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**FP7 SECUR-ED Demonstration Project
Security solutions for urban transportation –
Contributions of Fraunhofer IAO**

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Fraunhofer IAO





- **Introduction SECUR-ED Project**
- **Overview Fraunhofer IAO Activities**
- **Generic City**
- **Interoperability Concept and Notation**
- **Competence Management**
- **Modeling and Simulation Systems**
- **Post-Event Analysis**
- **Conclusion and Outlook**



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→ SECured URban transportation – European Demonstration

- Call FP7-SEC-2010-1, Security in Mass transportation, ID = 261605
- Budget = 40M€, EC Funding = 25 M€, the biggest FP7Security project
- Starting date: 1st April 2011
- Duration: 42 months (end September 2014)

Coordinated by:

THALES

→ Objectives

- Means to enhance urban transport security
- Transport operators of large and medium European cities
- Give access to an enlarged mass transport security market to the European industry

Deliver mission-oriented security solutions for mass transit nodes

→ Develop **demonstrations in various cities:**

- *Berlin*

- *Madrid*

- *Milano*

- *Paris*

→ Addressing **security** of people and infrastructures, from **minor incident to major terrorism** threats

- Proactively: stop the event before it occurs

- Reactively: act to limit the impact of the event, if the previous strategy fails

- Forensic: get information to prosecute and put the system back in operation

→ Supporting the creation of a **European common market** for future mass transport security solutions

SECUR-ED Partners

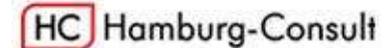


THALES

ALSTOM



BOMBARDIER
TRANSPORTATION



MINISTÈRE DE L'INTÉRIEUR, DE L'OUTRE MER, DES COLLECTIVITÉS TERRITORIALES ET DE L'IMMIGRATION



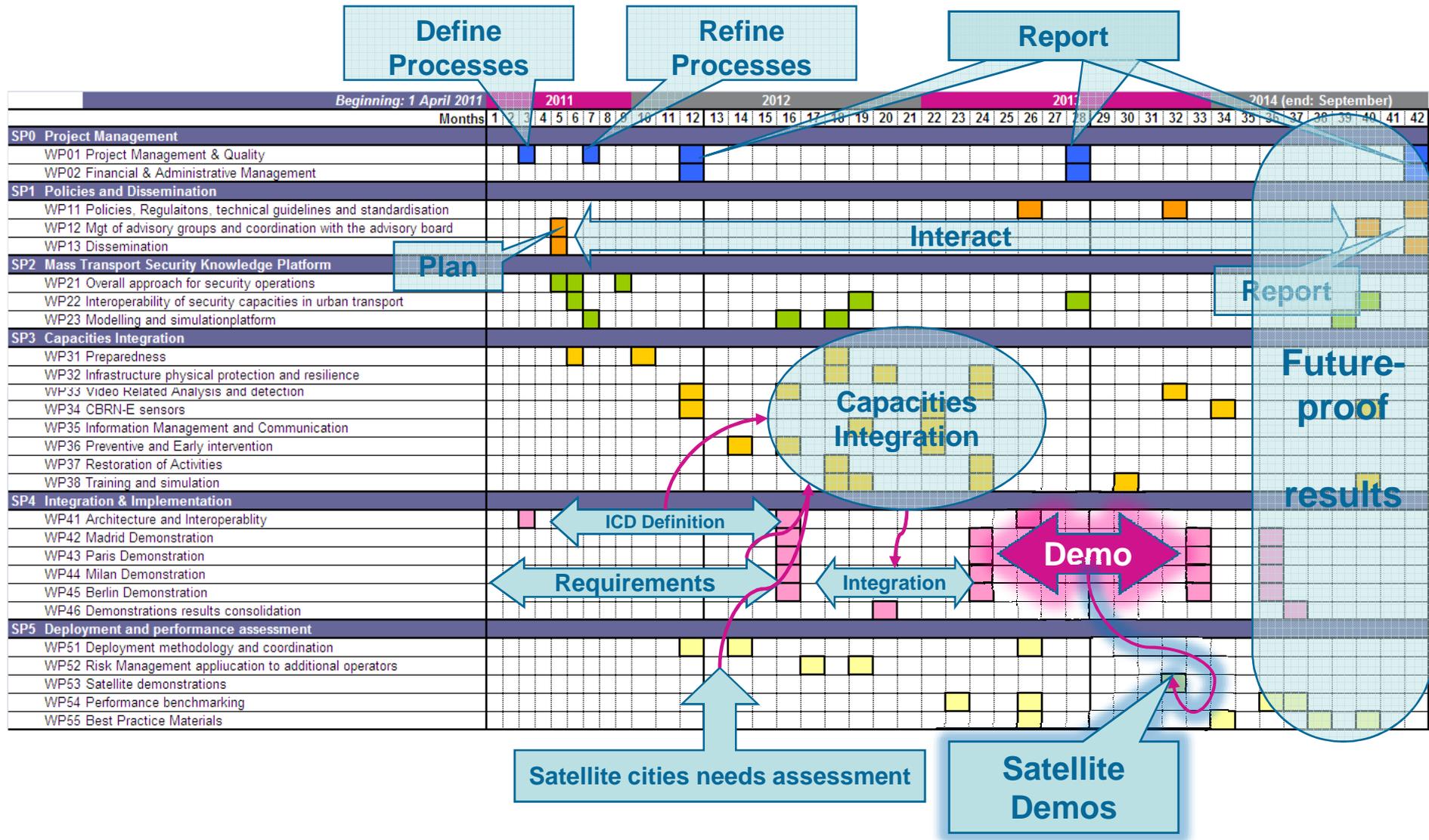
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SECUR-ED – Schedule Overview



