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# Trends and Challenges in IT Security

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Claudia Eckert

Fraunhofer Institute for Secure Information Technology SIT  
Darmstadt, Germany

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# Outline

1. Internet of smart Things and Services  
Trends in IT
2. Internet of smart Things and Services  
New Security Problems
3. Selected Security Solutions and open Challenges
4. Take home Message



From **Human-Centric** to **Human-Supportive Computing**  
New Paradigms: **Internet of Things and Services**

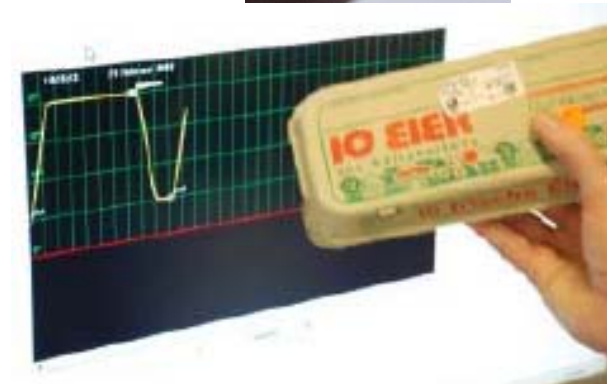
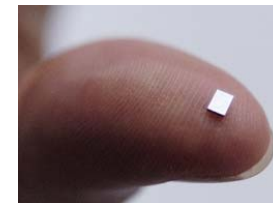
“7 trillion wireless devices serving 7 billion people by 2017”

*Wireless World Research Forum, 2008*

## Vision: Internet of Things Smart Items: beyond RFID

### Characteristics:

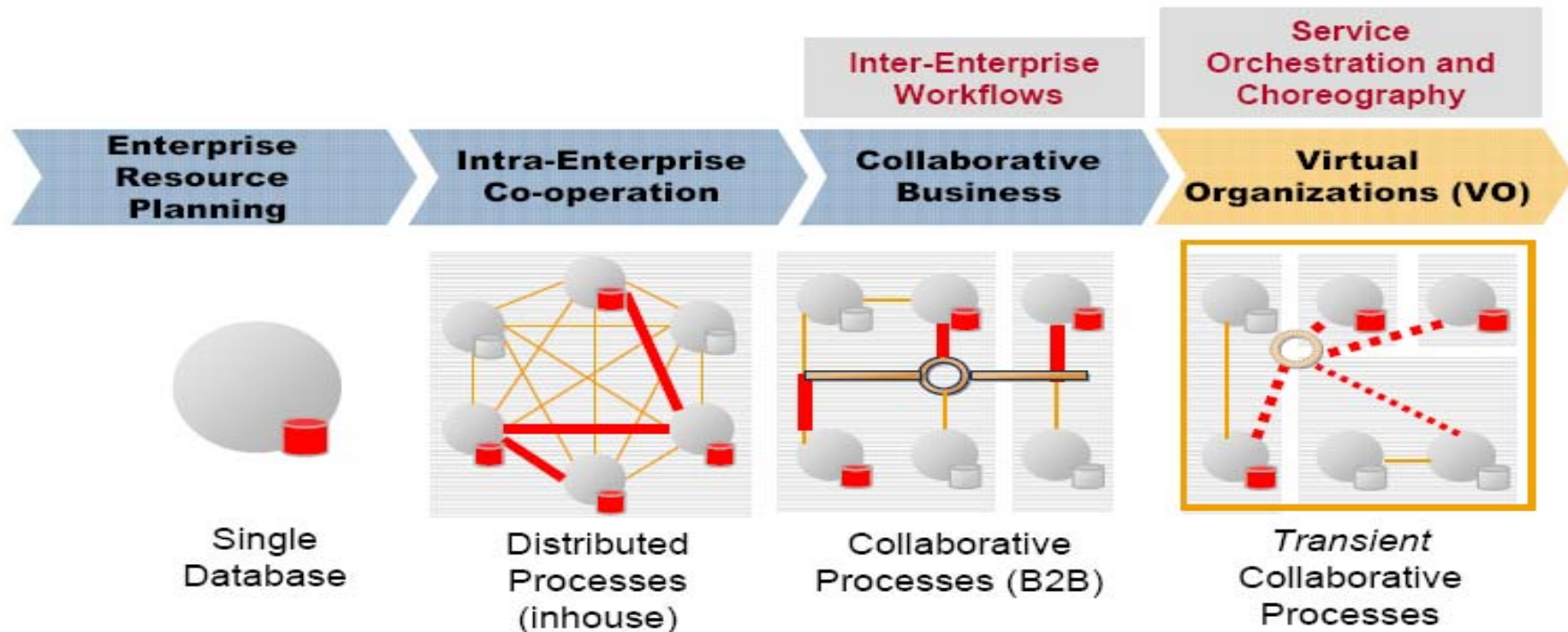
- **Sensors** embedded in Products
- Smart Product with **Product Memory**
- Product monitors its own **State**
- **Communicates** wire-less, ad-hoc
- is **Context-aware**, adaptable



## Vision: Internet of Services

### Service Market Place: beyond Application Silos

- **Service Paradigm:** re-usable, adaptable, cross-domain
- **New Business Models:** Software as a Service, ...





