IBBT w-iLab.t

Using the w-iLab.t testbed for cognitive networking and cognitive radio research

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outline

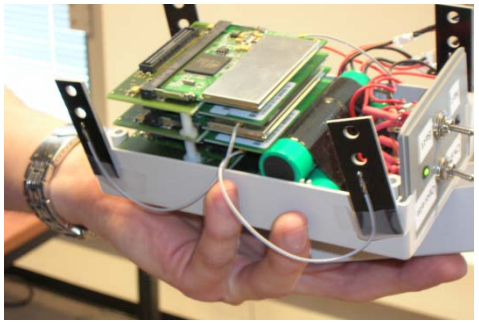
- w-iLab.t general info
  - background
  - what is available
  - w-iLab.t possibilities
- w-iLab.t hands-on
  - access policy & accounts
  - getting started

ilab.t technology centre

http://ilabt.ibbt.be

w-iLab.t background

- interdisciplinary projects @ IBBT
  - some involve wireless networks
    - real-life demonstrators
    - many different test set-ups



w-iLab.t background

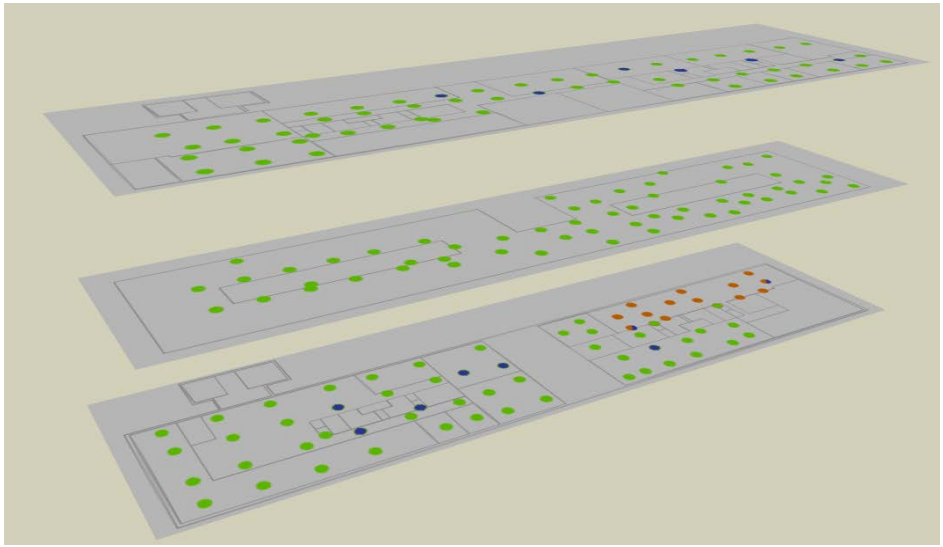
- individual set-ups: difficult to…
  - compare results
  - reproduce tests
- small-scale test vs. large-scale evaluation
- how to…
  - enable large-scale wireless experiments?
  - … in an organized way?
- the answer: a large scale wireless testbed
  - 2007: w-iLab.t

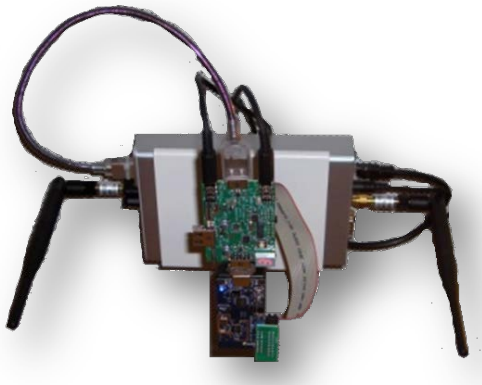
facts and figures

- **generic** testbed for wireless networks
  - sensor networks (ZigBee 802.15.4)
  - Ad-Hoc, mesh (Wi-Fi 802.11a/b/g/n)
  - Bluetooth
- 2 testbed locations
  - IBBT office: three office floors of 90m x 18m [200 nodes]
  - “pseudo-shielded” environment, Zwijnaarde: [60+20 nodes]

