

# The Internet of Things in an Enterprise Context



SYSTEMATIC THOUGHT LEADERSHIP FOR INNOVATIVE BUSINESS

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## The Future Internet: Towards a Web-based Service Economy



NETWORK PARTICIPANTS

**GOVERNMENT**  
eGovernment, eEnergy, eHealth, Security

**BUSINESS/SCIENCE**  
Cluster / SME  
New Services & Business Models

**CITIZEN/CONSUMER/EMPLOYEE**  
"Digital Lifestyle", New Media, Communities

OPEN PLATFORM FOR NETWORKS

**SECURE BROADBAND INFRASTRUCTURE**

**INTERNET of SERVICES**

**SERVICE-/USER-FRIENDLY IT**

NETWORK ENABLER AND FOUNDATION

**MULTIMEDIA CONTENT**

**INTERNET of THINGS**

**SERVICE-ORIENTED SOFTWARE APPLICATIONS**

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## The Internet of Things is ...

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'A world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business processes.

Services are available to interact with these 'smart objects' over the Internet, query their state and any information associated with them, taking into account security and privacy issues.'



The Internet of Things is a description of a not-too-distant future time, where everyday objects, rooms and machines have sensors and can "communicate" about themselves and with each other.

As futuristic as this vision may be, it is being taken very seriously in academia and business.  
- Prof. Elgar Fleisch

RFID, Sensor Networks etc. are just enabling technologies!

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## The Value Proposition of the Internet of Things

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### High Resolution Management



New dimension of insight

- High frequency of data collection
- High density of data points
- Near real-time data
- Low cost of data collection

### Next Generation Business Applications



Taking eSOA to the next level

- Smart Items offer their capabilities as services
- Business logic and processing moves to the "physical edges"
- Things become active participants in business processes

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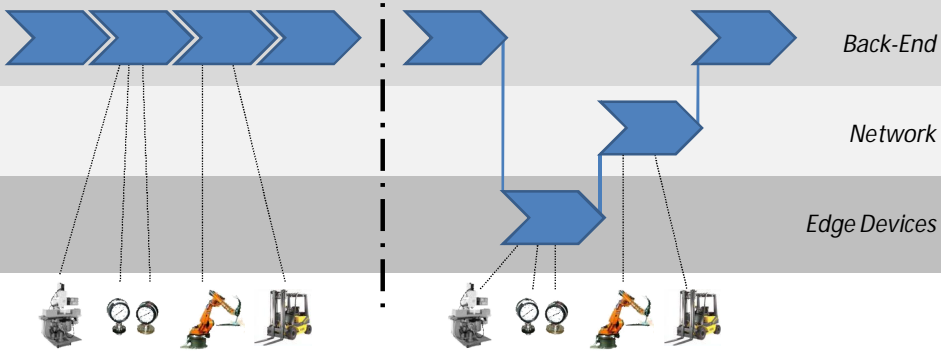


## Traditional vs. Decomposed Business Process Execution

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### Traditional Business Processes

### Decomposed Business Processes



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## Application Area 1: Manufacturing

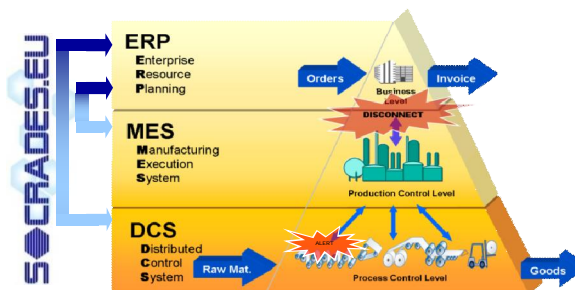
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### Two Trends

- Applying ubiquitous computing to the shop floor leading to *cooperating devices*
- *SOA implementations* on all levels to bridge the gap between DCS, MES and ERP

### Benefits

- Better visibility enables faster reaction
- Ease of integration
- Ease of reconfiguration
- Vendor independence



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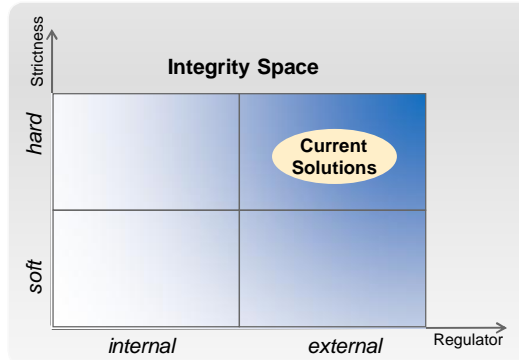


## Application Area 2: Supply Chain Integrity

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**Ensure full compliance of all participants and products in your supply chain to defined rules**

- Supply Chain Integrity is more than avoiding Counterfeits and Illicit / Grey Markets
- Tracking along Full Product Life-Cycle
  - Location
  - State
  - Events
- Different Types of Rules
  - Legal Requirements
  - Service-Level Agreements
  - Customer Demands