## Innovative Applications: e.g.

### (1) Smart Factory: Future of industrial automation

- Network of Smart Components
- Smart Services: e.g.
  - Energy-aware Production
  - On-the Fly Fault Detection



- Improved Manufacturing
- Maintenance, Compliance

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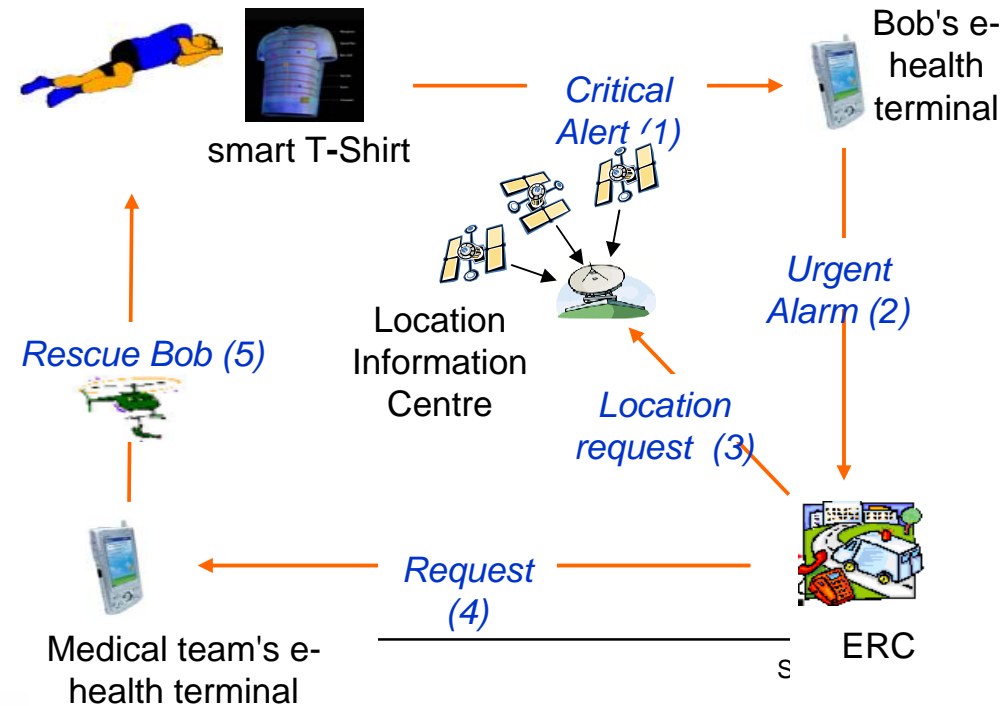
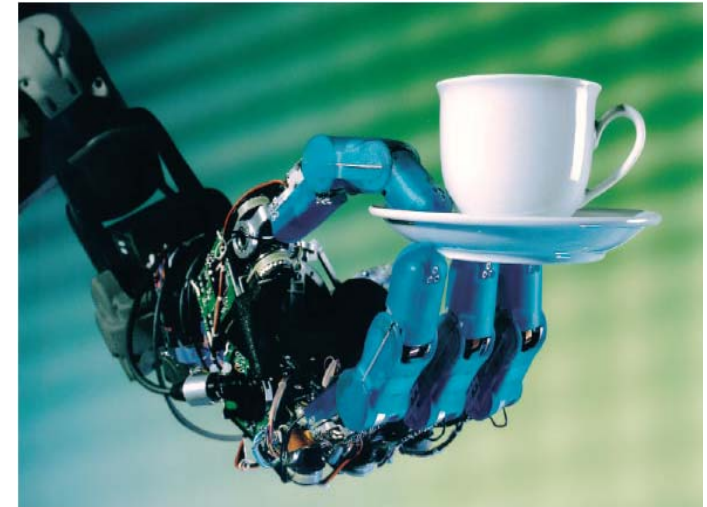
## (2) Smart Assisted Living

