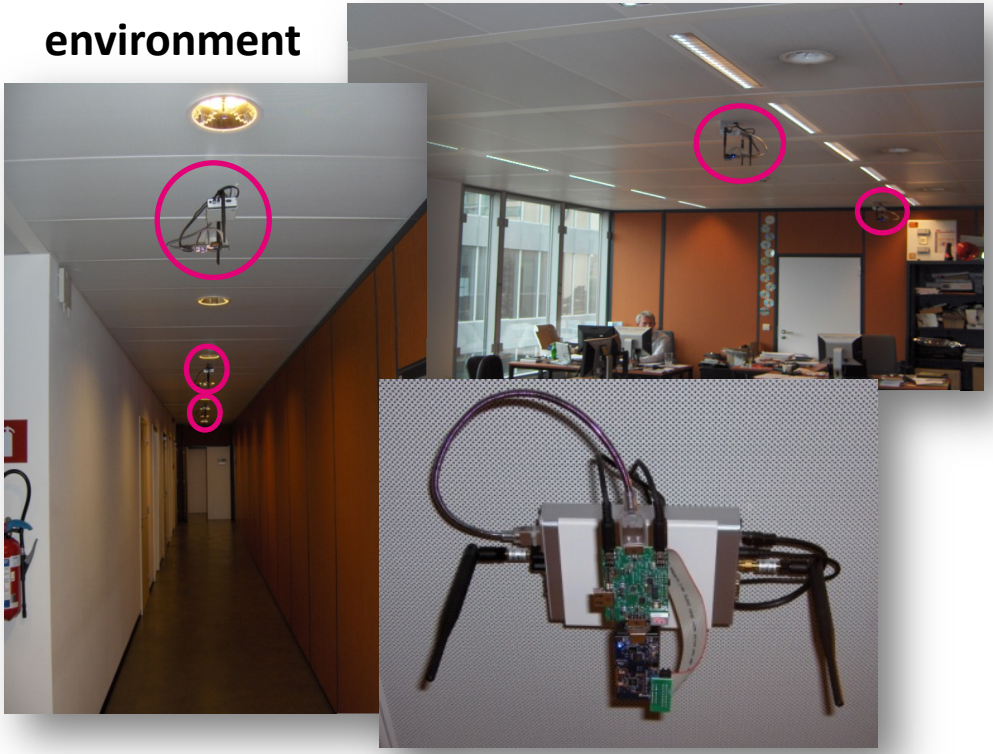
The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n°258301 (CREW project).

facts and figures

- **heterogeneous, generic testbed for wireless (cognitive) networks**
  - sensor and actuator networks
  - Wi-Fi based wireless ad-hoc/mesh/vehicular
- **2 testbed locations**
  - office: three office floors of 90m x 18m [200 nodes]
  - “pseudo-shielded”, Zwijnaarde: [60 nodes]
- **“node” = embedded PC + multiple interfaces + sensor node**
- **19 280+ experiments were scheduled since 2008**