Fraunhofer IAO activities

SP2 Mass Transport Security Knowledge Platform

Plan

WP21 Overall approach for security operations

→ WP22 Interoperability of security capacities in urban transport

→ WP23 Modelling and simulation platform

SP3 Capacities Integration

WP31 Preparedness

WP32 Infrastructure physical protection and resilience

WP33 Video Related Analysis and detection

WP34 CBRN-E sensors

→ WP35 Information Management and Communication

WP36 Preventive and Early intervention

WP37 Restoration of Activities

→ WP38 Training and simulation

All activities hereinafter showed at exemplary showcase : „Generic City“

WP42 Madrid Demonstration



→ Exemplary Big European Hub

[Photo: www.culturmag.de]

- Main station, including several metro and bus operators
- Complex Security Technology Infrastructure
- Several Transport Operators
- Police and Civil Protection Organizations



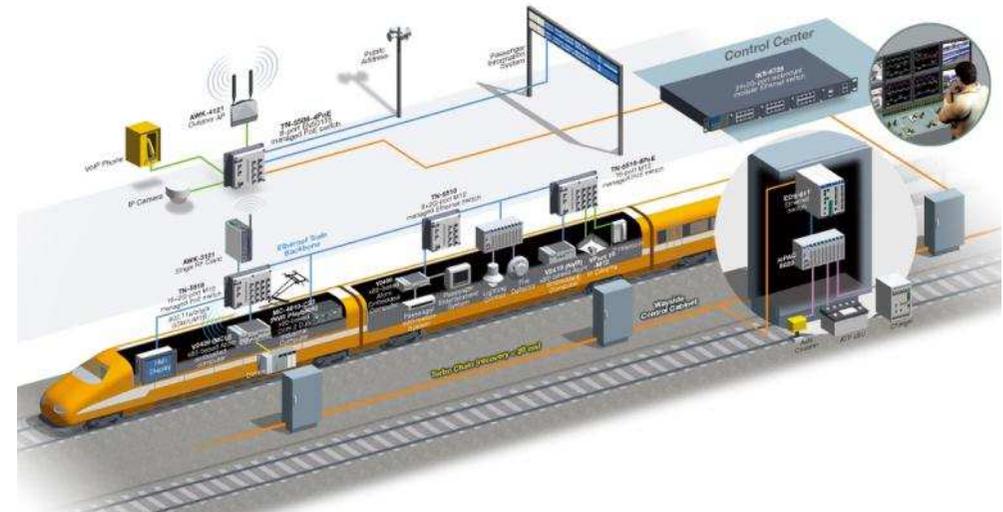
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→ Challenges in infrastructure modeling

- Consistency of security solutions
- Issues of Documentation in System of Systems Design
- Issues of regarded level of abstraction

→ Requirements for a common concept/notation:

- Simple enough for a broad understanding
- Abstract enough for organizational and technical application
- Flexible enough for different cities, adaption to existing systems and technologies



Exemplary Infrastructure [Graphic: www.moxa.com]

Concept and Notation for Interoperability of Security Systems

→ **The SECUR-ED Concept for Interoperability of Security Systems in Public Transport**
Sebastian Kurowski, Jan Zibuschka,
Heiko Roßnagel, Wolf Engelbach