facts and figures – node locations

- w-iLab.t testbed

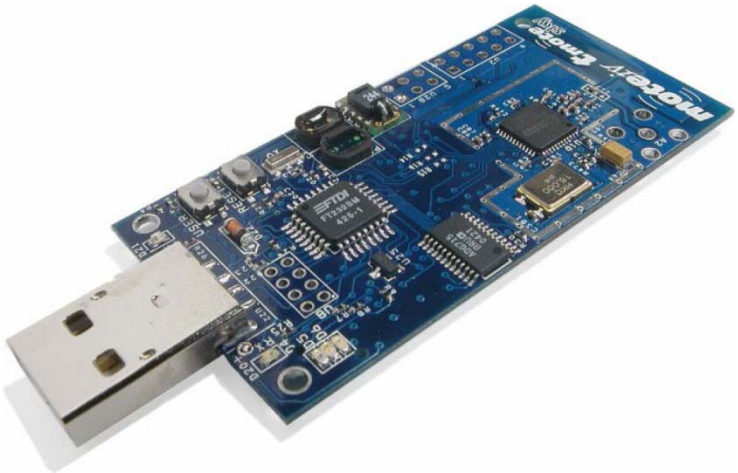


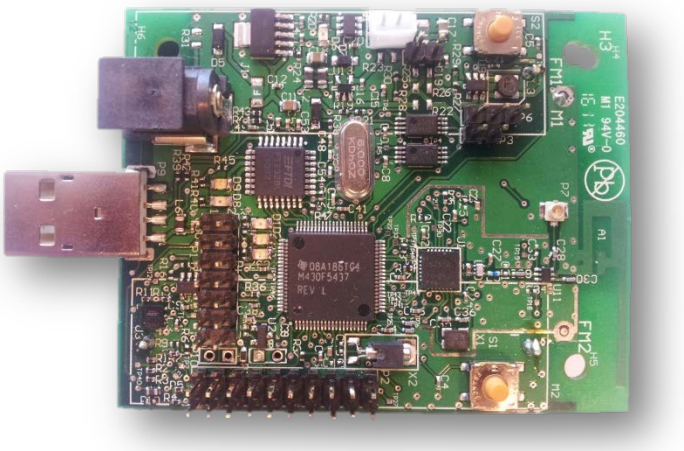


w-iLab.t Zwijnaarde

Hardware – sensor nodes

- Sensor devices
  - TI MSP430 processor
  - Flash memory
  - Chipcon CC2420 radio
  - Sensors for (light), temperature, and humidity



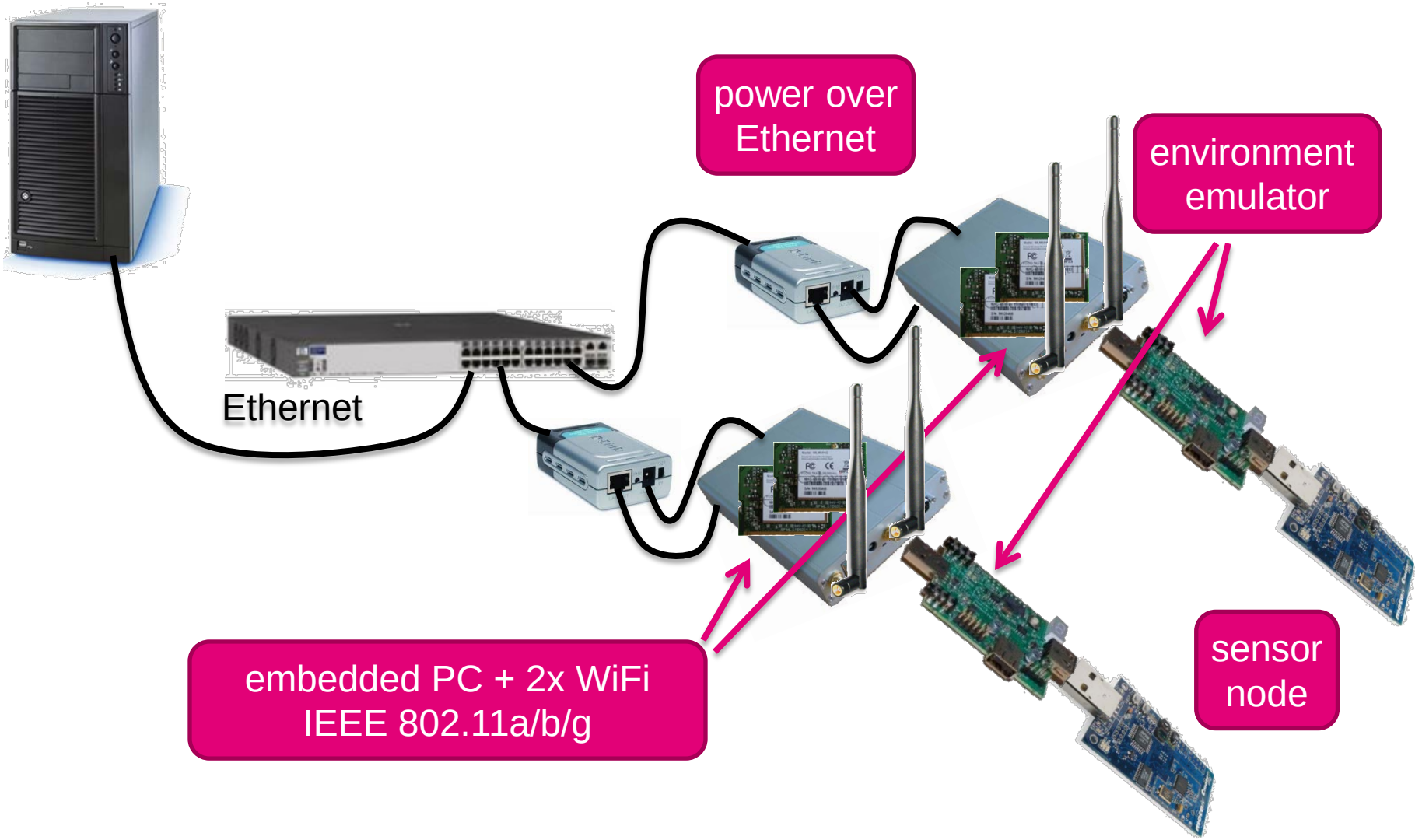


IBBT – Rmoni node

Hardware – embedded PCs

details: www.crew-project.eu/portal/wilabdoc

Hardware: office testbed architecture



Hardware: Zwijnaarde testbed architecture

Switch

PDU

embedded PC

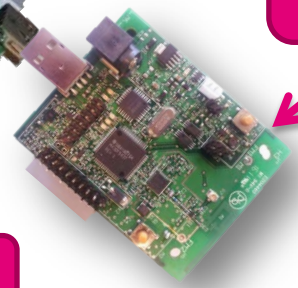
environment emulator

sensor node

webcam (40% of nodes)

2x Wi-Fi 802.11 a/b/g/n

Bluetooth 3.0 EDR



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How can w-iLab.t be used?

