Web of Things Use Cases and Solutions at FZI

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# Semantic Web vs Web of Things

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<thead>
<tr>
<th>Semantic Web / Web 3.0</th>
<th>Web of Things</th>
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<td>Subsymbolic data</td>
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<td>Dynamic domains</td>
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<td>Linked Data</td>
<td>Devices first-class things</td>
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<td>Light-weight web servers</td>
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<td>Cyber-physical systems</td>
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Outline

- FZI
- Web of Things Use Cases
- Possible Contributions
FZI Forschungszentrum Informatik

- Improving the knowledge exchange between academia and industry (~135 scientists)
- Information Process Engineering division (~35 scientists)
- Strong interlinks with Web technologies
  - Knowledge Management (OWL)
  - Complex Event Processing (WebSocket, SSN)
  - Semantic Data Management (Linked Data)
Outline

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- Web of Things Use Cases
  - Ambient Assisted Living
  - Digital Enterprise
- Possible Contributions
Ambient Assisted Living Use Case

- **Goal**
  - Increasing comfort and security for elderly and sensing/acting handicapped people
  - Usage of intelligent sensors for the identification of relevant situations
  - Care- and case-management tools for better therapy

- **Challenges**
  - Integration of systems and services from different parties and platforms
  - Maintenance, robustness and extensibility
  - Privacy
Ambient Assisted Living Use Case (2)

- Project: AICASys (related projects: universAAL, Ahead, Augment)
- What stakeholders?
  - Sensing or acting handicapped people, nursing staff, relatives, physicians…
- What things?
  - Hearing device with heart frequency sensor and microphone
  - Eye Tracking Glasses
  - Wheel chair
  - Smart phone
  - Medication reminder service
  - Smart home sensors (door, window, lamps)
  - PAUL home automation interface
- What benefits from linking between things?
  - We can estimate, what action user wants to execute (e.g., turn on lamp)
  - We know the current context of the user and can decide how to best contact him (e.g., via phone)
  - We can estimate the background knowledge of the user and adapt the user interface
- What benefits from interactions between things?
  - The medication reminder service and the smart phone of the user could evaluate whether the user
    needs reminders
  - Privacy is improved since only necessary information is exchanged directly between things
  - Things could communicate their battery status
- What other solutions?
  - Information bus: Difficulty in configuring all systems
  - Centralised knowledge base/data warehouse: Privacy concerns
Example AAL Scenario

Mobile Devices

FZI/ATOS Medication Reminder Service

openAAL

AHEAD Devices

Administrator
Adds Max Mustermann
And Annegret Müller to openAAL

Login Messages as XML

Action Message as XML to appropriate User

Service Description JSON

has a

Object

has a

Resource

has a

Literal

Context Management

Medical Professional
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Digital Enterprise Use Case

**Goal**
- Transition from sensing enterprises to proactive enterprises
- Go from search, sensing, anticipating, to proacting.
- Knowing "what might happen" and doing "what should be the best action"

**Challenges**
- Identify current situation / process and system behaviour and deviations from ideal
- Scalable, distributed architecture for management and processing of IoT big data
- Extensibility (new sensors, KPIs, contextual information)
Digital Enterprise Use Case (2)

- Project: ProaSense
- What stakeholders?
  - Decision Makers, Business Analysts, Workers and Developers
- What things?
  - Workers (do initial work in production process)
  - Transport or production machines/roboters
  - Products
  - Materials (60 different raw plastic materials)
  - Production/Equipment/Staff training plan
- What benefits from linking between things?
  - Understanding relationship between behaviour of things and KPIs
downtime and scrap rate
  - Holistic assessment of product quality
- What benefits from interactions between things?
  - (currently, centralised)
- What other solutions?
  - Tipco
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Possible Contributions

- Describing things
  - **Semantic MediaWiki** for human in the loop

- Linking things
  - **openAAL** centralised system for registering, discovering, connecting devices
  - **Linked APIs** for automatic composition of services
  - **OLAP4LD** for automatic numeric dataset integration with QB vocabulary

- Interaction between things
  - **Linked-Data-Fu / ETALIS** rule-based language and system for event processing
  - **Semantic Event Processing Pipelines** modelling language for big data applications based on KAFKA, STORM
Conclusions

- Interested in following goals of WoT
  - Interoperability
  - Flexibility (adding new types of sensors, replacing sensors…)
  - Privacy
- Interested in following technologies
  - Stream data protocols
  - Rule engines
  - Service description languages
Thanks!

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