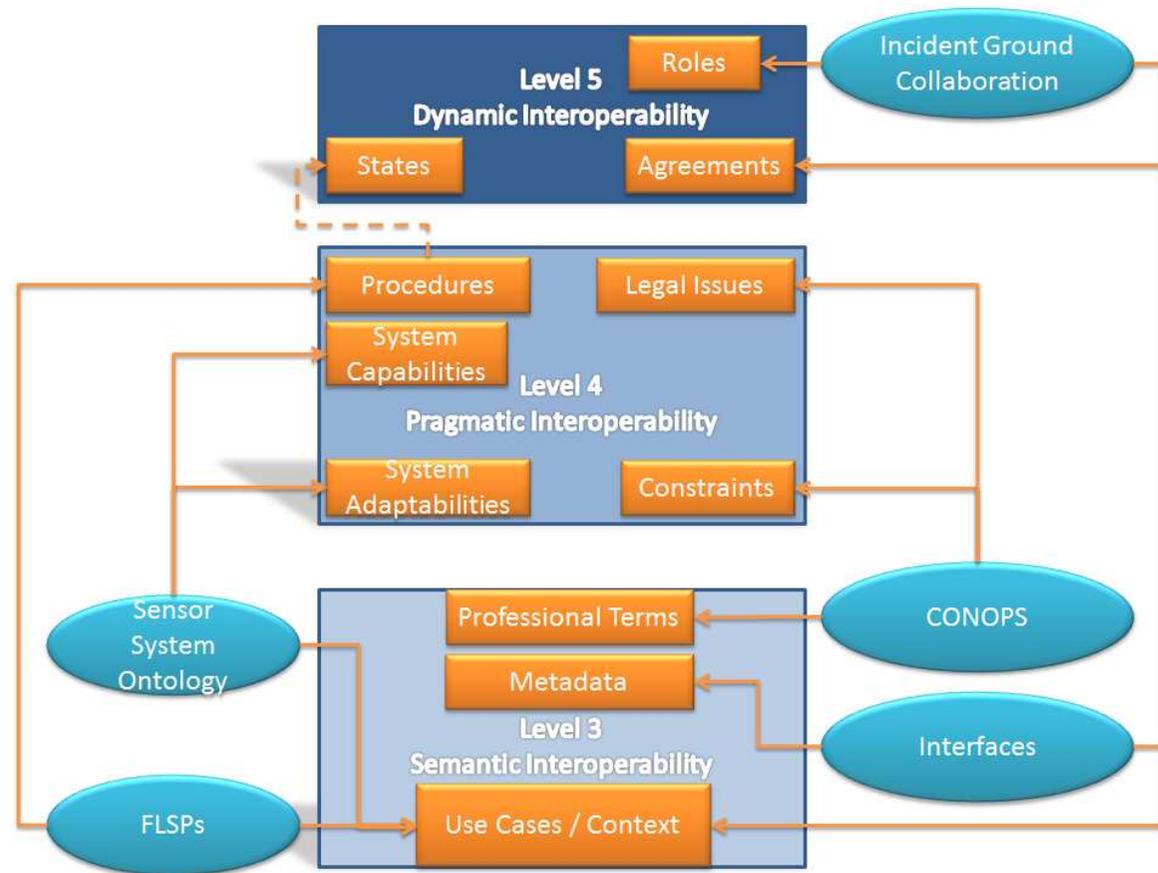
- Interoperability is often regarded as technical process (Level 1 to Level 2)
- Public Transportation Security is a **socio-technical** issue
- Collaboration and Communication between **Individuals and Technology**
- Issues of **Documentation in SoS Design**
- Issues of regarded level of **abstraction**



[Kurowski et al 2012] [Turnitsa 2005]

- **Holistic view** on public transport security
via Survey focused on assets describing the entities involved in public transportation