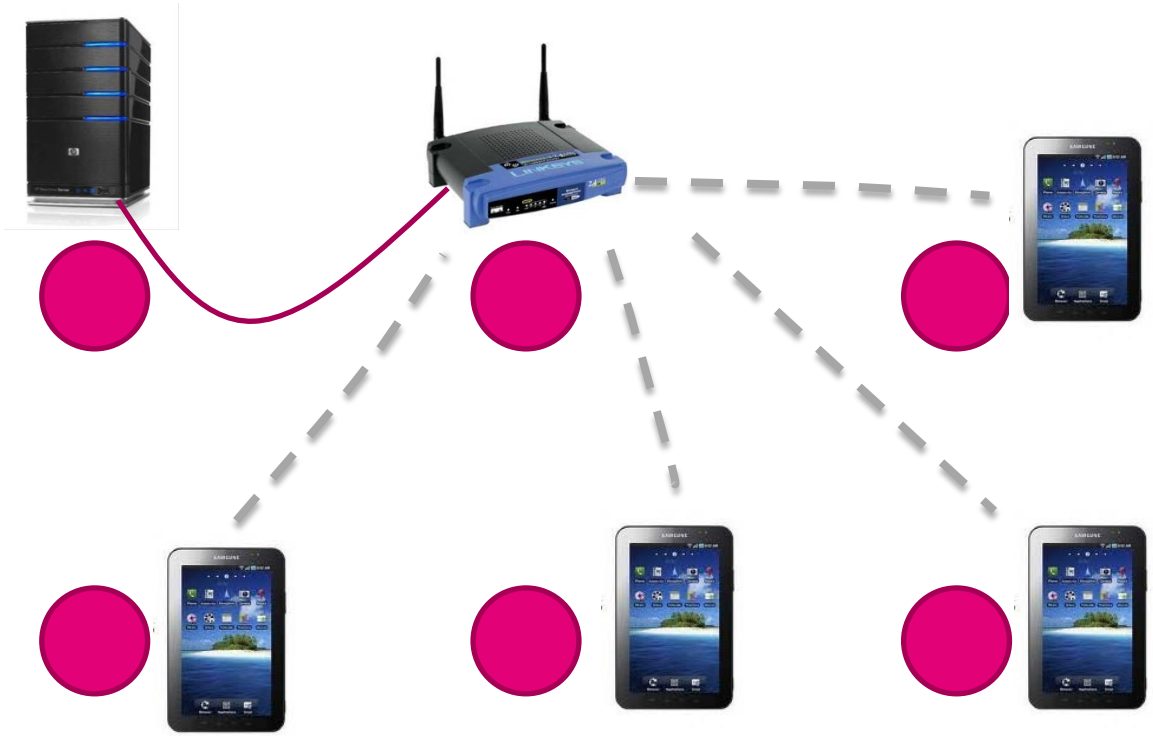
All devices can be used as if they were on your own desktop.

But: w-iLab.t provides tools and the management for:

- mass-installing nodes
- configuring nodes
- interacting with nodes
- collecting data from nodes
- collecting information on nodes (e.g. power consumption)
- controlling wireless environment
- monitoring the wireless environment
- processing data
- visualizing data
- storing data
- …

Obtain more reliable developments and results, only in a faster and more easy way.

Example configuration



Example configuration (2)

Example configuration (2)

Controlled mobility

based on vacuum cleaning robot

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Emulated mobility

- shielded from outside interference
- variable attenuators
- emulate mobility

OpenLab

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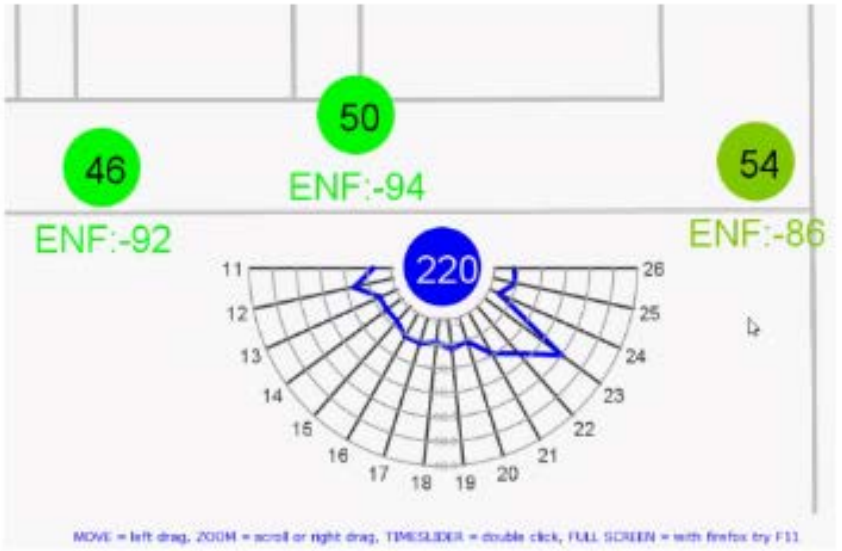
IBBT w-iLab.t