generic testbed

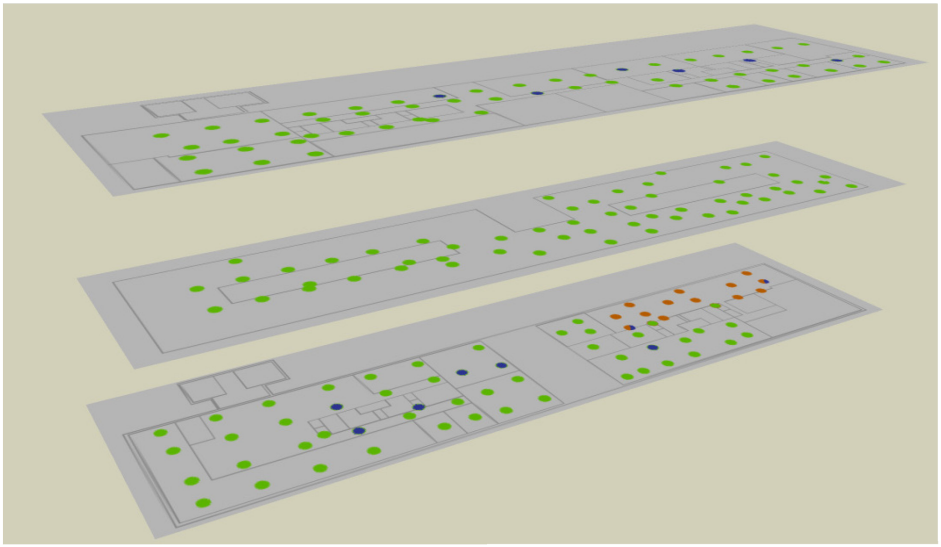
office environment



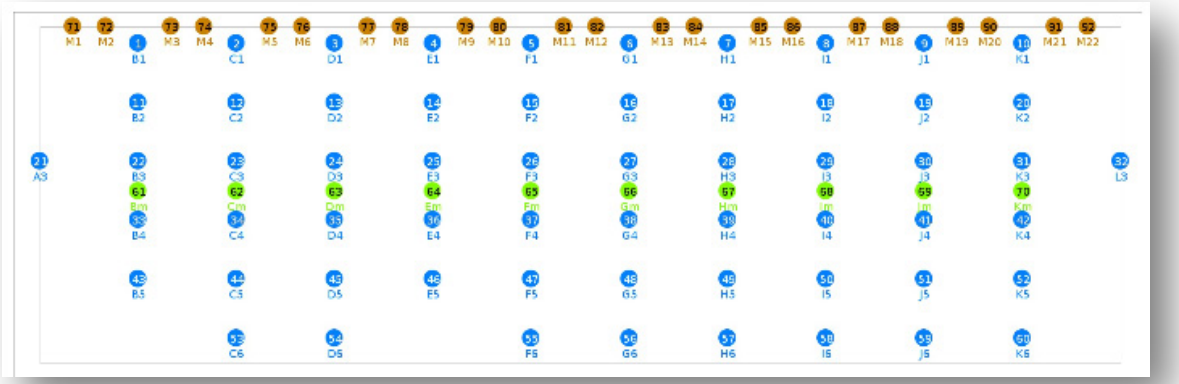
Pseudo-shielded environment

facts and figures

- **office testbed**



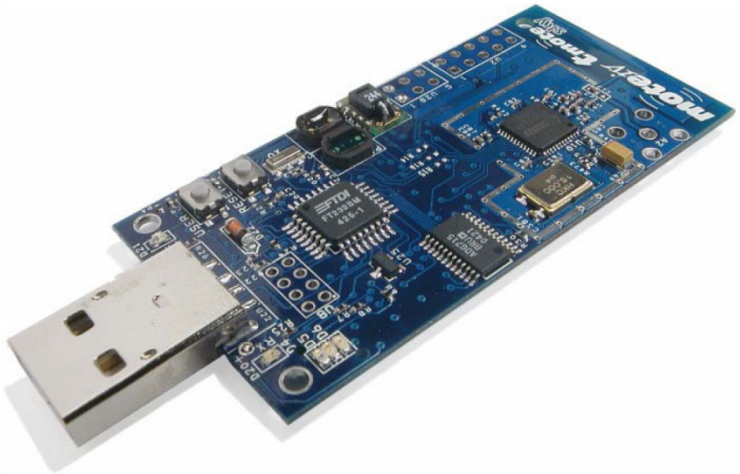
Zwijnaarde testbed

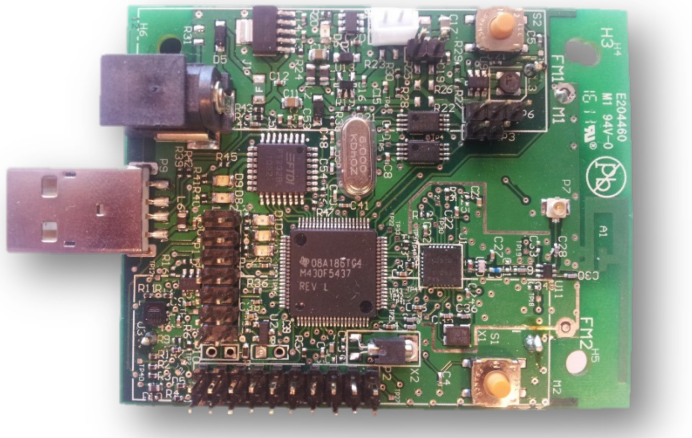


Hardware – sensor devices

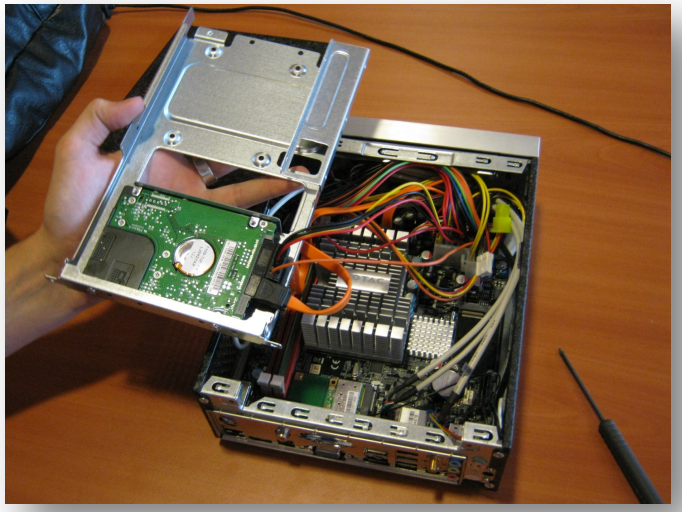
- **TMote Sky & IBBT-Rmoni**
  - Sensors for light, temperature, and humidity
  - 802.15.4 radio