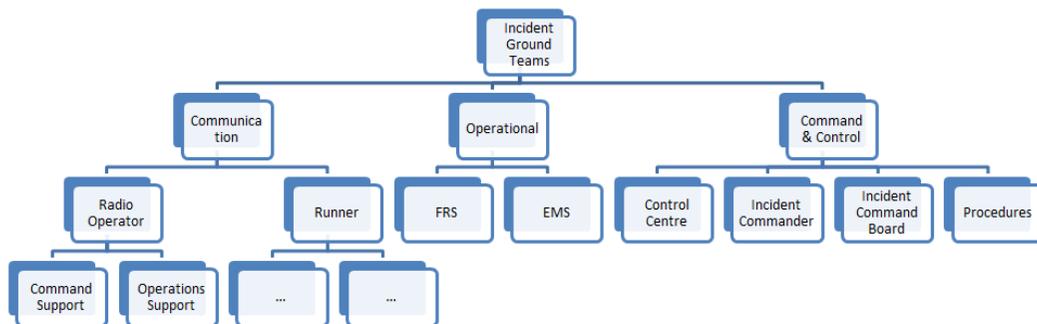
→ Integrated Interoperability Model



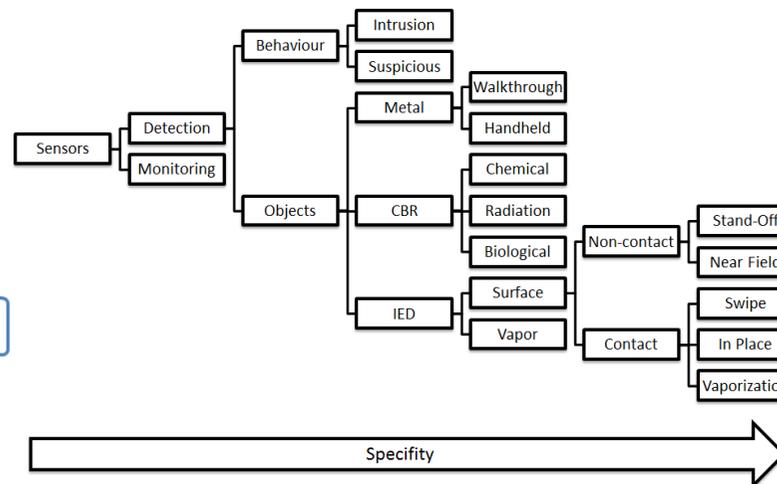
The SECUR-ED Interoperability Concept

Describing Information Systems, Roles and Interfaces

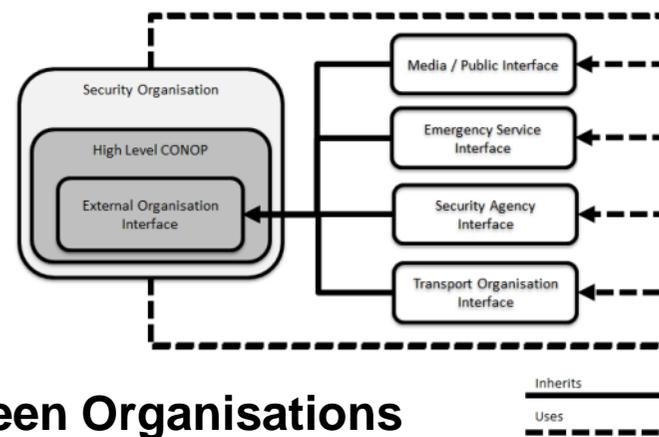
Aggregated Information



Roles



Information System Typologies



Interfaces between Organisations

The SECUR-ED Interoperability Concept/Notation

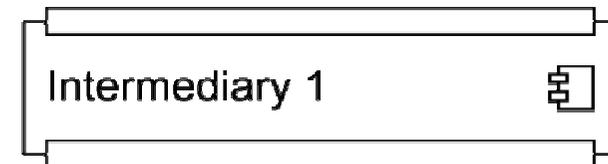
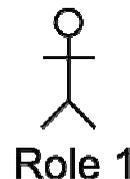
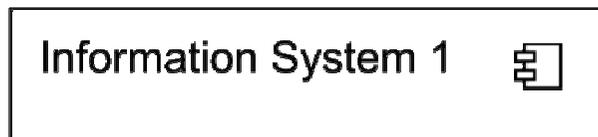
→ The SECUR-ED Interoperability Notation

Johannes Sautter, Heiko Roßnagel, Sebastian Kurowski, Wolf Engelbach, Jan Zibuschka

○ Unified Modelling Language (UML)

- Hierarchical composition
- Information hiding
- Separation of model and notation

Interoperability Object Templates (1)



Information System

- Entity that processes/stores data
- Specified dependency to its environment

Role

- By persons
- Tasks/Interaction with IS

Intermediary

- Specific Information System
- Interaction between IS

[Sautter et al 2012]

The SECUR-ED Interoperability Concept/Notation

Interoperability Object Templates (2)