Cognitive radio and cognitive networking components

Cognitive components

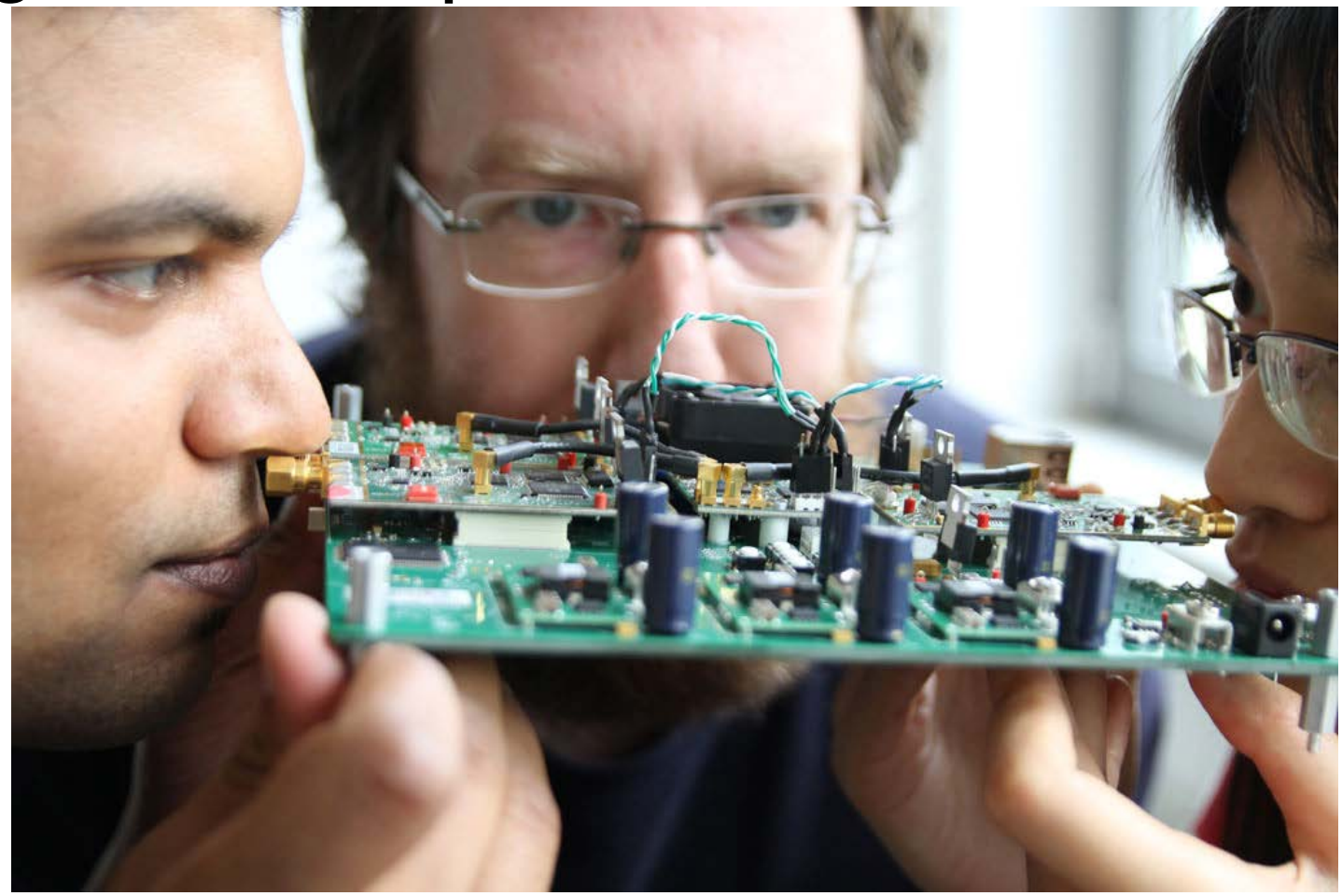


- real-time and post experiment spectrum information
- 10 scanning engines, distributed at the Zwijnaarde location