### Smart Service-Robots:

- Assistance for restricted persons

### Home Care

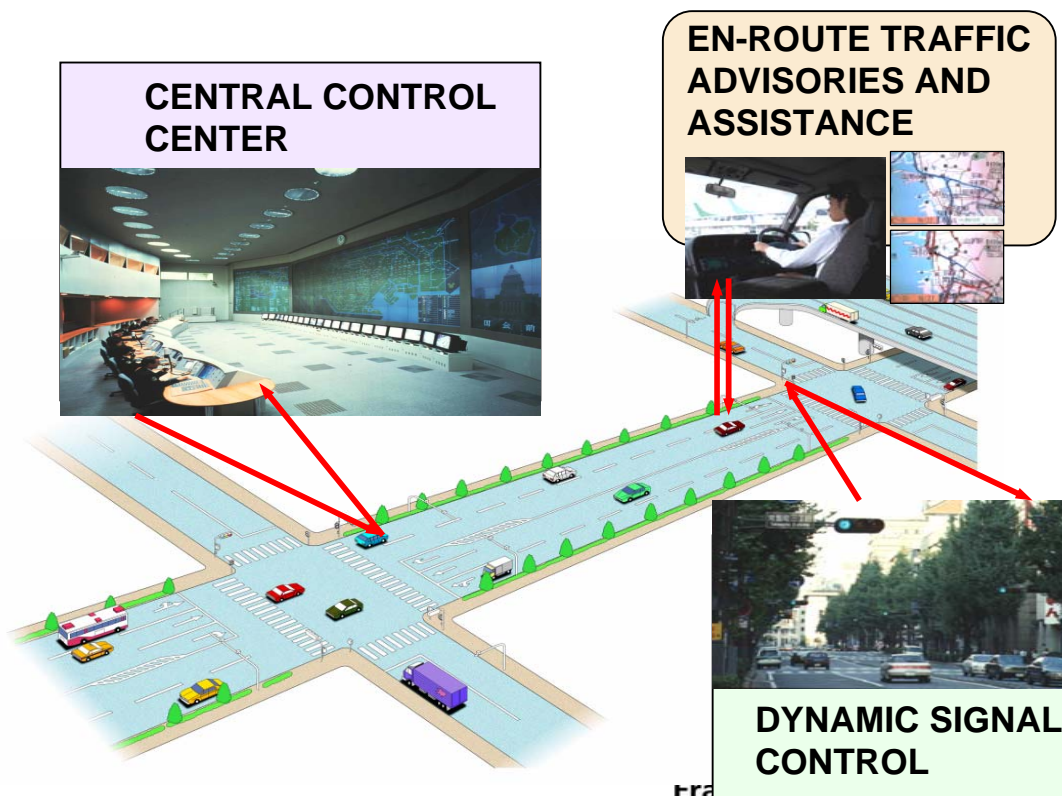
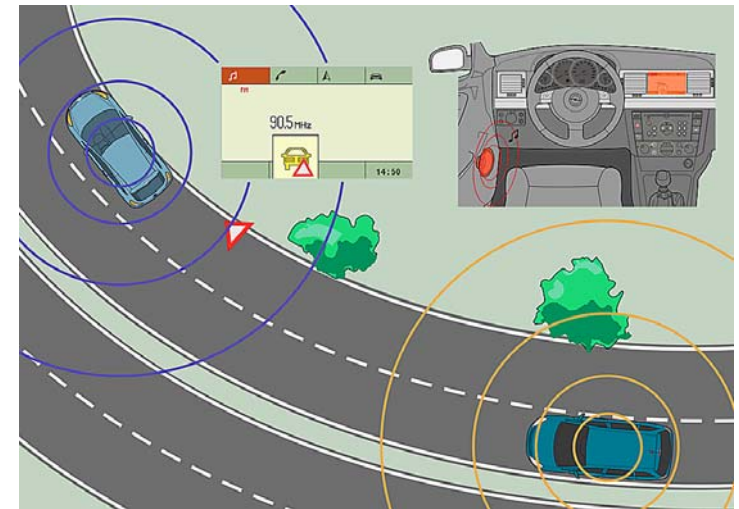
- Monitoring of Health Data



- Improved Health Care
- Life-saving, Cost-saving, ...

## (3) Smart Mobility

- Vehicles as **Part** of IC-Infrastructure
  - Seamless Mobility
- **Car-to-Car** Communication
  - Road Barrier Ahead



- **Car-to-Infrastructure**
    - Traffic Management
  - **Car-to-Driver**
    - Assistance, Advices
- ➔ Improved Mobility
- Safe, Comfortable, ...