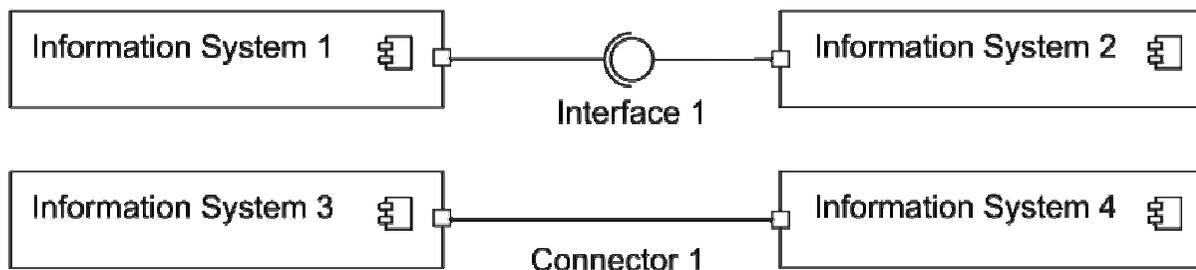
Two alternatives to represent interfaces:

→ UML-interfaces (balls-socket- vs. class-notation)

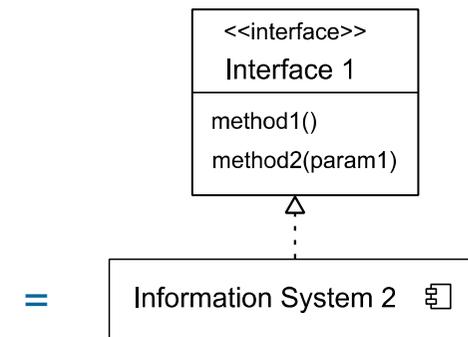
- Define initiative/realization of organisational/technical connection

→ UML-connectors

- Leave open or abstraction (numerous interfaces)



Interfaces notated as UML interface and UML connector

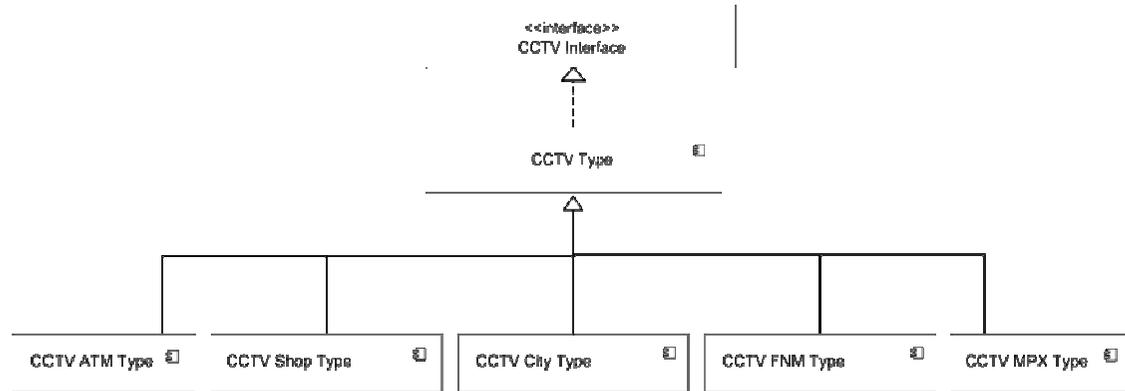


UML interface
and realizing
information
system

The SECUR-ED Interoperability Concept/Notation

Guidelines for Annotation Security-relevant information

- **Context**
 - Per Model
 - Per Interoperability Object



Classification diagram of Closed Circuit Television (CCTV) Devices

Two kinds of UML component diagrams:

- **Classification diagrams**
- **Infrastructure diagrams**

Attribute	Value
Information system type	Surveillance
Information system description	A type defining the CCTV appliances.
Purpose of Information System	Surveillance of areas
Security related Purpose	See Purpose of Information System
Information system operator	ATM or FNM or MPX or City of Milan
Security System Typology	Fully Controlled System
Processing Capacity Description	25 frames per second, 468kbit/s, 800x600px

Sample Annotation of the IS „CCTV Type“

Smoke Incident in Generic City



→ Smoke Incident



[Photo: Svante Oldenburg, www.triggerimage.co.uk]

→ Reactions to Security Issues

- Collaboration of
 - Transport Operators
 - First Responders
 - Fire Fighters
 - Police