Cognitive components: USRP2

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

Cognitive components: WARP

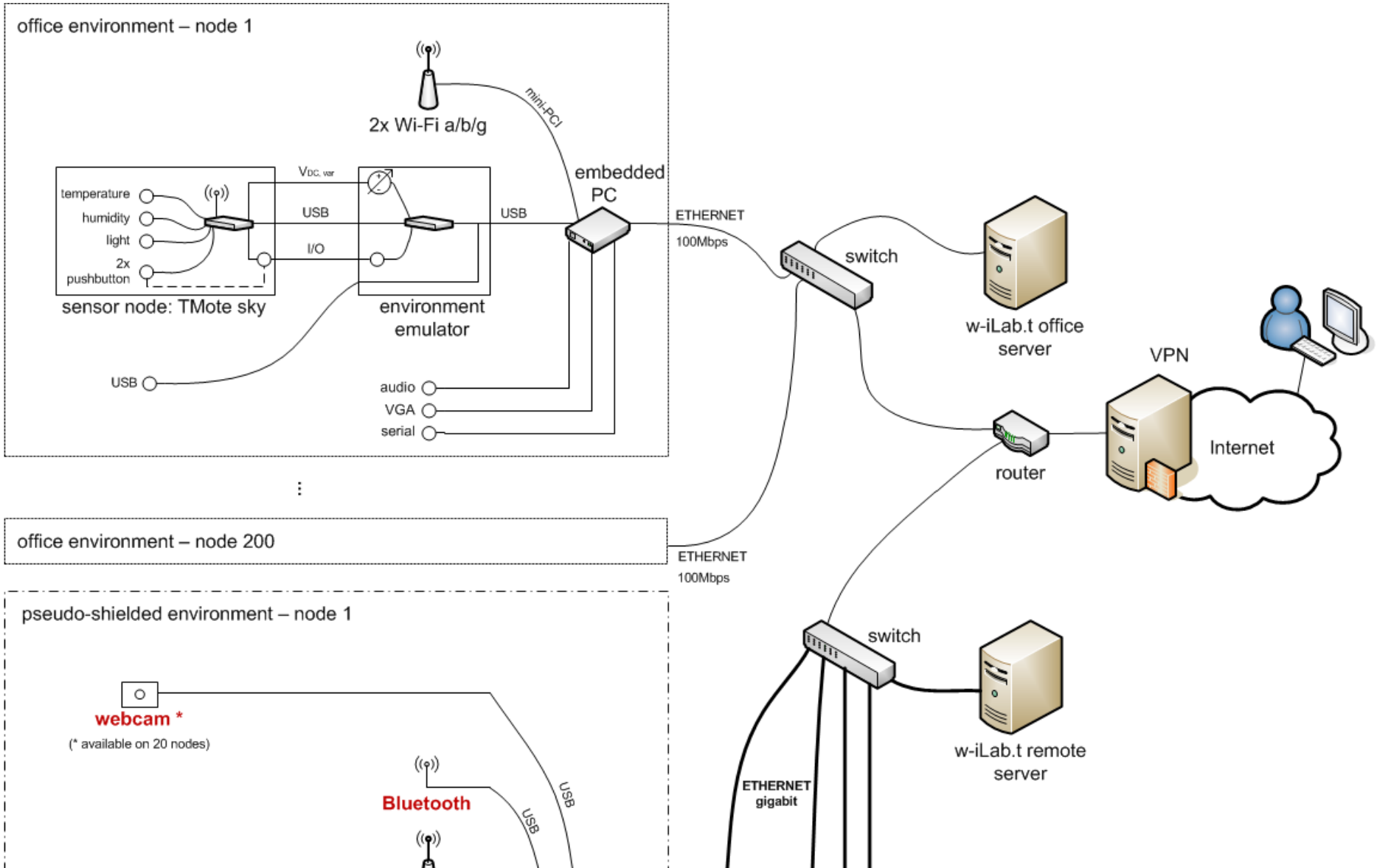


Cognitive networking

- cognitive (sensor) networks
  - local scan performed by sensor nodes
  - using information from sensing engines

- example use case: ISM networks in home

Component interconnection



w-iLab.t

Hands-on: controlling the testbed

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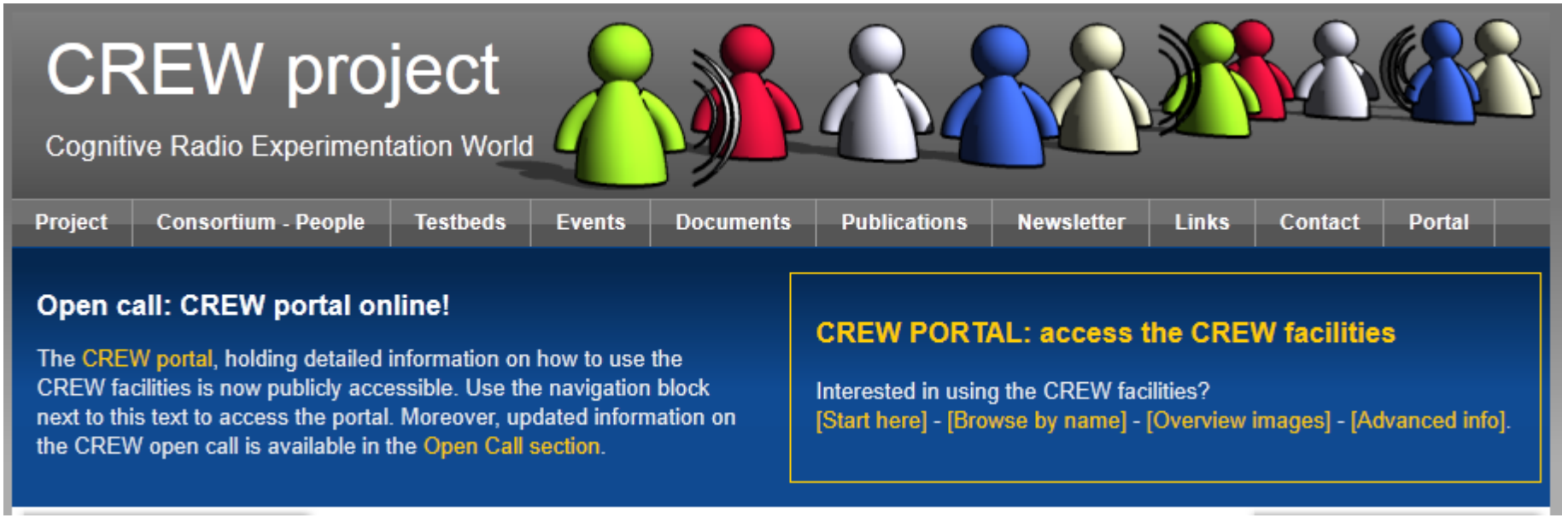
Connecting to the testbed

