Internet of Things and Smart Solutions Laboratory:

Research and Industrial Collaboration

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INTERNATIONAL CONFERENCE
INNOVATION: NOW IS THE FUTURE

Who am I

- Head of Mobile & Cloud Lab, Institute of Computer Science, University of Tartu, Estonia

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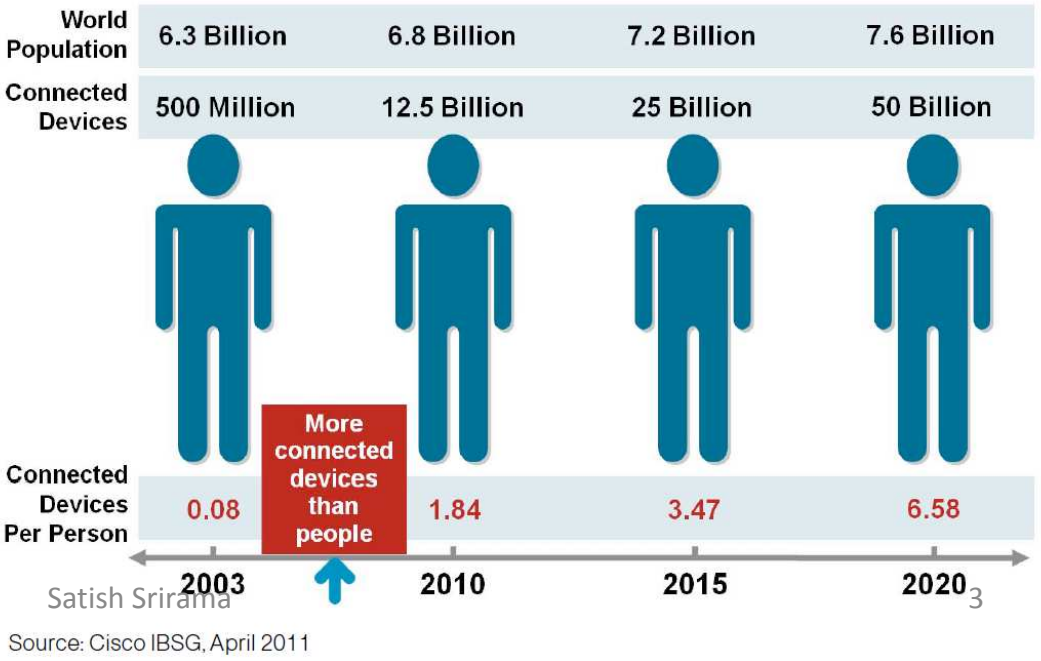
Internet of Things (IoT)

- IoT *allows people and things to be connected*
  - ***Anytime***, ***Anyplace***, *with* ***Anything*** *and* ***Anyone***, *ideally using* ***Any path/network*** *and* ***Any service***
    [European Research Cluster on IoT]
- More connected d
- Cisco believes the
  trillion by 2025



Source: Cisco IBSG, April 2011

IoT - Things

IoT - Scenarios

- Environment Protection
- Smart Home
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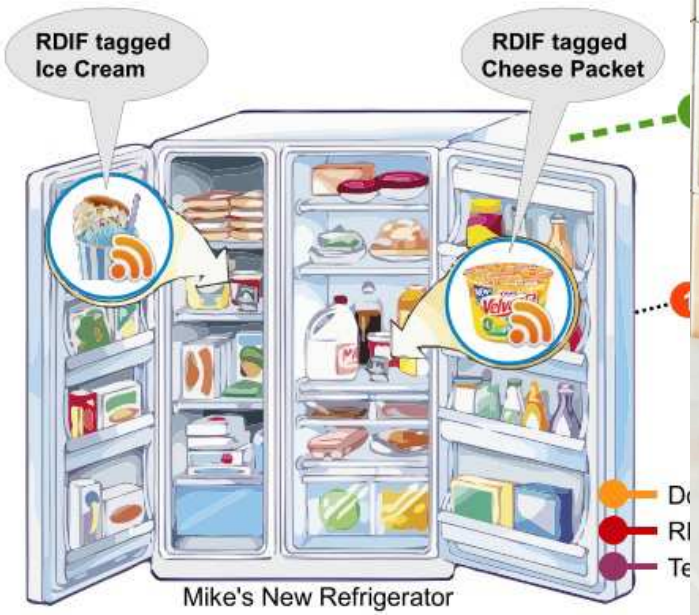