## **Message so far:** ICT is an **Enabling Technology**

- **Improved Processes:**

Compliance, Flexibility, Cost Reduction

- **Improved Mobility:**

Driving Assistants, Traffic Management

- **Improved Health Care:**

Assisted Living

- **Improved Energy Management:**

CO<sub>2</sub> Reduction, Environment Protection

**Tight Coupling** between Business IT and IT-based Processes

**Consequences:** **New Security Problems, Increased Impact**

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### (1) Security Breaches in Smart Industrial Automation

Manipulated **Smart Objects**:

- Virus Distribution  
(e.g. via Robot) into Backend
- Force System to misbehave

Manipulated **Infrastructure**

- Industrial Espionage
- Malware Distribution via Smart Objects
- Compliance Breaches, Liability Problems

**Impact:** Increased Damages, Cascading Effects



### (2) Security Breaches in Health Applications

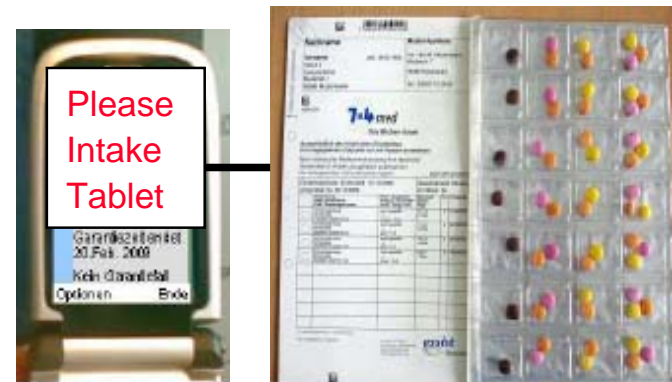
#### Manipulated **Service Robot**

- Unauthorized Surveillance.  
Privacy issues
- Insert faked Remote Commands



#### Manipulated **Home Care** Equipment

- Leak & modify Health Data
- Induce false Treatments
- Impede timely Reactions



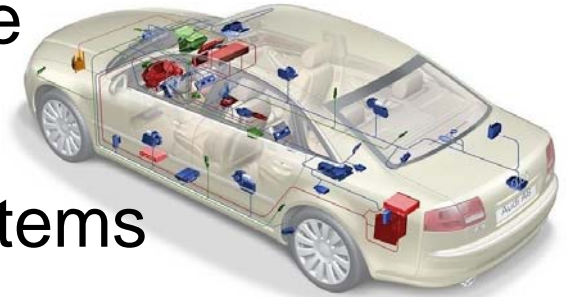
**Impact:** Severe Health Injuries, Privacy Threats



### (3) Security Breaches in Smart Mobility

#### Manipulated **in-Vehicular** System Infrastructure

- Owner as a deliberate Attacker
- Compromised internal Safety Critical Systems



#### Manipulated **Infrastructure, Services**

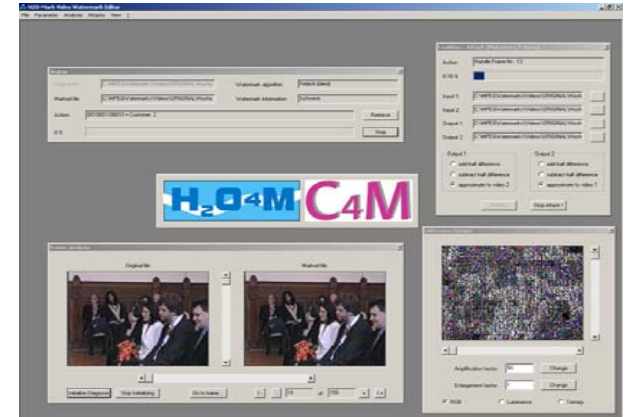
- Virus Distribution via Telematic System
- Leakage of Movement Profiles
- Compromised eSafety Applications



**Impact:** Severe Safety Threats, Cascading Attacks, Liability

### Security Challenges

- **Artefact Security**
  - Protecting Intellectual Properties
  - Provide Anti-Piracy Technology
- **Information Assurance**
  - Risk Mitigation Technologies
  - Information Leakage Prevention
- **Ambient Security:**
  - Sensor Data collection & protection
  - Seamless Security
  - Privacy-Enhancing Technologies



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### 3. Selected Ssecurity Solutions

#### (1) Artefact Security

- IP Protection: **SIT Watermark Technology**,  
e.g. Image Watermark for integrity protection

Darmstadt, den 11.11.2005

TESTAMENT

In dem vorliegenden Testament verfüge ich, Fritz Mustermann, was mit meinem Eigentum im Fall meines Ablebens geschehen soll. Diese Entscheidungen habe ich nach reiflicher Überlegung getroffen. Ich lege daher die folgenden Verfügungen fest: Markus Mustermann soll mein Haus und das Grundstück in Darmstadt im Komponistenviertel in der Beethovenstrasse bekommen.

