Panel on
Telecommunications Challenges in Urban Networking
Moderator and Panelists

**Moderator**: Kevin Daimi, University of Detroit Mercy, USA

**Panelists**
Christian Jung, Fraunhofer IESE, Germany
Jerker Delsing, Lulea University of Technology, Sweden
Steffen Späthe, Friedrich Schiller University, Germany
Topics Covered

- IT Trend: Integration - from monolithic systems to smart ecosystems (Christian Jung)
- Context-Rich Systems (Christian Jung)
- Smart Rural Areas vs. Smart Cities (Christian Jung)
- The role of telecommunication in very large automation and autonomous systems (Jerker Delsing)
- (Steffen Späthe)
Questions that will be addressed

- How will different system classes be integrated?
- Data introduced by these systems is constantly increasing. How would this huge data be managed?
- How do context-rich systems adapt to the needs of user or business processes?
- How can we embed trust in very large automation and autonomous systems?
- Can very large automation and autonomous systems engineered or self-engineered?
ABOUT ME

- Fraunhofer IESE
  - Founded in 1996
  - Institutes for software & systems engineering
  - 200+ employees
  - Departments for all phases of software and system development

About Me

Christian Jung
Team Leader »Usage Control«
Department »Security Engineering«
Research Focus: Context-aware Security

Fraunhofer Gesellschaft
- 66 institutes and research units
- 24,000 employees
- €2 billion annual research budget
IT TREND: INTEGRATION
FROM MONOLITHIC SYSTEMS TO SMART ECOSYSTEMS

Security, Privacy, Trust
Big Data / Data Analytics
Software used across application domains

Industry 4.0, eEnergy, eHealth, Smart Farming, Finance & Insurance

Research and development challenges

- Diversity: Engineering methods, processes, technologies, tools, etc.
- Uncertainty: Unknown qualities, application context, service availability, etc.
- Guaranteed Qualities: Safety, trust, security, user experience
- Complexity: Integration, big data

Data is constantly increasing
Context-awareness is one answer to increasing system complexity → Being alert and responsive to surroundings and adapt accordingly

Mobile devices (smartphones, wearables, etc.) are our daily companion → maybe more important than our wallet

- Capability to collect a lot of data: Location, movements, accelerator, device usages, etc.

What would be logically the next step?

- Improve context-awareness by other information sources such as house automation, vehicle data, work place information, social networks, etc.
Open Questions

- How to be compliant with privacy and data protection law?
- Who is the owner of data?
- Who can access data and for which purpose? How often? How long?

Access control has to be extended!

- What happens after data has been released?

Research field data usage control may be the answer

- But, how can data usage control be realized across systems?

- Standardization?
How to build very large complex automationssystem?
Heathrow terminal 5

5 million connected points!!
IoT Product Segments

Conveyor (Tier2) Components and Parts (Tier3)

- Drive Heads
- LTU & Winches
- Belt Structure
- Belting
- Pulleys
- Feeder Breakers
- Components (a.u. idlers, motors, etc.)

Suppliers of these Products are:

- Potential partners, and;
- Future Service Providers

One customer, KGHM, one component

- 120 km conveyers
- 720,000 idler bearings
What about London railway then?

X.XXX.XXX number of bearings

- Connected bearings will support
- Bearing condition monitoring
- Railway wagon condition monitoring
The automation challenge

- Annual growths more than 10% and over 500 billion connected devices are expected worldwide by 2025. - Cisco 2013

- Massive automation systems not possible with current technologies

- Not enough many engineers on the globe to do the job with current technology
ISA-95 systems in to the cloud?
Important questions for the future

- How to build trust?
  - Security
  - Safety
  - Personnel integrity

- How to engineer these super large system?

- Approaches?
Intelligent industrial processes
ProcessIT
The Embedded Internet System Vision

- Sensors on the Internet
  - Minimal size < 1 cm³
  - Power life time > 2 year
  - Wireless connection
  - TCP/IP and web-services
  - Ad-hoc communication
  - Ad-hoc system integration
  - Secure
  - Simple application
  - Roughed packaging
Great ideas grow better below zero!
What roles do security, energy, comfort, and healthcare play in smart home settings?

What are the main barriers to adopting smart home?

Do we need smart homes to realize 'Energiewende'?

In a mass market, who will be responsible to maintain smart home installations - residents or 3rd party service provider like telcos?
SMART HOME DOMAINS - security, energy, comfort, healthcare, ...

Security
- Monitoring
- Alerts
- Video, Audio

Healthcare / Ambient Assisted Living
- Monitoring of resident, resident’s behavior, and life signal
- Support self organized, self controlled living in individuals home place
- Enable remote supervision and emergency communication with relatives and health care service provider

Energy
- Integration of homes into the smart grid
- Automated control of home appliances in respect to current and future energy availability and costs
- Measurement off individual energy consumption of home devices
- Improve autarcy and/or usage of self product

Comfort
- Automation of common tasks
- Based on resident’s behavior
- Adapt classic power connections with ICT support, e.g. Light on house stairs

Other Domains
Multimedia, gardening,

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What roles do security, energy, comfort, and healthcare play in smart home settings?

- Energy, comfort, healthcare, security - the key domains in smart home discussion

- But different domain have different requirements to
  - Reliability
  - Flexibility
  - Bandwidth
  - Privacy/Data security

- Smart home installations are not motivatable/justifiable/un-arguable with only one domain in mind
What are the main barriers to adopting smart home (end user perspective)?

- No killer application
- No real pain or psychological strain
- It is too expensive
- Much too complex
- No interoperability between domains, vendors, device series
  - Too much standards ;)

- To do „it right“, you need many specialists
  - Electrician, HVAC security service, installation service, OEMs of home appliances, content provider, ICT experts, ...
  - There is not „plug-and-play“ and not „smart home guide“

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Energiewende – The german way to transform power supply from conventional to renewable energy sources

- Establish communication between Smart Home and Smart Grid
- Enable „demand side management“/ „demand side response“
- Enable dynamic energy pricing (topic in law and regulation)
- Improve production and consumption forecast
- Adjust consumption to production forecast
  - By any idea of a dynamic market
  - E.g. „Energy Flat Rates“ (within a certain power profile)

- In my eyes, THE main topic in bringing Smart Home to mass market.
- Still missing some economic electrical power storage systems

DO WE NEED SMART HOMES TO REALIZE ‘ENERGIEWENDE’?
Why 3rd party service providers?
• Administrative complexity
• Security (update, patches, etc.)
• „Infrastructur as a service“

Which player?
▶ Network providers (TelCo)
  ▶ e.g. Deutsche Telekom
▶ Content providers
  ▶ Google, Apple
▶ Device Manufacturers
  ▶ Samsung
▶ Power Supplier
  ▶ e.g. RWE

In a mass market, who will be responsible to maintain smart home installations - residents or 3rd party service provider?