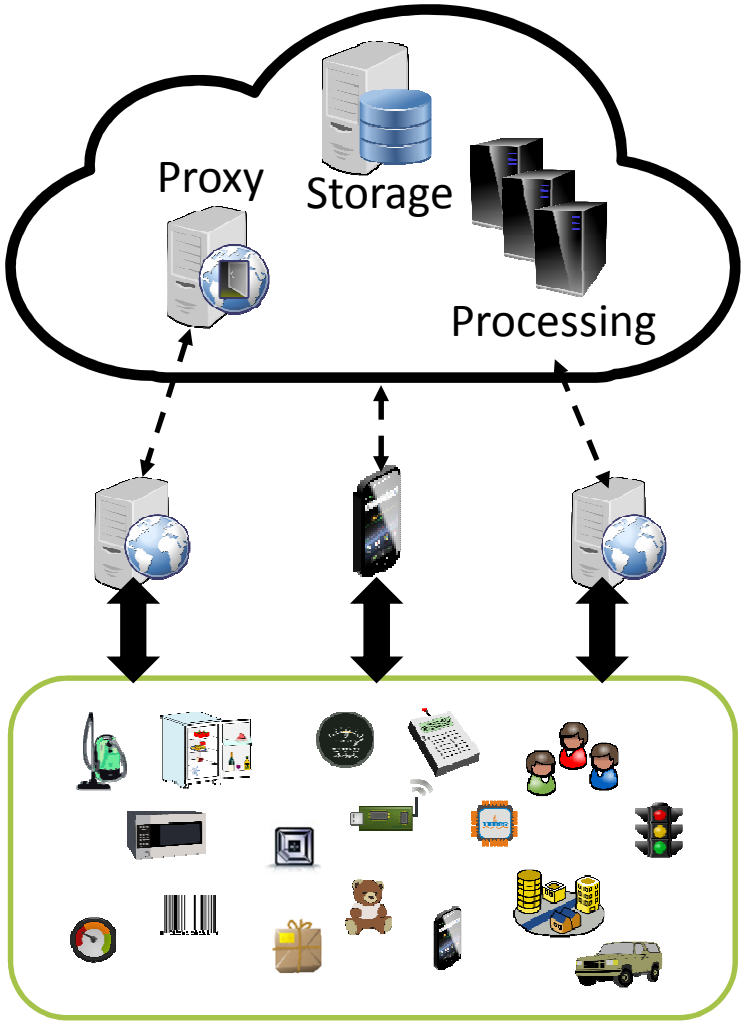
[Kip Compton]
[Perera et al, TETT 2014]