Weiterhin erhält er € 500,  
Leo € 50000.

Mein Auto, ein schon in die Jahre gekommenes Mercedes, soll Peter Schmidt bekommen, da er schon als kleiner Junge von Autos begeistert war. Meiner Nachbarin, Frau Josephine Müller, möchte ich das Service aus Meissener Porzellan schenken, das ihr so gut gefällt. Der Rest meines Vermögens geht an das Deutsche Rote Kreuz. Diese Organisation möchte ich unterstützen, da ich sicher bin, dass mein Geld so einem guten Zweck dient. Dies ist mein letzter Wille, verfaßt im Vollbesitz meiner geistigen Kräfte.

Fritz Mustermann


Original Version

Weiterhin erhält er € 500,  
Leo € 50000.

Manipulated Version

Weiterhin erhält er € 50000.

Weiterhin erhält er € 50000.  
Leo € 50000.



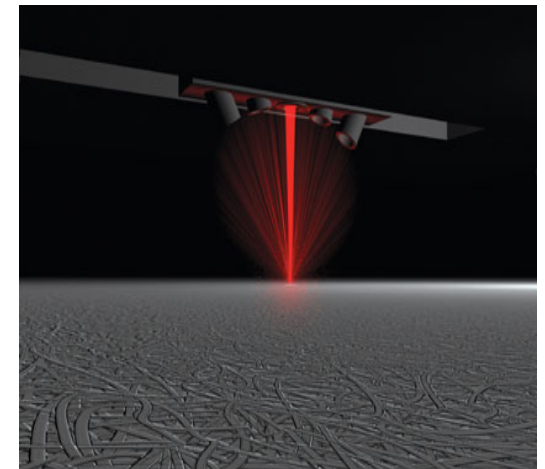
The colour **Blue** reveals **inserted** characters  
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## (1) Artefact Security

### Anti Piracy: LSA (Laser-Surface-Authentication)

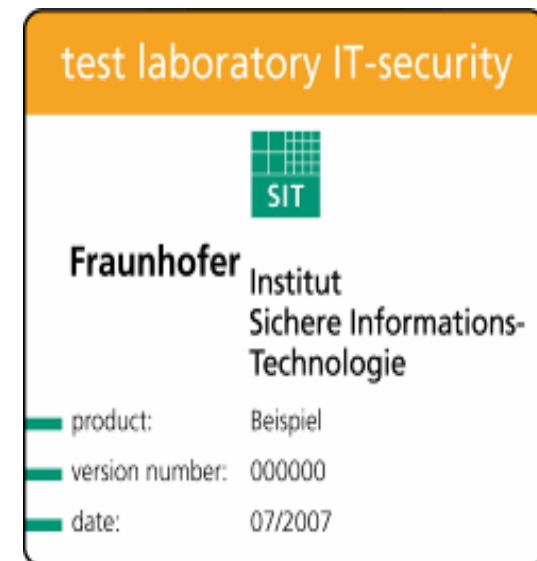
- Protecting high-value physical Objects
- Analysis of Microscopic Surface Structure
  - Fingerprint of Physical Object
- SIT Anti-Piracy System
  - Measurement
  - Identification and Analysis Services
  - Protection of the whole Supply Chain:
    - Production, Retailer, Customer, Warranty