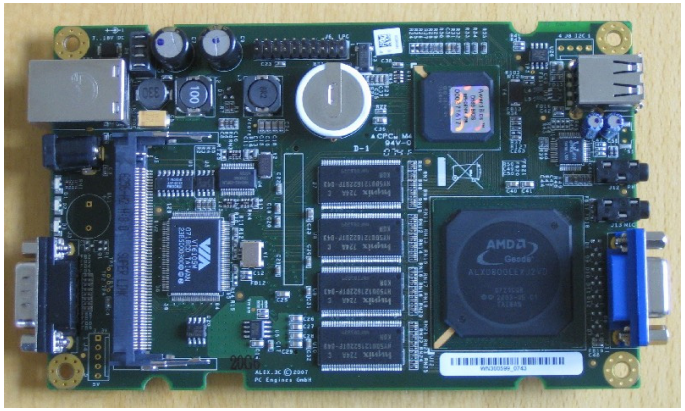
- **Specifications available on www.crew-project.eu/portal**





Hardware – embedded PCs





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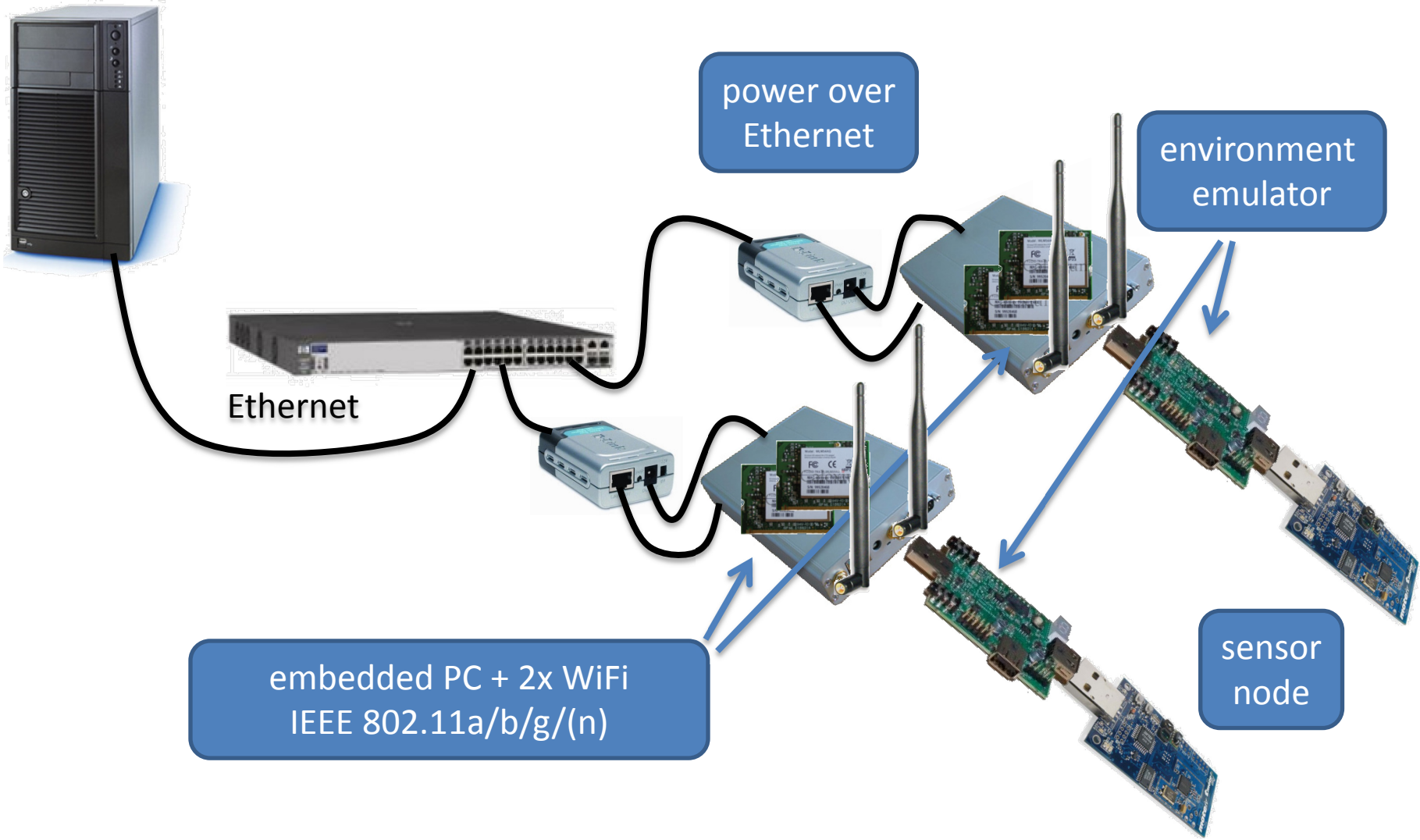
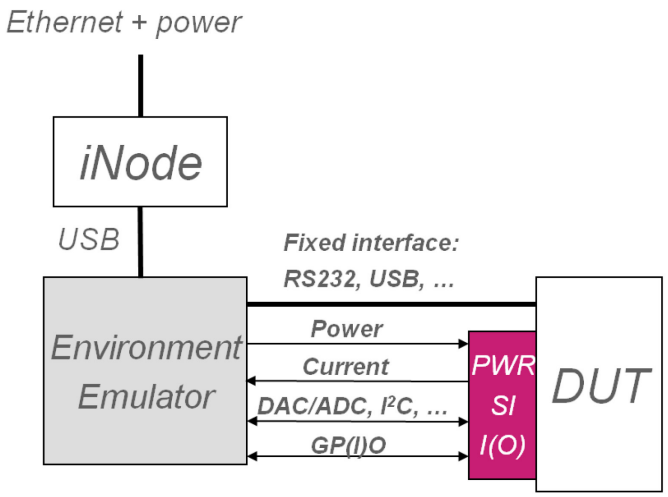
Hardware: testbed architecture