Cloud-based IoT

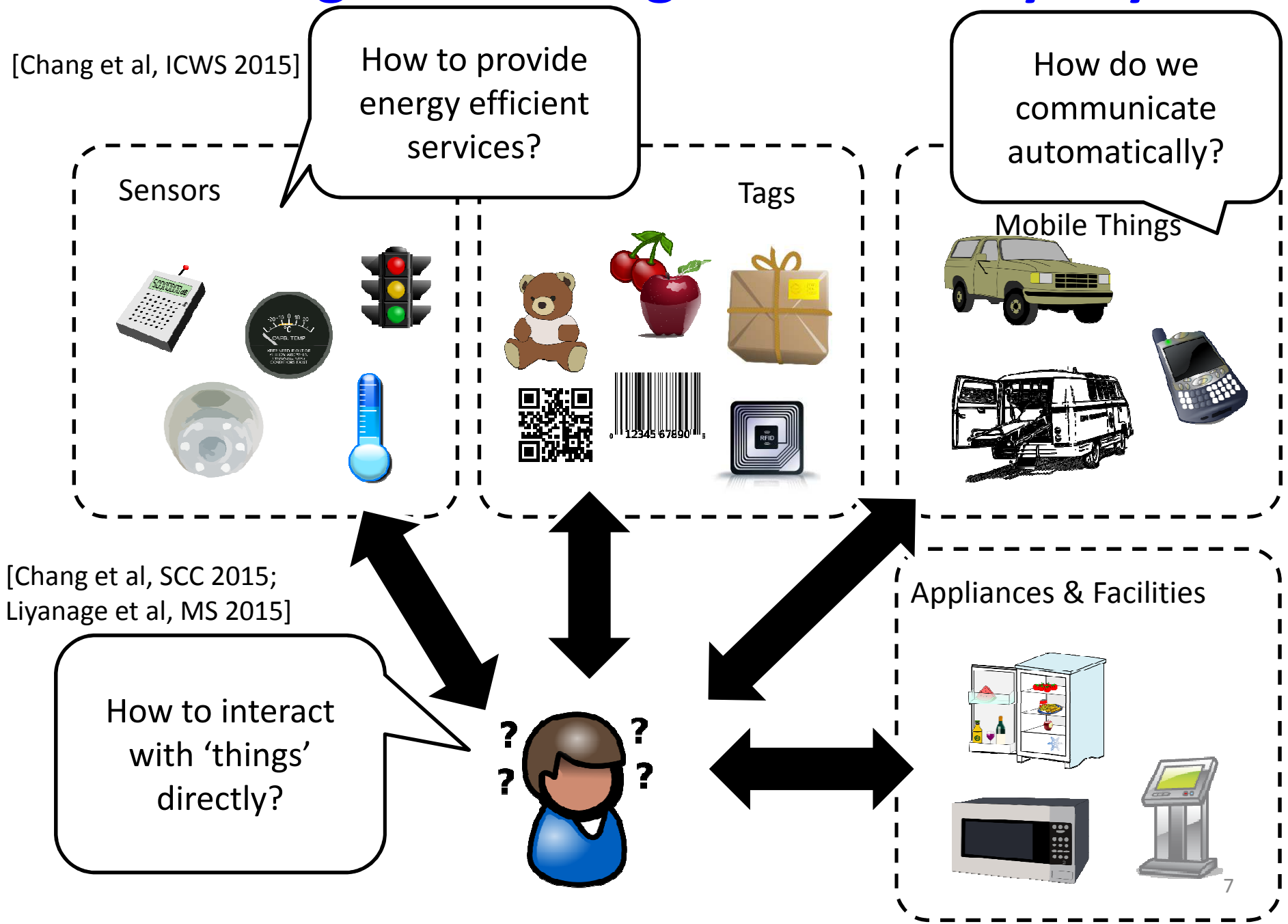
Remote Cloud-based processing

Connectivity nodes & Embedded processing

Sensing and smart devices



IoT Challenges – Sensing and Gateway Layers

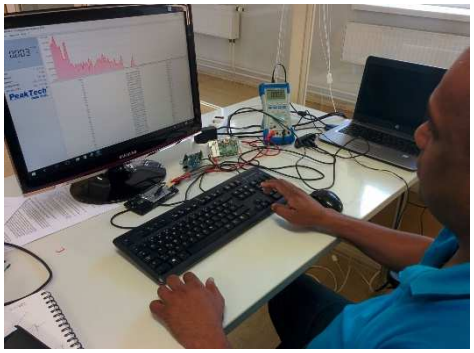


IoT Challenges – Cloud Layer

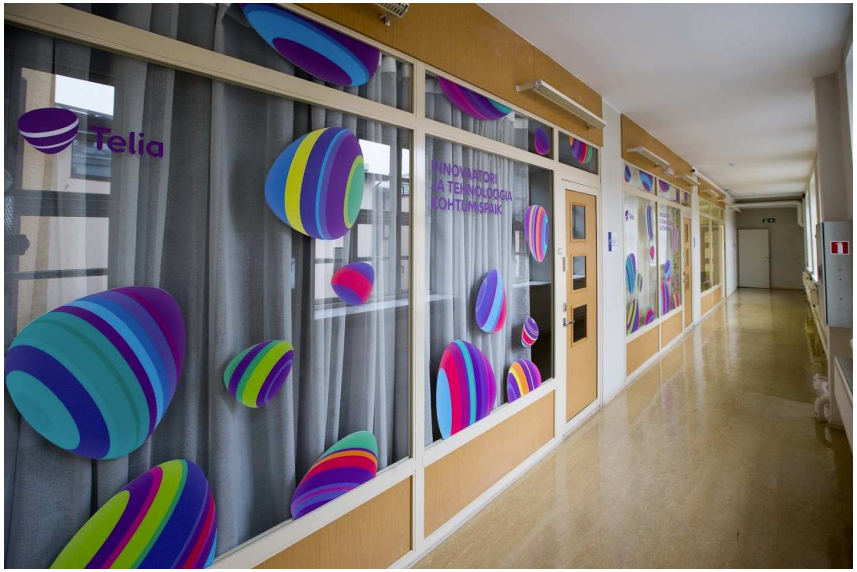
- Scalability is a huge challenge [Srirama and Ostovar, CloudCom 2014]
- IoT Data Processing on Cloud (Big data acquisition and analytics)
  - In Zetabytes (10^{21} bytes) by 2020 [TelecomEngine]
  - Mostly deals with streaming data
  - Has to be properly stored, analyzed and interpreted and presented
- Privacy and data security