## (2) Information Assurance

- **Risk Mitigation: SIT Security Test Lab**

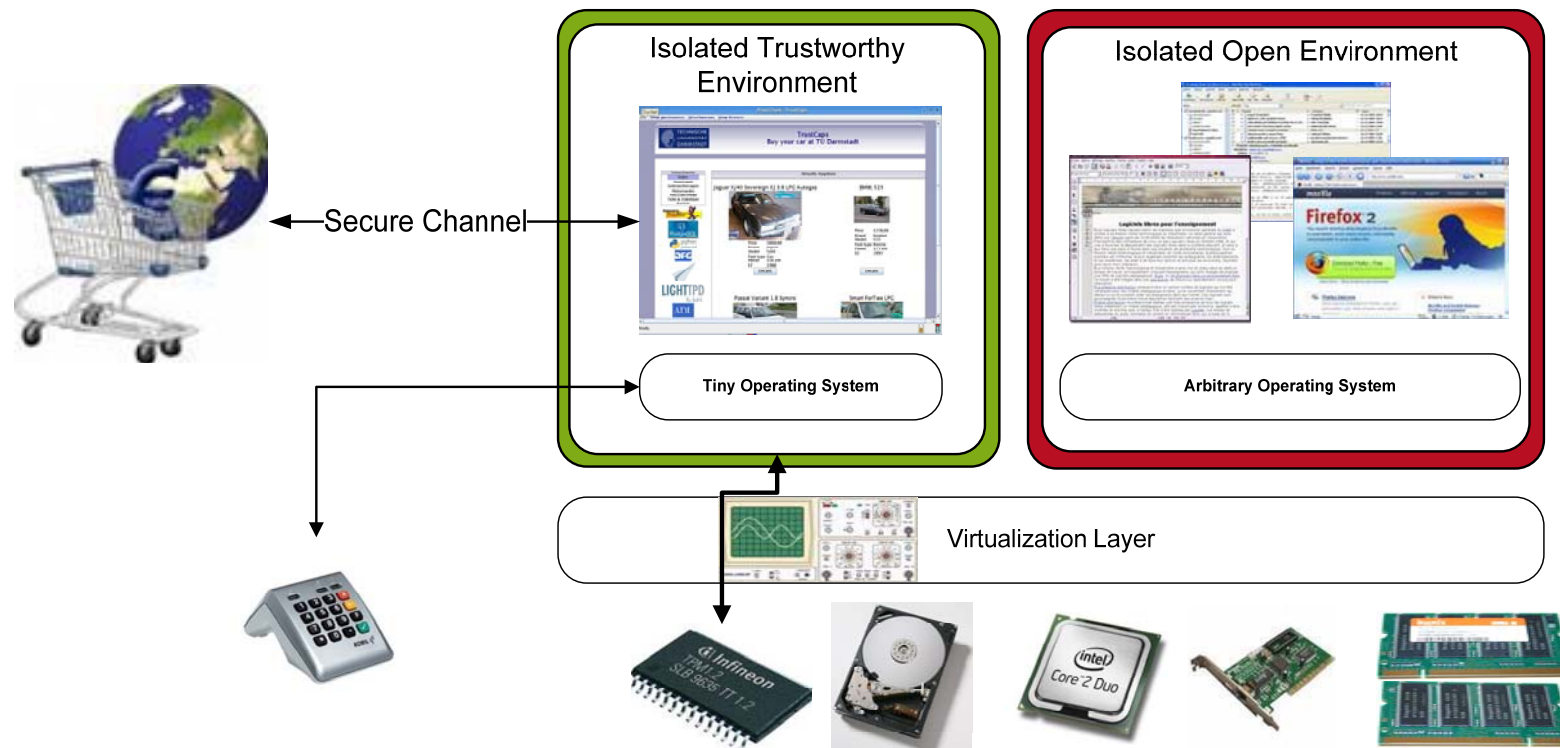
- Best-Practice Tests: Hacking, Code-Review, ...
- Tool-supported attack Simulation
- Security Testing Tools: Side-Channels, Web-Security, ...



## (2) Information Assurance

### • Information Leakage Prevention:

- **Trusted Client:** Trustworthy Browser, Trustworthy Transactions for Business, eHealth, Banking, Logistics etc.