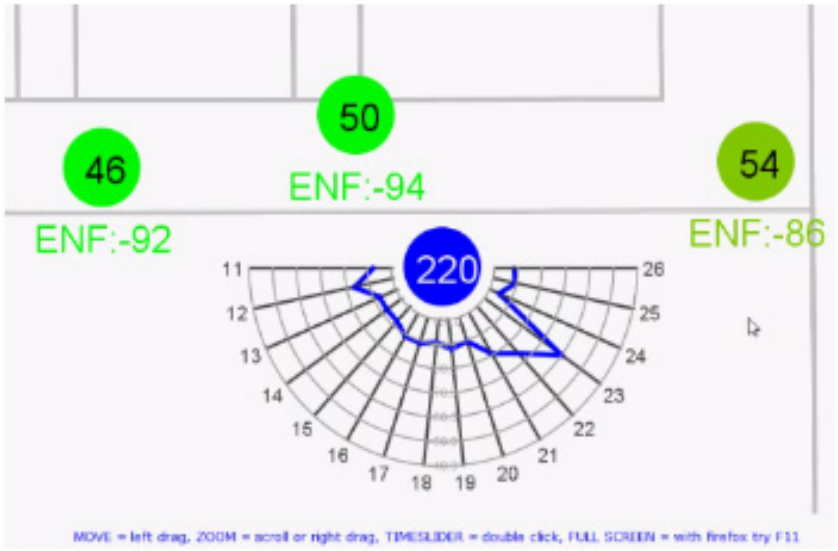
Hardware: environment emulator

- **functionality includes:**
  - emulation of sensor input
    - analog / digital inputs and outputs
  - battery emulation
    - use: e.g. emulate depleting battery, energy harvesting
    - avoid replacing real batteries
  - measure power consumption

www.crew-project.eu/portal



Cognitive components: imec sensing



- real-time and post experiment spectrum information
- 10 scanning engines, distributed at the Zwijnaarde location

