Intent-based Computing & Energy-Efficient Internet

Stefan Van Baelen
Research Coordinator
Monaco, 24/04/2014

iMinds: Strong in Cooperative Research
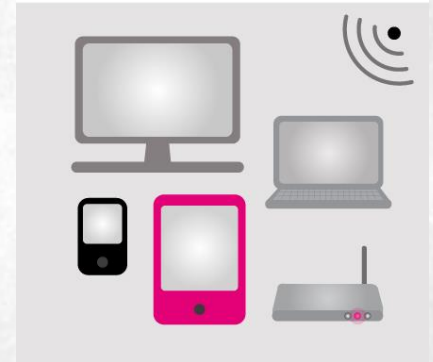
demand-driven

cooperative

iMinds

interdisciplinary

research in ICT

5 university partners

KU LEUVEN

Universiteit Antwerpen

UNIVERSITEIT GENT

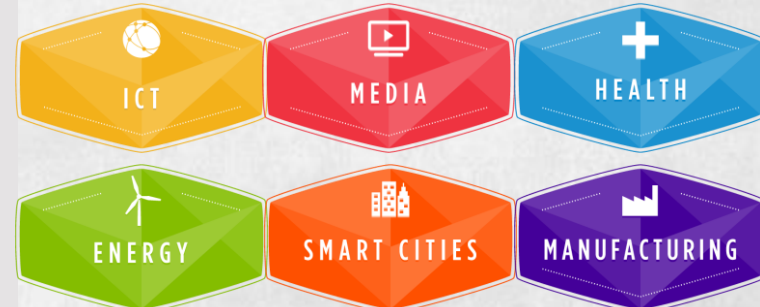universiteit hasselt
UNIVERSITEIT VAN DE TOEKOMST