- w-iLab.t can be controlled fully remotely
- who can use the testbed?
  - “w-iLab.t classic” (=non-CREW components)
    - best effort access typically free for non-commercial use
    - terms apply
    - see ilabt.ibbt.be (or contact stefan.bouckaert@intec.ugent.be)
  - w-iLab.t CREW components
    - for approved experiments: free or even funded (open call!)
    - availability not guaranteed

Connecting to the testbed

- OpenVPN connection is needed
  - details + apply for an account: see CREW portal



www.crew-project.eu/portal

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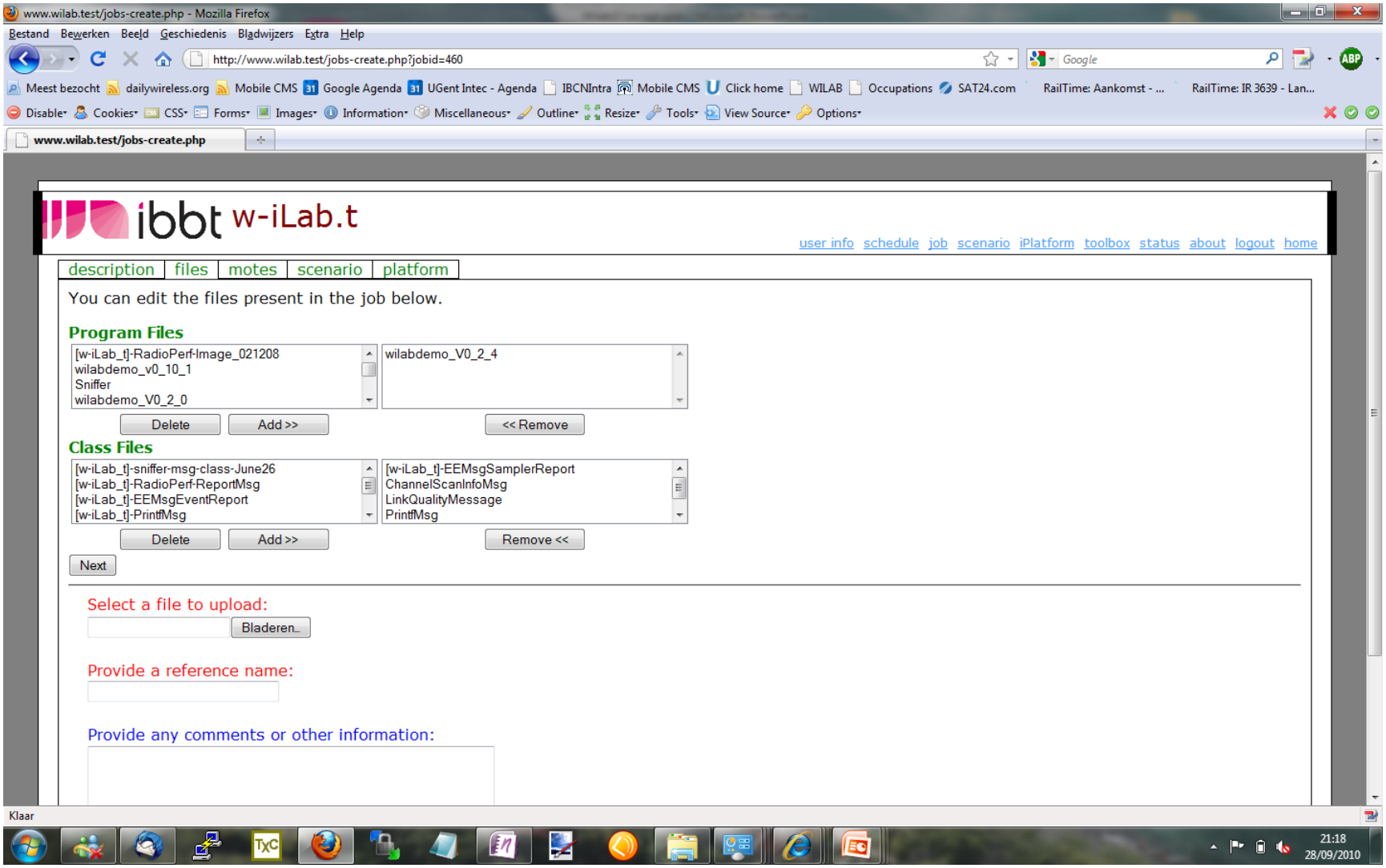
Connecting to the testbed