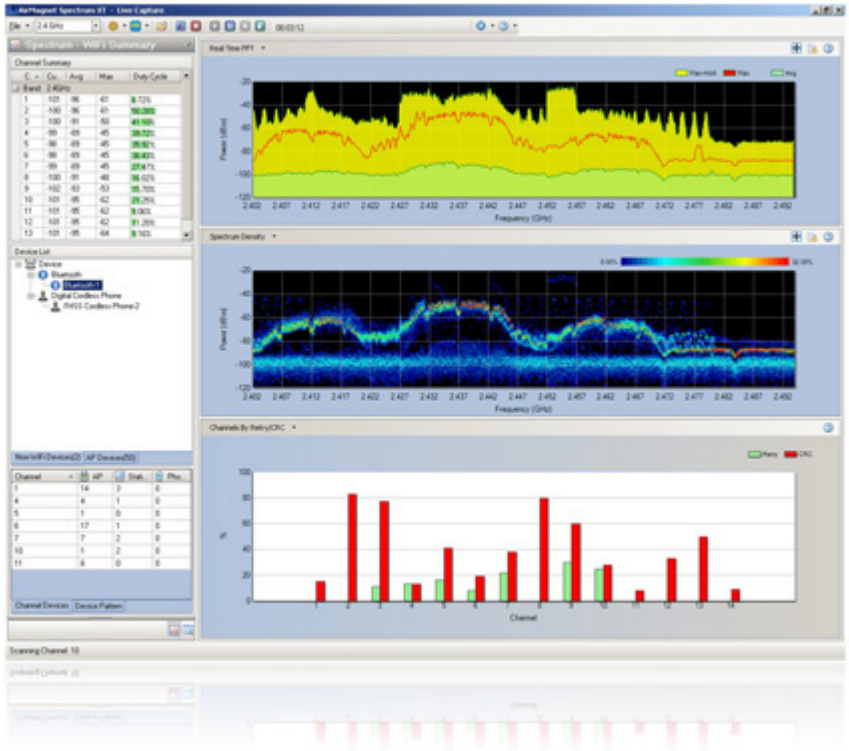
Cognitive components (2)

x 2

x 6

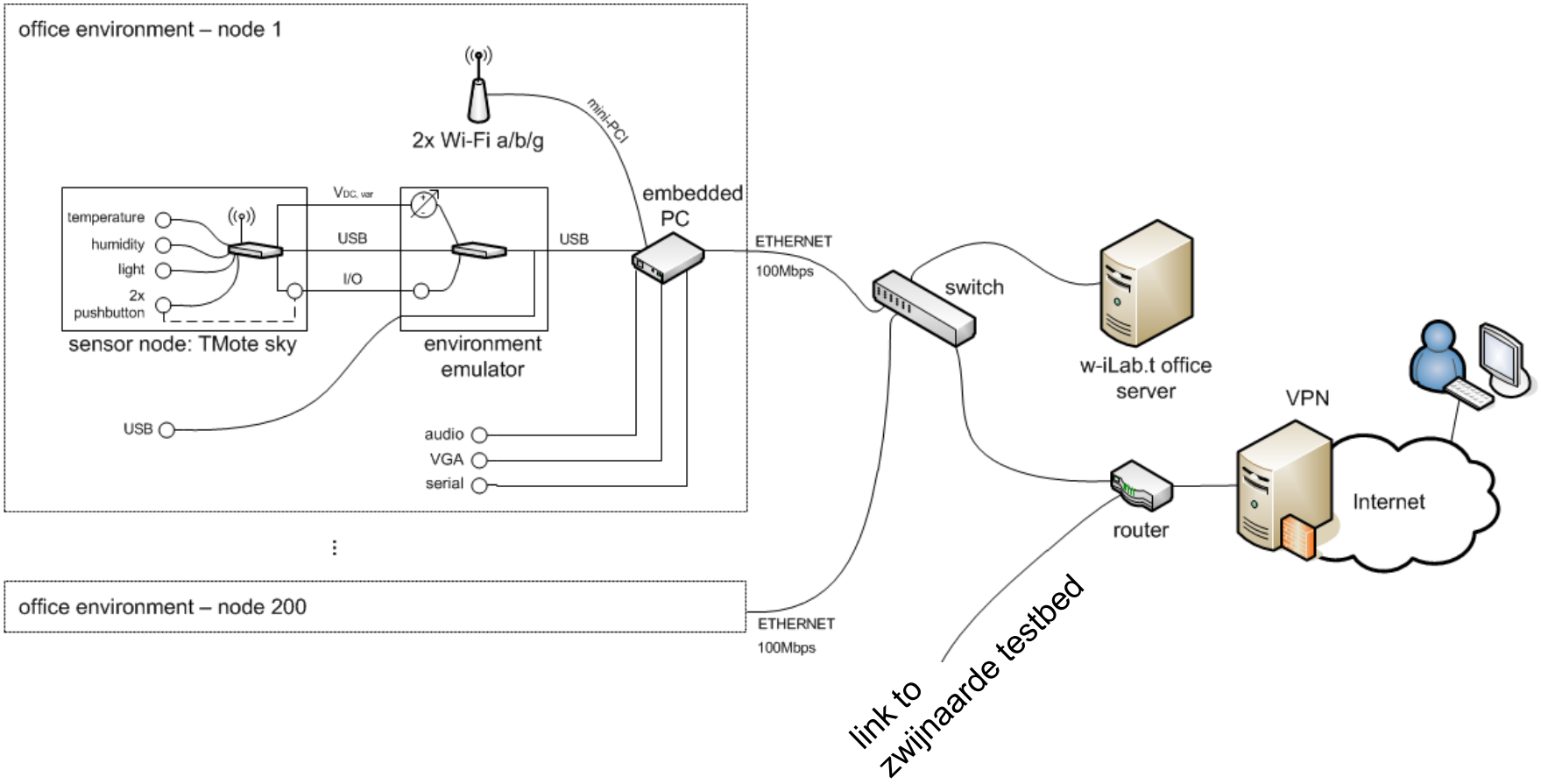
- USRP2 / USRP N210 devices (facilitate SDR radios)
- dual band 2.4 GHz / 5 GHz ISM daughter boards