Vrije Universiteit Brussel

5 departments

Digital Society

Future Health

Future Internet

Future Media & Imaging

Security

5 vertical markets + ICT

ICT

MEDIA

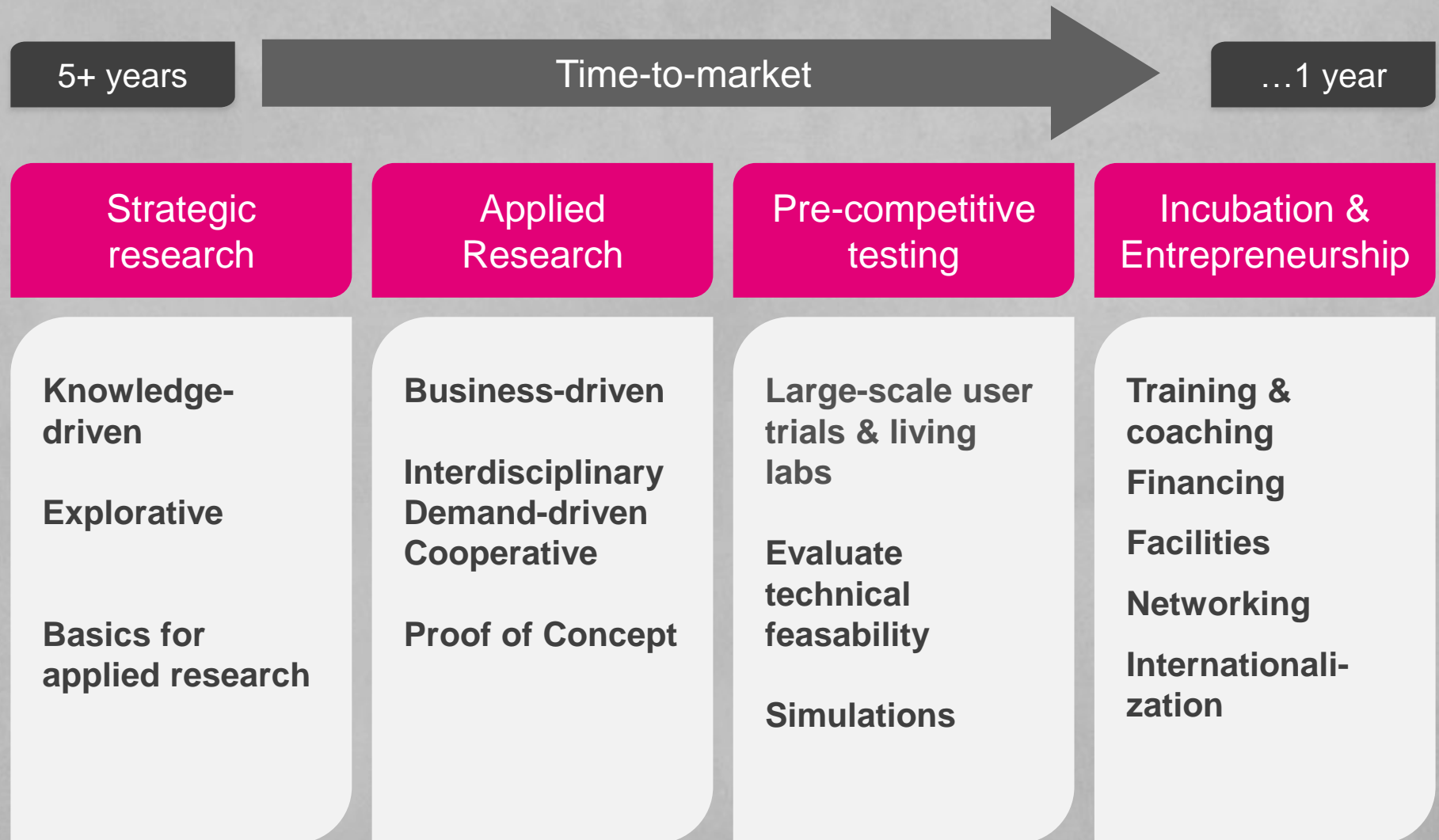HEALTH

ENERGY

SMART CITIES

MANUFACTURING

400+ PROJECTS with industry
(FP7 incl. FIRE & FI-PPP, EUREKA, JTIs, EIT)

iMinds

1000+ PARTNERS in the iMinds ecosystem
(Large Industry, SMEs, Public Sector)

800+ RESEARCHERS located at 5 universities

# From idea to business: our innovation toolbox

5+ years	Time-to-market	...1 year

Strategic research	Applied Research	Pre-competitive testing	Incubation & Entrepreneurship
Knowledge-driven **Explorative** **Basics for applied research**	**Business-driven** **Interdisciplinary Demand-driven Cooperative** **Proof of Concept**	**Large-scale user trials & living labs** **Evaluate technical feasability** **Simulations**	**Training & coaching** **Financing** **Facilities** **Networking** **Internationali-zation**

iMinds

The iLab.o toolbox: 5 unique assets

iMinds ILAB.O

European Network of Living Labs

Panel Management

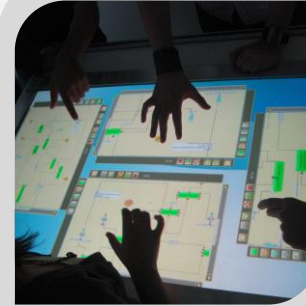We'll find and motivate your test-users
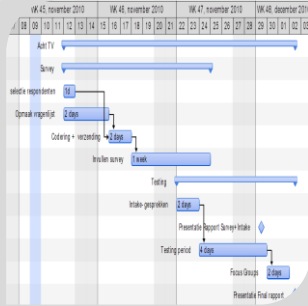
Living Lab Methodology

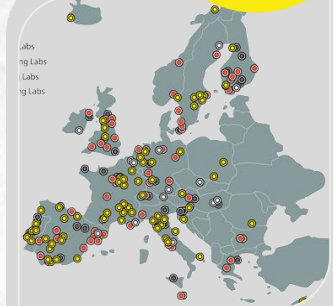We'll show you how to set up a living lab project – e.g. with LL Analyser and Data Aggregator

Prototyping & testing

We'll model a rough idea into a usable app for daily life and test it through

Simulate Your Business
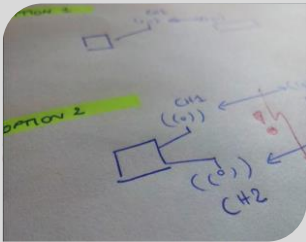
Co-design of cooperative business model on the fly

European Network of Living Labs
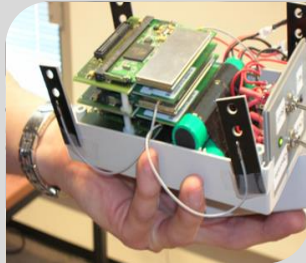
Gateway to 300+ Living Labs