Working in Silos

- We have been building prototypes for a while
  - Students have been active participants
- Needed a platform to test the relevant devices and technologies
- To try and test new scenarios



IoT and Smart Solutions Laboratory



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IoTSS Lab - Activities

- IoT research [Chang et al, PMC 2014; Flores and Srirama, JSS 2014; Zhou et al, TSC 2016; Mass et al, SCC 2016; Chang et al, ICSOC 2012]
  - Fog Computing, Mobile Cloud, Adaptive workflow mediation ...
- Design and develop IoT scenarios
  - Testing facility for EU Horizon 2020 Smart Cities & Communities Lighthouse project SmartEnCity
- We are also interested in sociological aspects
  - How easy it is to use the IoT solutions?
  - How people benefit from it?
  - Behavioral aspects

- Business models
  - How to encourage people in using these smart technologies?

Challenges Faced in Establishing

- Approached several companies
- Software Technology and Applications Competence Center
  - R&D in ICT for sustainable software industry
  - Have several companies as partners
    - Cybernetica, Skype, Nortal, browserbite, Plumbr etc.
- EU FP7/Horizon 2020 projects have always been a good platform to have industry and academic collaboration

Challenges of IoT Lab - continued...

- Established the smart home with YOGA Taking care
  - Yoga declared bankruptcy on 19th April 2016
- At university we prefer open source solutions
  - Also tend to focus at theoretical and fundamental research
  - Always trying to find a balance between industry partners' needs and our main research
- Currently we have the setup with OpenHAB
  - A vendor and technology agnostic open source automation software for smart homes

Opportunities the lab gave

- Ever since we established the lab several companies approached us
  - Proposing interesting scenarios
  - New collaboration opportunities
    - Not just Estonian but also several international
  - Need to explore further
- Collaboration with Telia also gave us access to customer base and new use cases
  - Telia organizes VUNK events http://vunk.eu/en
    - Accelerate your startup by getting Telia's market access

IT in e-Estonia

- Cornerstone of Government IT
  - e-ID card and X-Road infrastructure
- Banks – 98% of transactions over Internet
- Tax forms – 5 minutes online
- e-voting over Internet – first in the world
- National e-Health
- Very friendly start-up culture
  - Registering a company just takes ~90 min
  - University of Tartu also strongly encourages it

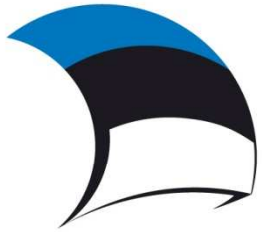
Some thoughts from this experience and points for discussion

- Technical Innovation has no borders
  - International cooperation helps the whole region to become forerunner in selected domains
- Introduced Estonia as agile, lean, technologically ready for innovations, market proof-of-concept country, etc.
  - Why not to extend it to Baltics
- Technology is Agile
  - So should be legislation if it wants to support growth
- "Innovation projects" should be out of regular legislations
  - Innovation means failing a lot
  - How to support and brand innovative services that are not ready for today's marketplace?

Some thoughts - continued

- Governments should support by any means all the educational, testing, trialing, etc. initiatives
  - Educational system, legislation, project grants, subsidies, innovation tenders, etc.

European Union
Regional Development Fund



Investing in your future

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Estonian Research Council

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THANK YOU FOR YOUR ATTENTION

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