“Cheap” sensing: Airmagnet Spectrum XT



Hardware overview as available on CREW portal

http://www.crew-project.eu/portal/schematic-overview



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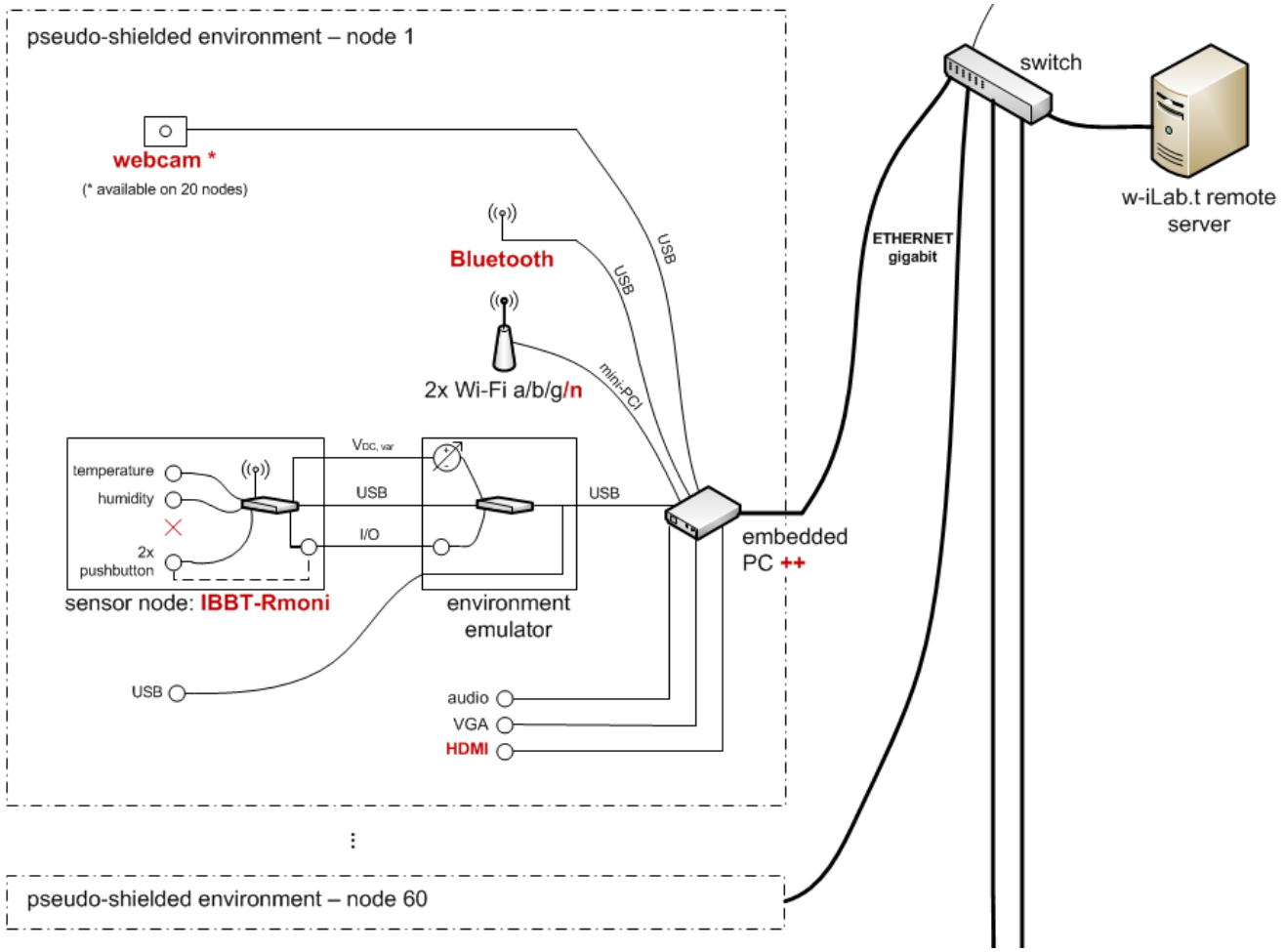