Importance of validated toolbox!

iMinds Research Infrastructures: iLab.t

Strategic Advice

Solving technical issues, develop measurement strategies, High-level solution architecture, techno-economics

Discovery & feasibility

Technology discovery & feasibility analysis

Prototyping & testing

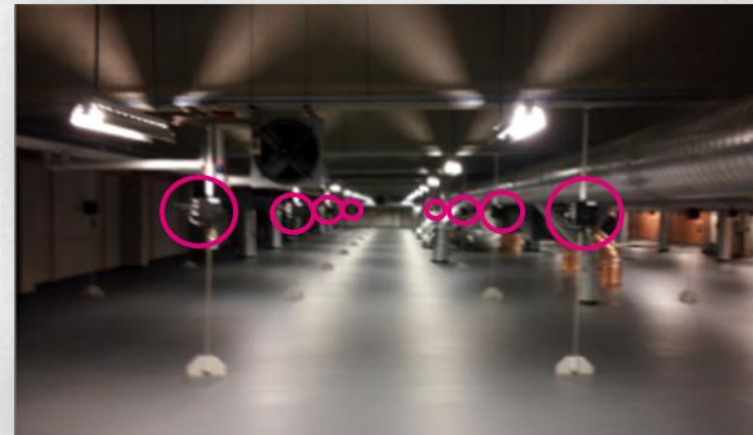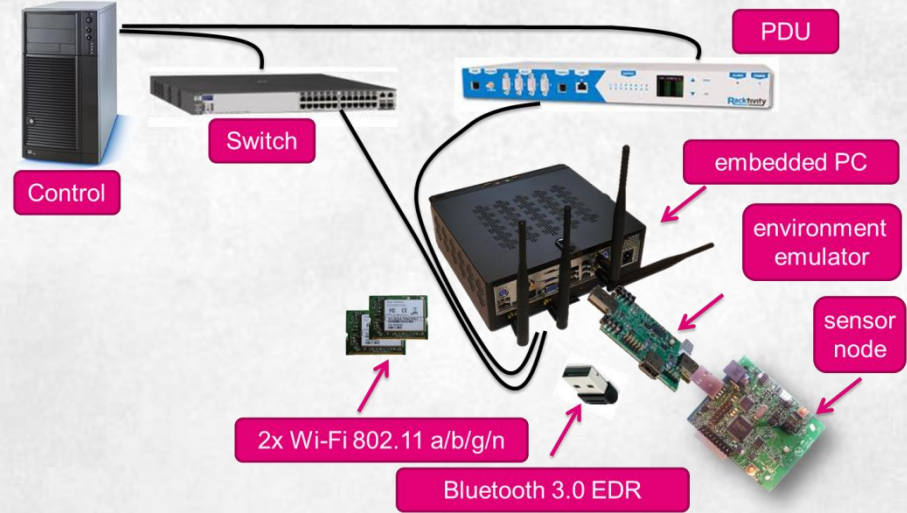Rapid prototyping in state-of-the-art technical facilities, specialized measurement equipment

Analyze

Performance and scalability analysis

Supported by multidisciplinary technical and practical expertise

iLab.t technical facilities

Intent-based Computing using Edge Clouds

Pieter Simoens
Bart Dhoedt
(iMinds-IBCN-UGent)
Stefan Van Baelen
(iMinds)