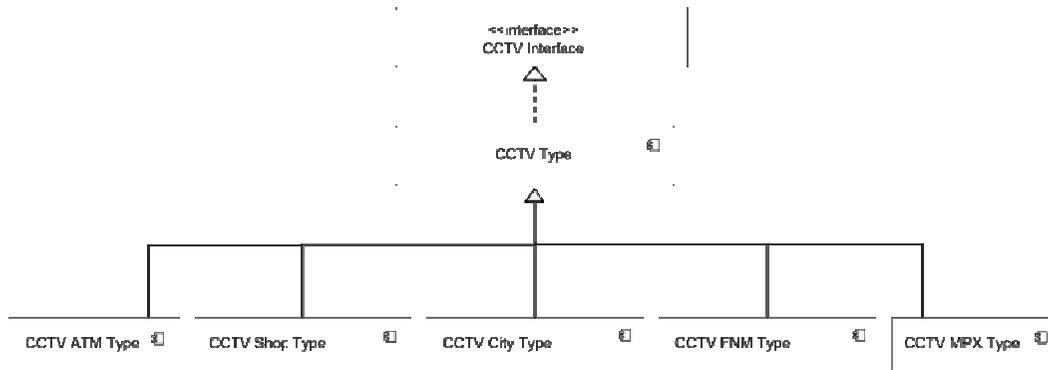
- Heterogeneous workflows, departments, decision hierarchies, terminologies