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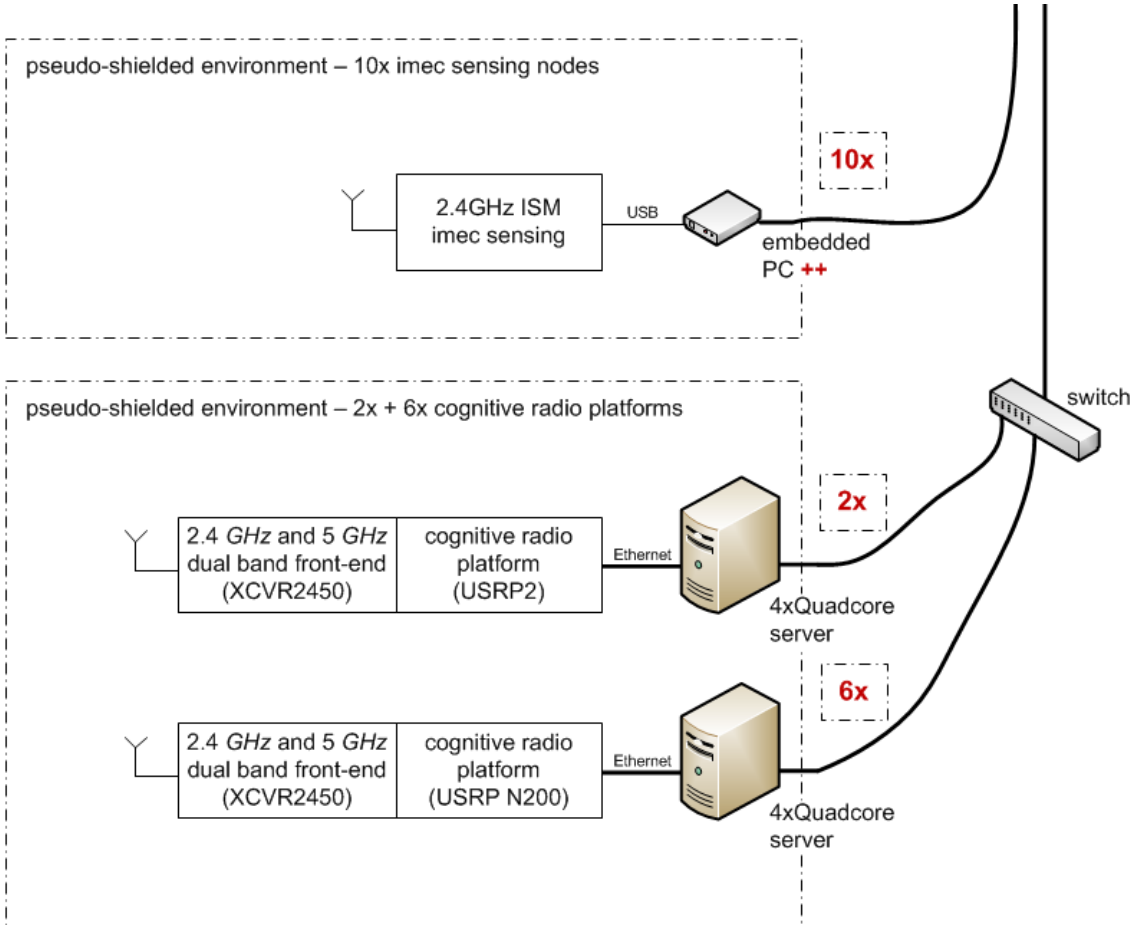
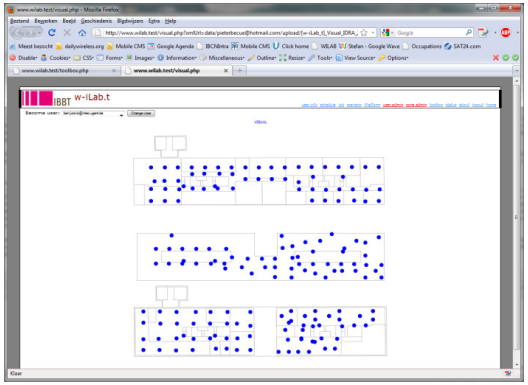
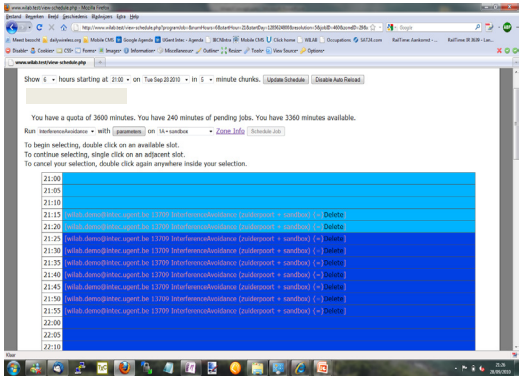
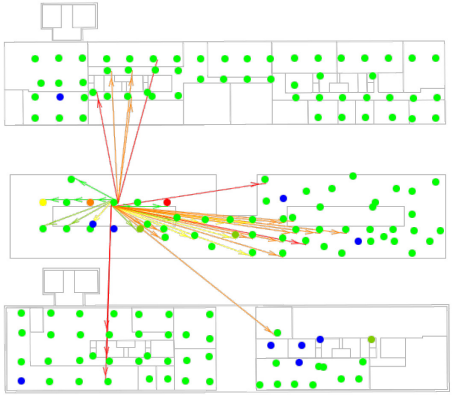
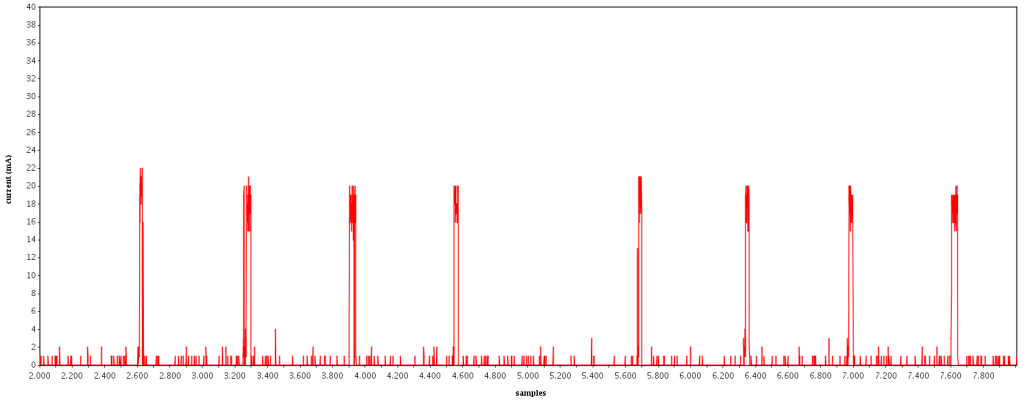