A view on the future: Intent-based computing

deviceless cyber-physical interfaces

context
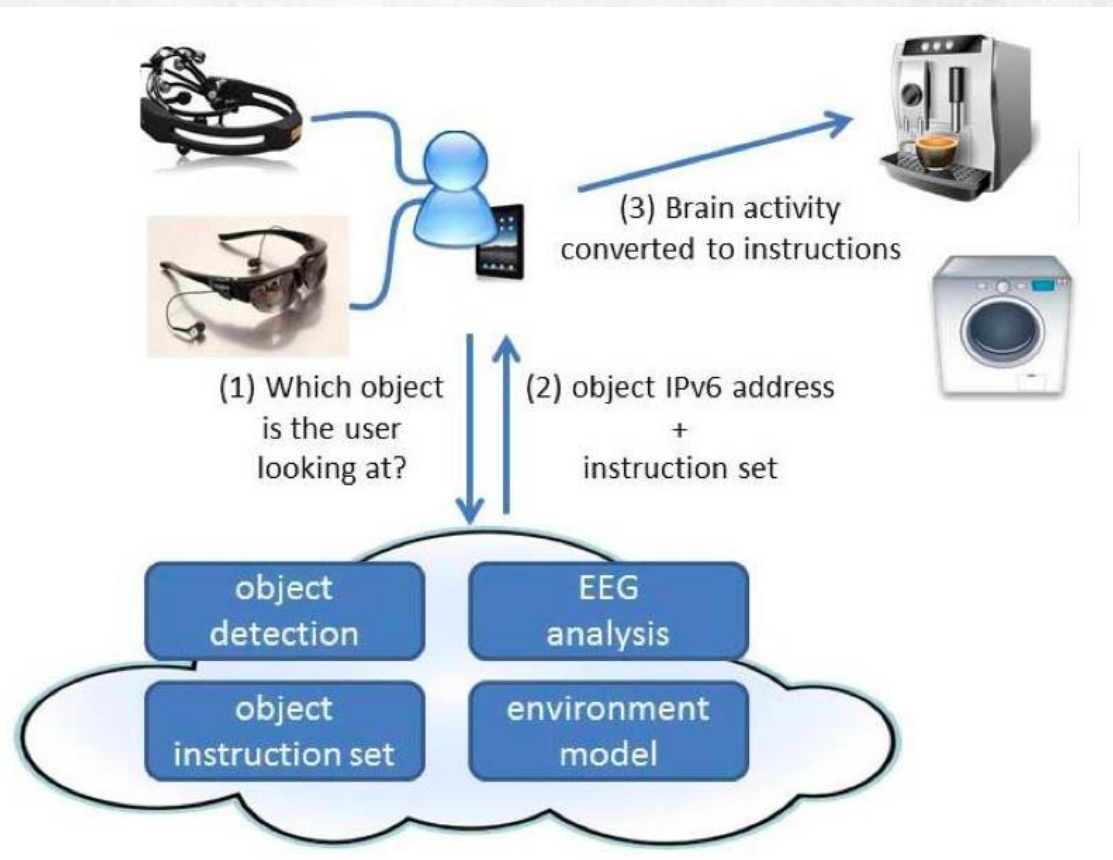
personalized blending of multimedia
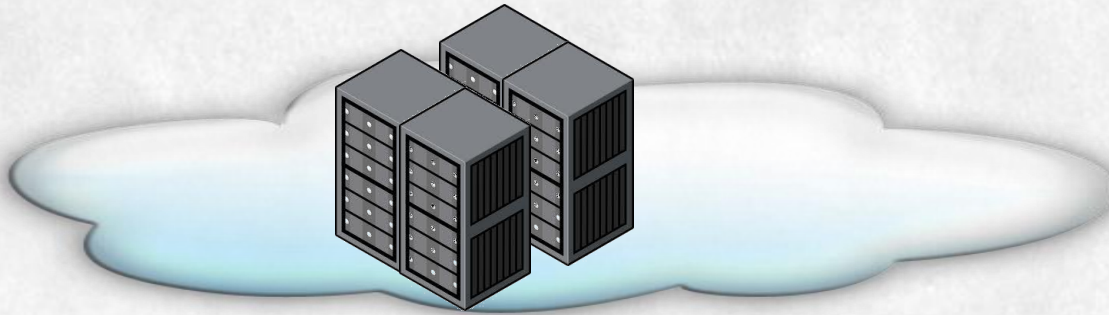
Intent-based computing

Mobile and wearable devices interacting with the cloud

4 TYPICAL STEPS IN INTENT-BASED COMPUTING

- derive intent from user viewpoint

- map to model of indoor environment

- dynamic instruction loading

- network routing

(3) Brain activity converted to instructions

(1) Which object is the user looking at?