- Heterogeneous IT-systems

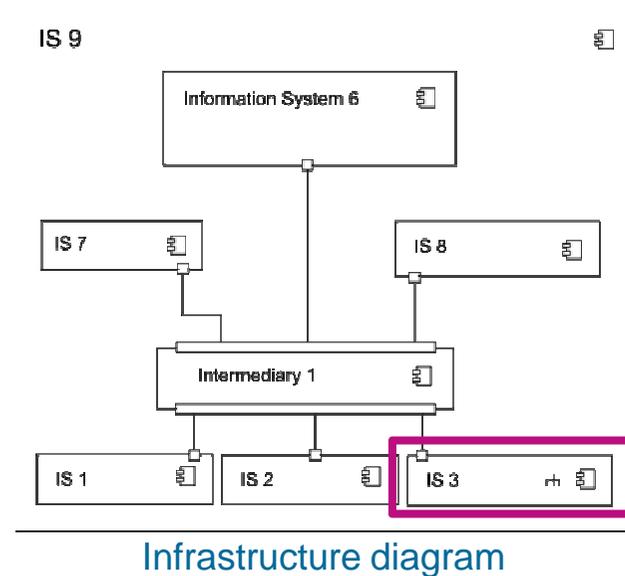
Smoke Incident in Generic City



Example for Classification and Infrastructure

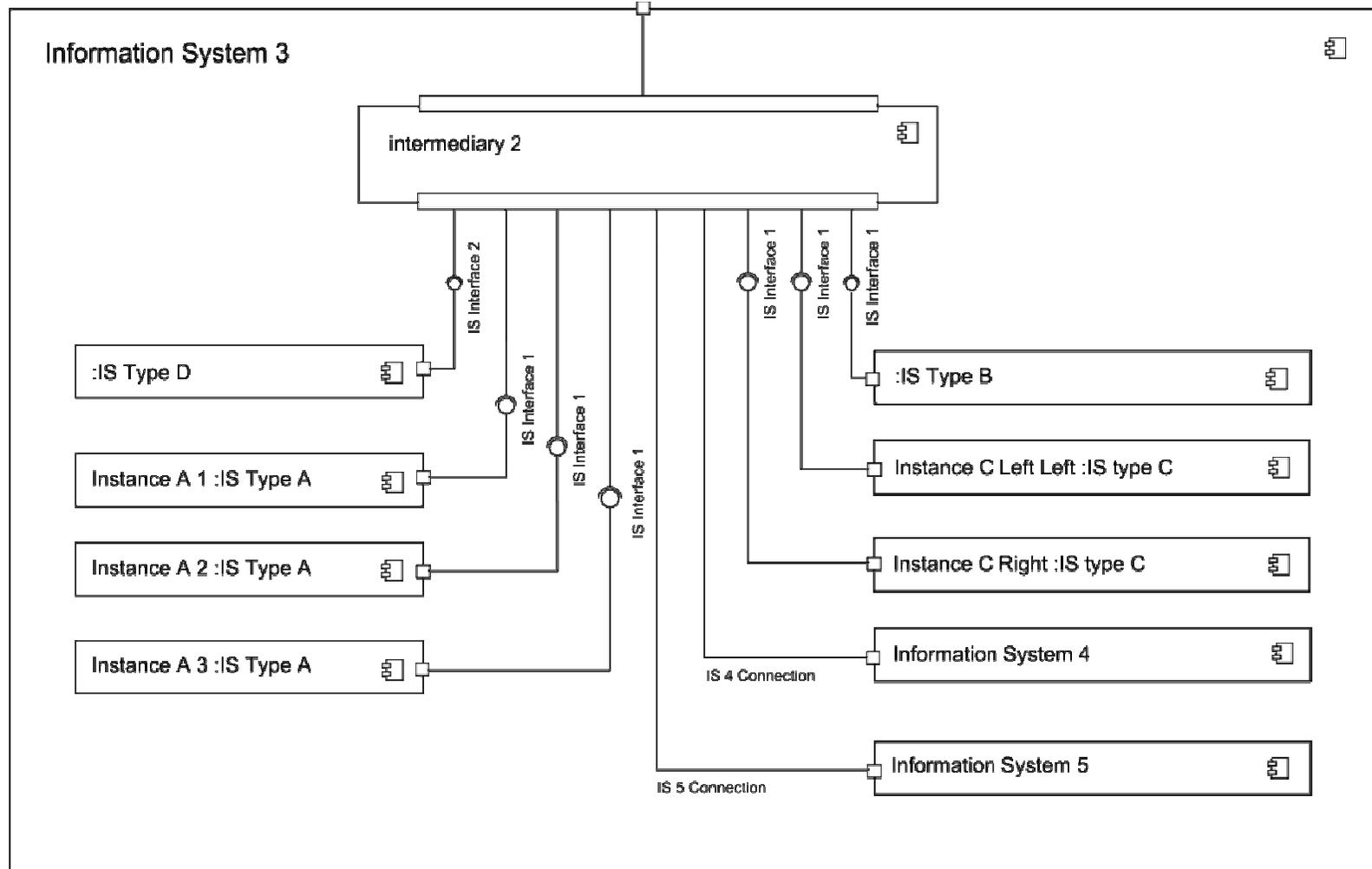


Classification diagram



Infrastructure diagram

The SECUR-ED Interoperability Notation for Information Systems (5)

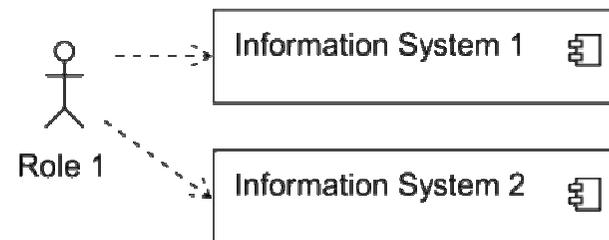


Control Room



[Photo: www.dvg-duisburg.de]

- **Several Roles**
- **Several Information Systems**



Infrastructure Diagram –
Role Interacting with two information systems



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Competence Framework

→ Competence Framework – HR approach to bridge competence gaps in security scenarios

Alexander Karapidis, Hartmut Buck (Fraunhofer IAQ)
Hilbert Kuiper (TNO)

→ Objectives

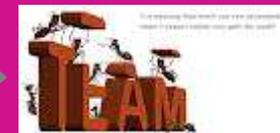
Identify security relevant competence gaps (of staff, organisational process....) in mass transportation systems



Align training activities to bridge identified competence gaps



Enhance performance of staff in security relevant work situations



1. Identification of security relevant scenarios

2. Critical incident elicitation

3. Identification of competences & competence gaps

4. Align training to competence gaps

5. Evaluation of training and security performance

Benefits of the competence framework

Benefits for
public trans-
portation
providers:

Standardised guideline to reveal competence gaps and interlink them with appropriate trainings based on given (scenario-based) needs

Benefits for
security
training
providers:

Security-relevant needs in training can be identified faster.
Training activities fit to competence gaps

Benefits for
third party
stakeholders:

Newly emerging security issues concerning training aspects can properly be communicated to all stakeholders

Control Room



[Photo: www.dvg-duisburg.de]

→ Information Systems for several purposes

○ Decision-Support via Simulation Tools



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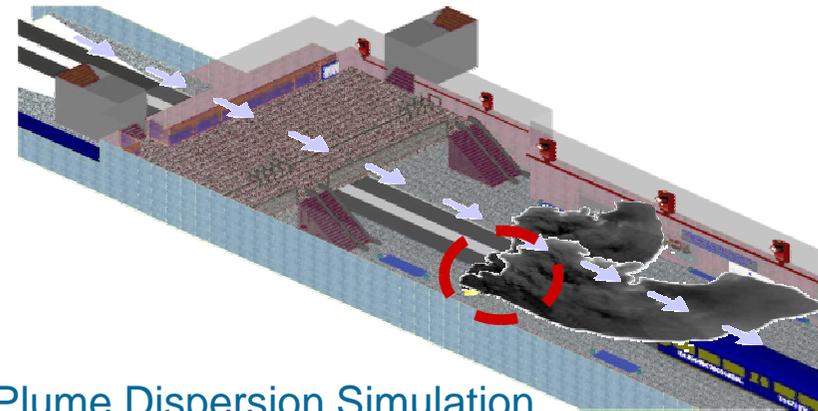
→ Simulation Models