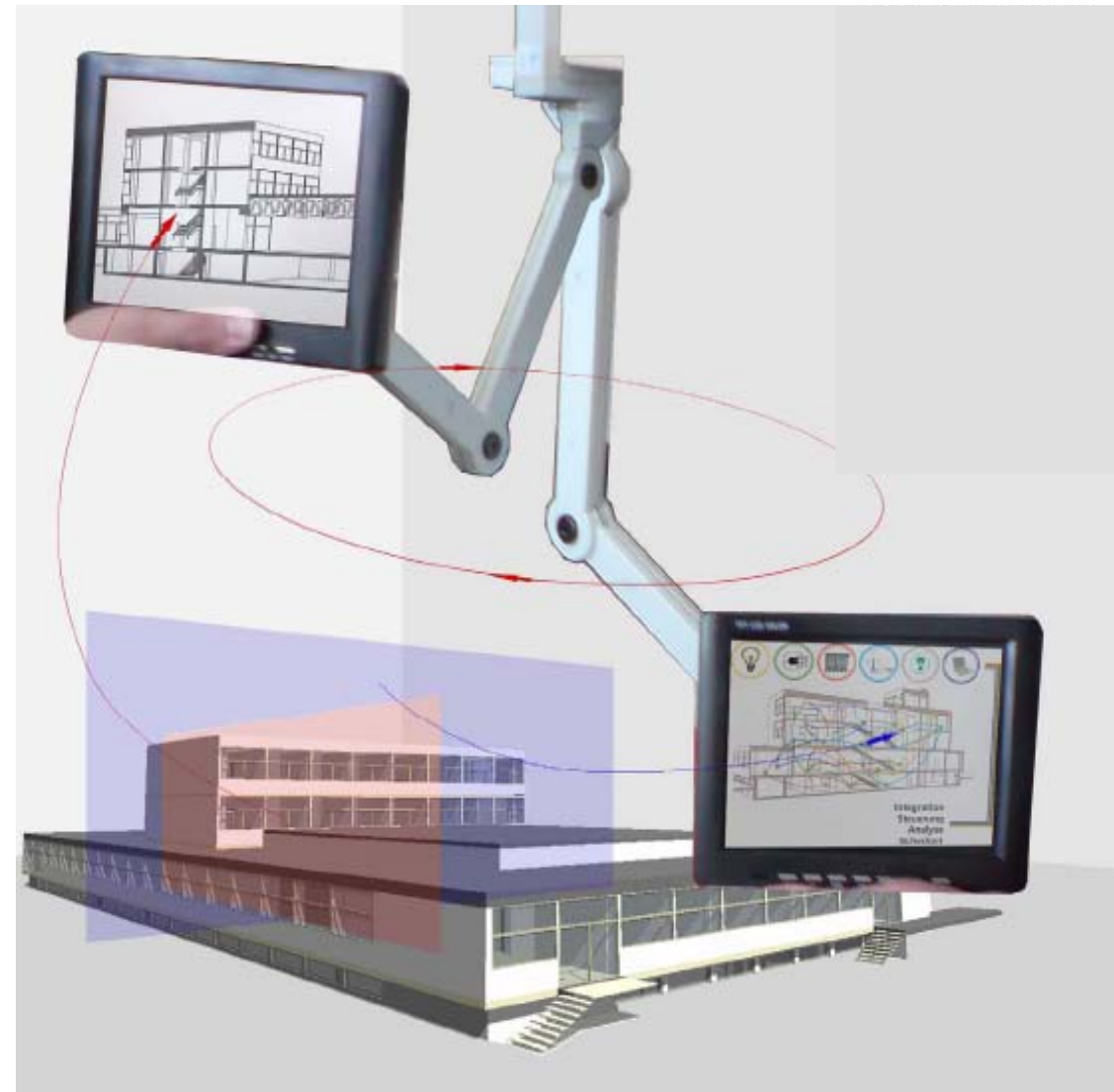
### (3) Ambient Security

- **Sensor Data Fusion:**

SIT **FacilityBoss System**

**Smart & Secure Facility  
Management Services**

- RFID-based Tracking,  
Tracing
- Access Controls:  
context, roles, time, ....
- Green Office
- Emergency Services