- Once the openVPN is active:
  - w-iLab.t Office: http://wilab.atlantis.ugent.be
  - w-iLab.t Zwijnaarde: OMF-based deployment
    - provisioning of testbed nodes
    - experiment control

w-iLab.t office - user interface



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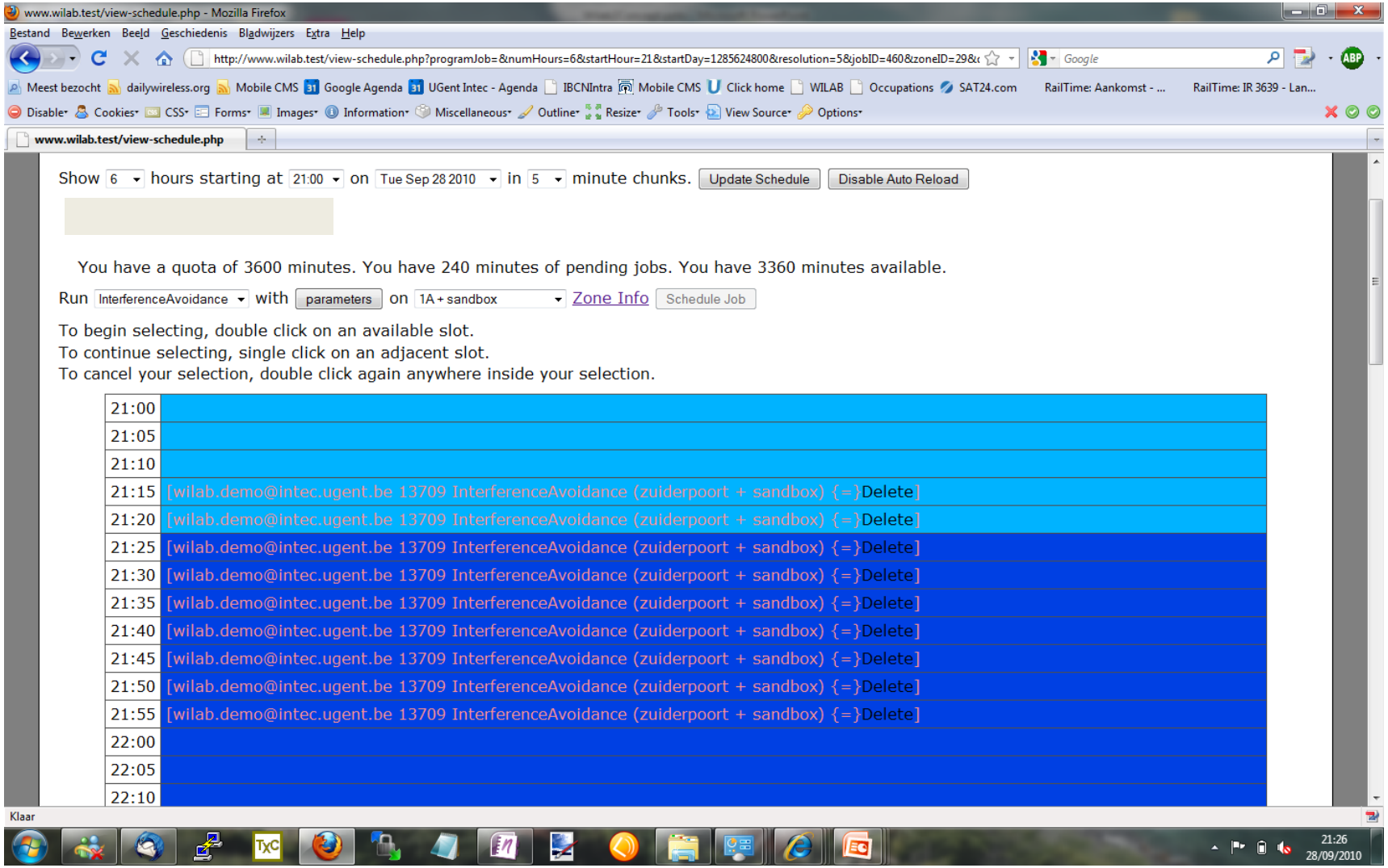

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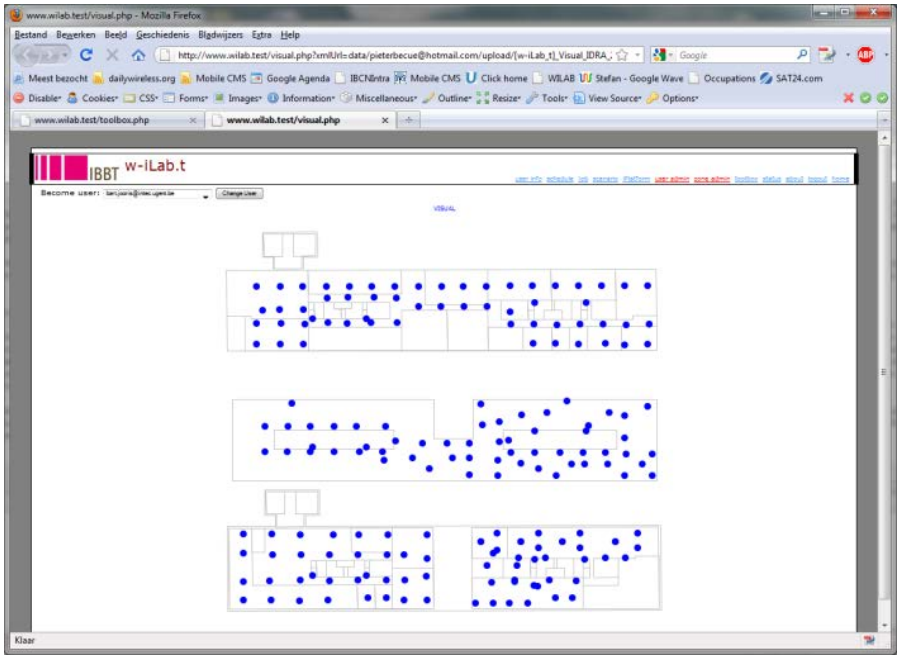