(2) object IPv6 address + instruction set

object detection

EEG analysis

object instruction set

environment model

The architecture behind: Clouds, edge clouds and cloudlets

cloud

latency   bandwidth   localized data   personalization
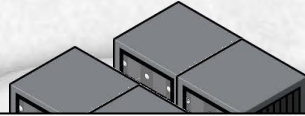
edge cloud

Intrinsic limitations

size   weight   battery

Cloudlets on wearable devices

iMinds

The architecture behind: Clouds, edge clouds and cloudlets

Key challenges:

- **Infrastructure management of edge cloud**
  - **Offloading computational tasks in WAN and LAN**
  - **Latency, energy consumption, processing**
  - **Facilitate peer-to-peer connections**
- **Intelligent data upload strategies**
- **Collaborative modeling of real world models**
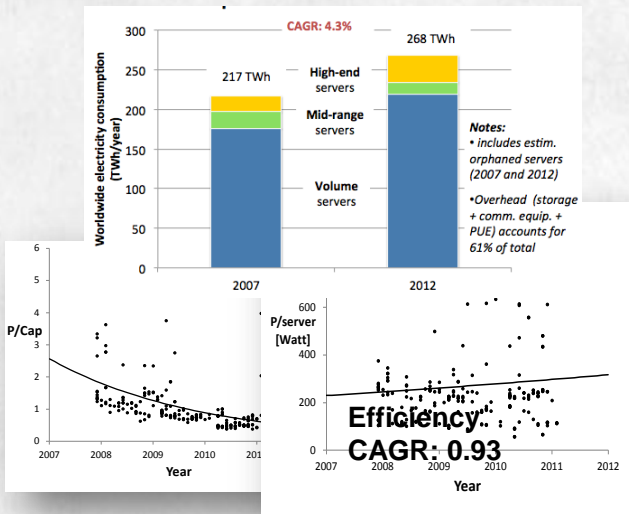- **Software distribution**

size   weight   battery

iMinds **Cloudlets on wearable devices**
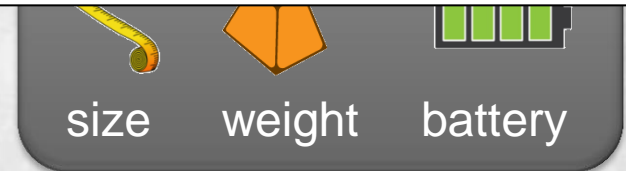
Energy-efficient and environment friendly internet

Wouter Haerick
Piet Demeester
(iMinds-IBCN-UGent)
 Stefan Van Baelen
(iMinds)

Context

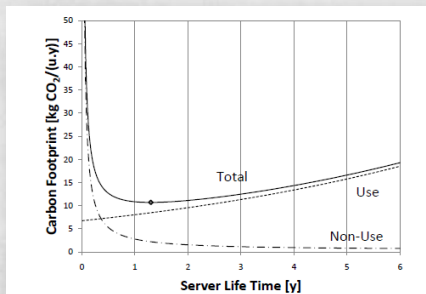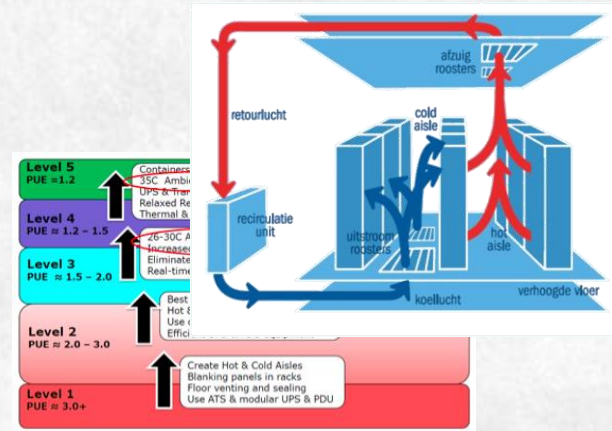**Increasing power consumption
Energy hotspot in cities**

**Green DC
Datacenters with
integrated EMS**

**PUE reduction techniques
→ Thermal maturity model**

Figure 7. Server Carbon Per User Footprint in function of Server Life Time
(Optimal Server Usage)