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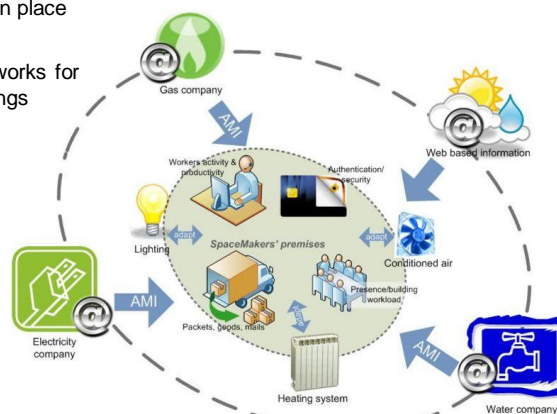


## Application Area 3: Energy

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**Moving Towards Future Service-based Energy Infrastructures**

- Advanced Metering Infrastructures (AMI)
  - Measure, collect and analyze energy usage
  - First regulations in the US in place
- Smart Grids
  - Interactive Distribution Networks for Energy Efficiency and Savings
  - Manage Fluctuations
- Energy Trading



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## Application Area 4: Health

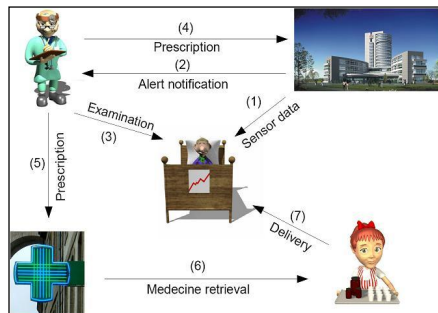
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### Process Optimizations

- Tracking of Equipment, Patients and Medication

### Better Care

- (Remote) Patient Monitoring
- Ambient Assisted Living



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## Application Area 5: Automotive

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### Car-to-X Communication Use Cases



#### Car-to-Infrastructure (C2I)

- Data exchange with road side beacons and traffic signs
- Access to backend services
- Forwarding of data between vehicles

#### Car-to-Car (C2C)

- Collision warning
- Crossing Assistance
- Local Danger Warning
- Real-time traffic jam warning

#### Back-end Services

- OEM:** Remote Diagnosis, Vehicle Relationship Management
- Insurance:** Intelligent Pricing (Pay-as-you-Drive)
- Fleetmgmt.:** Intelligent Coordination of logistics/ car rental
- Traffic Management:** Safety and Efficiency
- Business Applications**

Picture from <http://www.cvisproject.org>

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## Application Area 6: Insurance

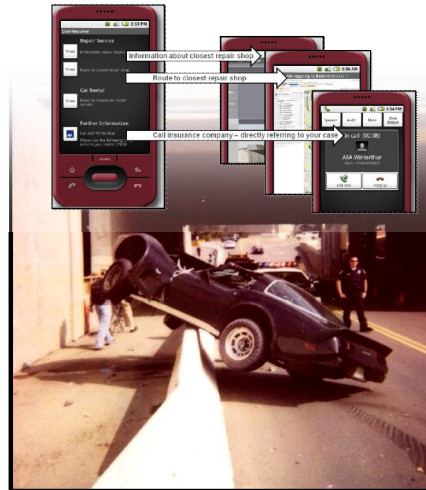
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### Direct Benefits

- Customer-specific insurance
- Better underwriting
- More efficient operations, e.g. claims management
- Loss prevention or minimization

### Improved Customer Interaction

- Immediate help in case of loss
- Additional service offerings



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## Major Technical Issues

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Addressing	Discovery Services    ONS    EPC    IPv6 Physical vs. Logical Addressing    ucode
Heterogeneity	RFID    Actuators    Devices    Protocols Wireless Sensor Networks    Embedded Systems
Services	Service Composition    Service Interfaces    Semantics Quality of Service    Quality of Actuation Quality of Information    Context Awareness
Scalability	Sensor Data    Edge Processing    Distributed Business Logic Streaming Data    Event-Driven Architectures Filtering    Aggregation

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## SENSEI Project

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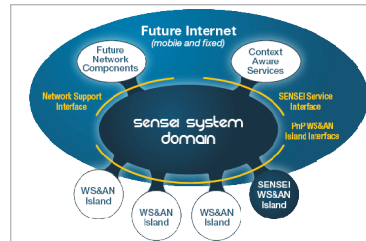
### Objectives

A highly *scalable architectural framework* enabling easy plug and play integration of a large number of globally distributed Wireless Sensor & Actuator Networks (WS&AN) into a global system.

*Open service interfaces* and corresponding semantic specification to unify the access to context information and actuation services.

*Efficient WS&AN island solutions* consisting of a set of cross-optimised and energy aware protocol stacks.

*Pan European test platform*, enabling large scale experimental evaluation of the SENSEI results



### Partners



integrating the physical with the digital world  
of the network of the future

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## Summary

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### Many Business Opportunities

- However, adoption is lagging, because of ...
  - Unsolved technical challenges
  - Lack of proven cases
  - Missing global standards

### Combined Efforts are Needed

- Industry and Academia
- Technology and Economics
- Europe, Asia and the Americas



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Thank you for your attention!

QUESTIONS - SUGGESTIONS - DISCUSSION



## Acknowledgements



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