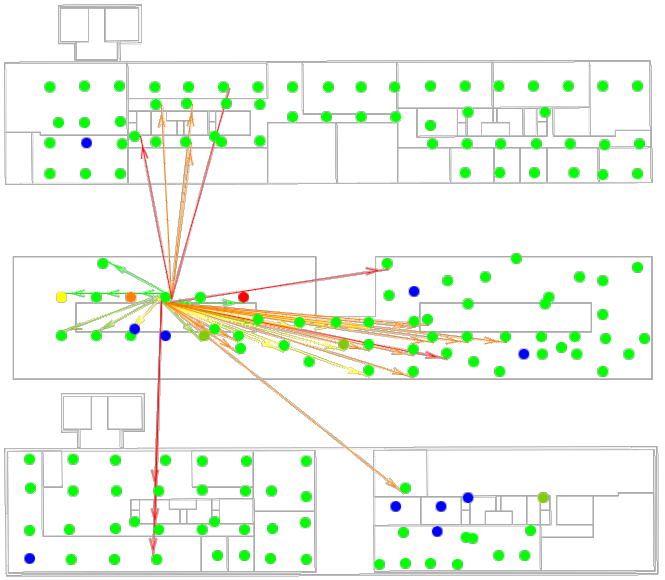

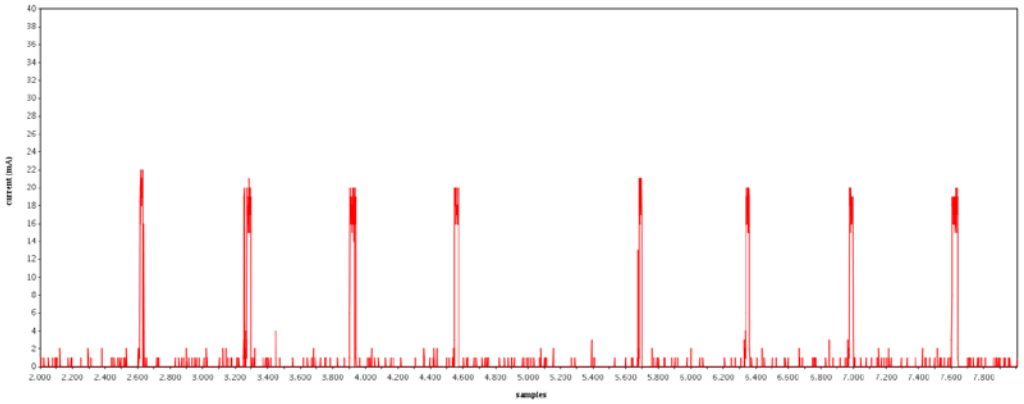

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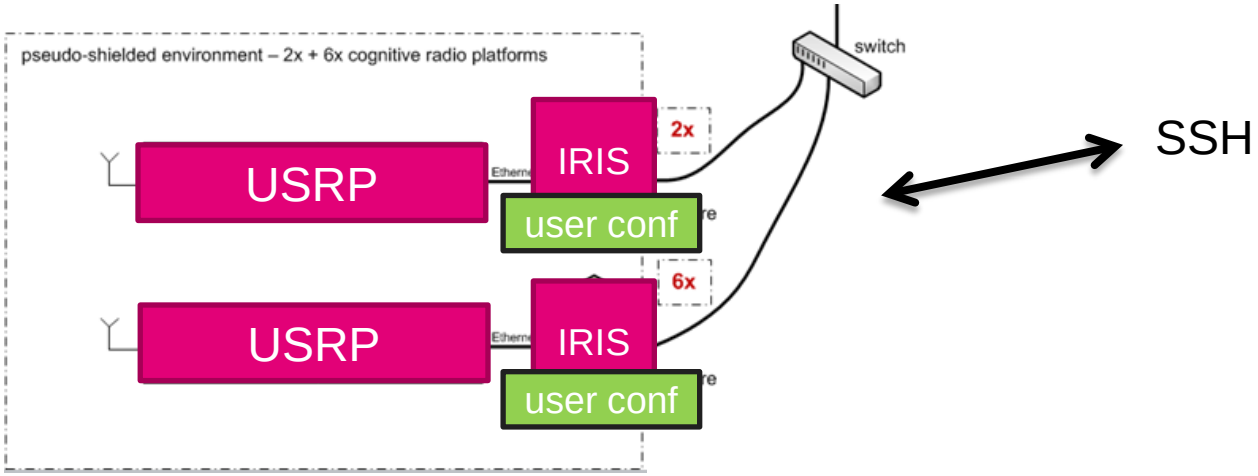

Video demo

- Spectrum sensing with USRPs
- Benchmarking

Summary: the w-iLab.t

- generic wireless testbed
- heterogeneous wireless nodes
- software defined radios / spectrum sensing engines
- supports full experiment lifecycle
  - easy deployment of code across a wide selection of nodes
  - analysis of results
- enabler for experimentally-driven research

The w-iLab.t testbed

Questions?

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