### (3) Ambient Security

- **SIT-Hydra Middleware**

#### Smart Management

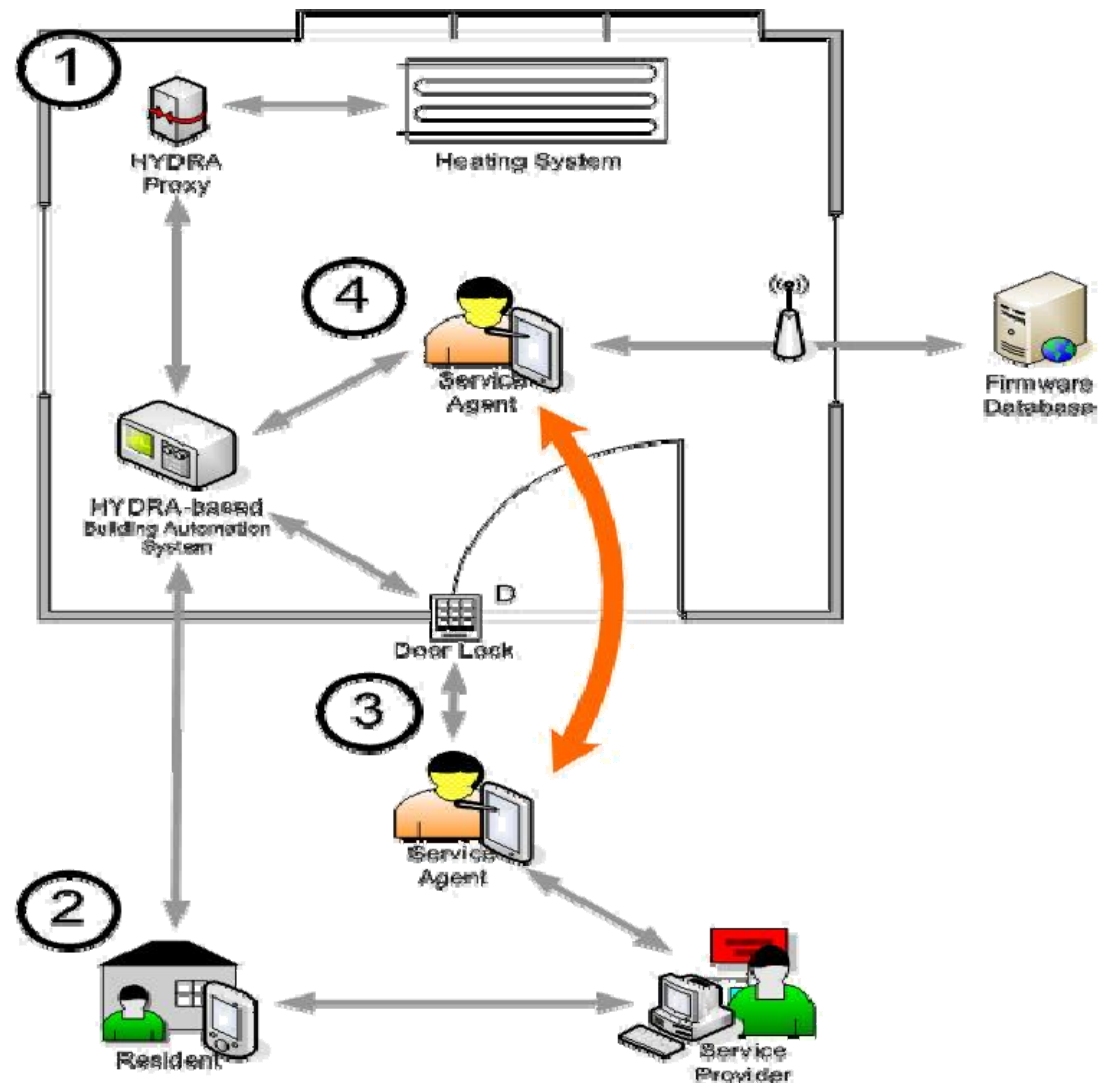
- Web-Service-based
- Situation-aware Security Policies
- Identity Management

#### Access controls,

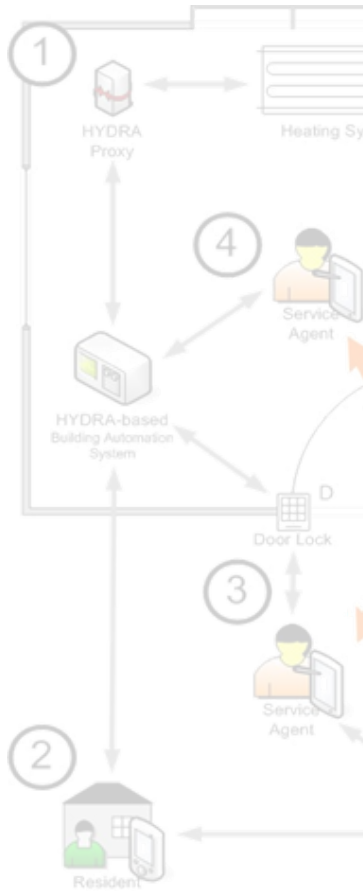
depending on

1. Authorization

2. Situation



## Situation-based Access Control



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## Some Open Challenges

- Privacy **Enhancing Technology**:
  - Look-up & Search Services on Encrypted Data
- Enhanced **Malware Detection**
  - Adaptation of Data Mining Techniques
- Enhanced **IT Forensics**
  - Searching Huge Log Files, Audit Evidences
- Enhanced **Embedded Security**
  - Security for Resource-restricted Items
- Enhanced **Component Identification**
  - Using Physical Unclonable Function (PUF)



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Security is the Enabler!
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### Take Home Message

#### Internet of the Future

- The Internet of smart Things and Services  
Enables Smart Applications
- **But:** Raises lots of new Security Issues
- New Security Challenges
  - Artefact Security,
  - Information Assurance,
  - Ambient Security
- Benefit from SIT innovative Security Technologies
  - Collaboration models: licensing, contract research, ...



# Contact

Fraunhofer Institute for Secure Information Technology SIT

Prof. Dr. Claudia Eckert

Rheinstraße 75  
64295 Darmstadt, Germany

Phone: +49-6151-869-358  
Telefax: +49-6151-869-224

mail: [eckert@sit.fraunhofer.de](mailto:eckert@sit.fraunhofer.de)  
www: <http://www.sit.fraunhofer.de>