user interface – demo





Wireless benchmarking

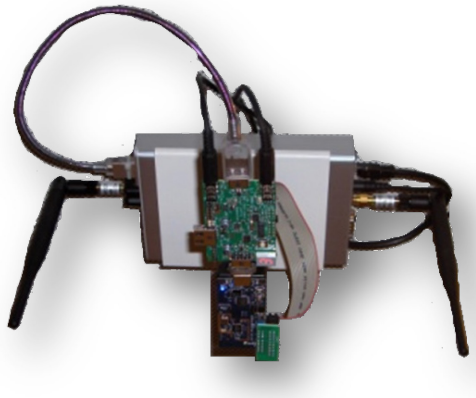
- **w-iLab.t allows automation of experiments**
  - automatic collection, processing & analysis of test results:
    1. state of the testbed,
    2. state of wireless environment
    3. state of solution under test
- **more info: white paper on benchmarking**
  http://www.crew-project.eu/documents
- **example implementation available on the CREW portal**

Summary: types of experiments

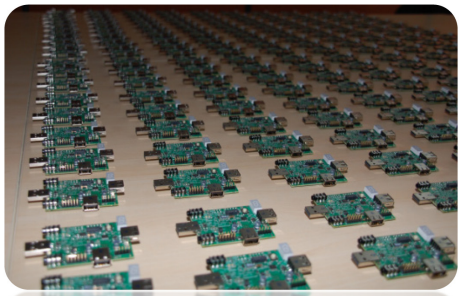
- **sensor nodes (802.15.4) nodes only**
  - *flash firmware*
  - *{collect, process, visualize, analyze} results*
- **embedded PC with Wi-Fi / Bluetooth interfaces**
  - *configure device (protocols, drivers, kernel,…)*
  - *{process, visualize, analyze} results*
- **cognitive components**
  - imec sensing, USRP (Iris)
- **combined experiments**

Conclusions: the w-iLab.t testbed

- **w-iLab.t**
  - actively used
  - Hardware and tested tools
  - 802.15.4 sensor networks, Wi-Fi based networks, Bluetooth
  - cognitive components: sensing and SDR
- **support for heterogeneous experiments**
- **advanced functionality**
  - environment emulator
  - analyzer / visualizer
  - benchmarking



Questions?



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