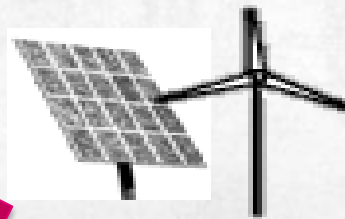**Server Lifetime & Carbon footprint**
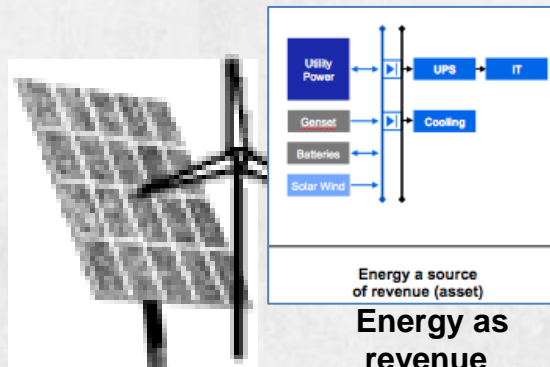
**Energy as
revenue**

City context:
Underexploited interaction
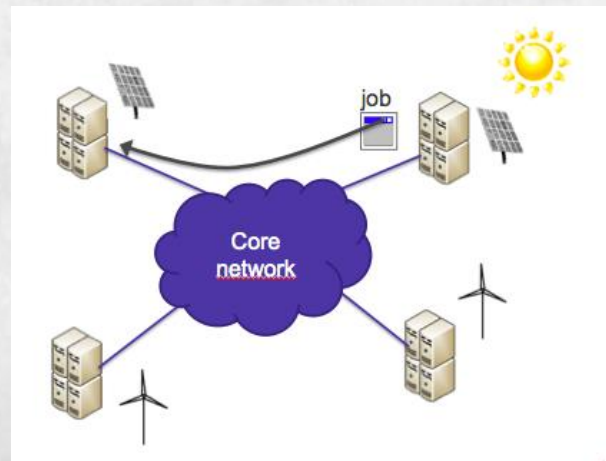to absorb green city energy

**Underexploited energy
tuning of ICT equipment**

Realizing an energy-efficient internet

CITY ENERGY CONSUMPTION AND GENERATION

Connect datacenters with cities energy consumers/produces

Spread load across datacenters to optimize usage of green energy

iMinds

iMinds Expertise

Modeling energy consumption
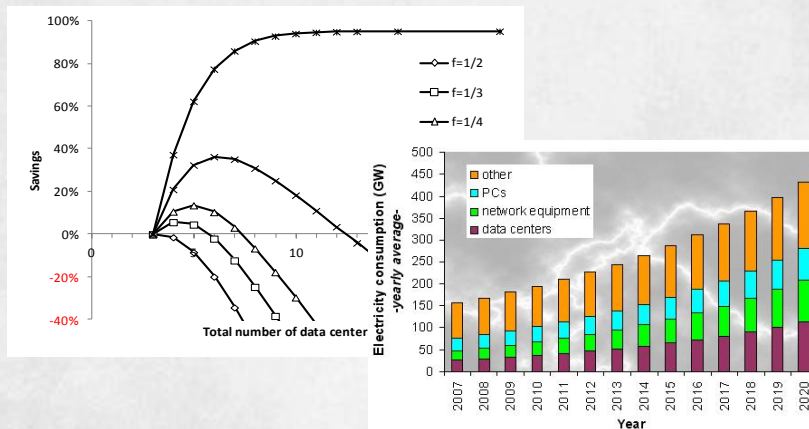of (global) ICT energy equiment

Modeling carbon footprint

Modeling, prototyping and evaluation
of carbon-driven load balancing

Design of energy-efficient
(optical) core and access networks

Software defined networking
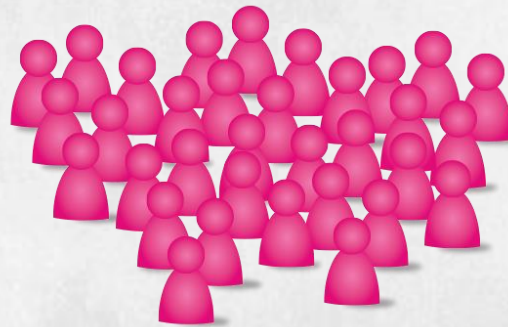
Experimental validation
(Testbeds, FIRE, OpenFlow)

Currently involved in >25 EU
pin the domain of Future Internet

Collaborations with main telecom &
equipment providers

iMinds

Regional ecosystem with local SMEs

Stefan Van Baelen
iMinds Research Coordinator
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Join us
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