Steffen Schneider, Therese Friberg
(University of Paderborn), Oliver Strauß,
Wolf Engelbach (Fraunhofer IAO)

→ Seven relevant categories of simulation identified

- Person flow
- Traffic flow
- Sensor networks
- Human behaviour
- Stability of constructions
- Spread of hazardous/dangerous substances (includes explosions)
- Safety & security processes in case of emergency

[Schneider et al 2012]



Plume Dispersion Simulation
[University of Paderborn, www.orgamir.de]



Passenger Flow Simulation
[Roßnagel et al 2010]



[Photo: www.dvg-duisburg.de]

→ Information Systems for several purposes

- Decision-Support via Simulation Tools
- Lessons Learned via Post-Event Analysis

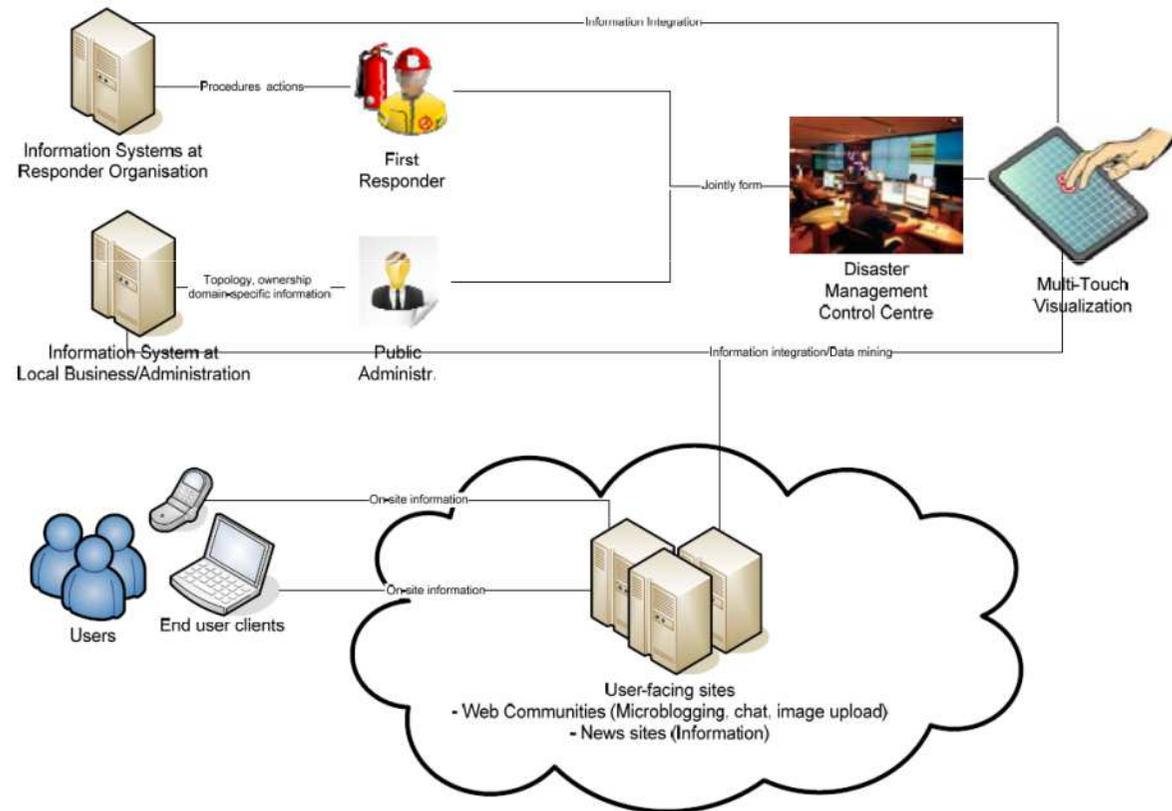


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Post-Event Analysis

→ Multi-Touch System for non-operational Phases of Crisis Management

Uwe Laufs, Jan Zibuschka, Heiko Roßnagel, Wolf Engelbach



[Laufs et al 2012]



Implementation of MultiTouch Applications

Technical solution for Multi-Touch: MT4j

→ Open Source

→ Multi-Platform

- Multitouch for Java (developed in-house at Fraunhofer IAO)

→ Multi-Device

- Interaction pattern abstraction layer

Integrates using SOA Interfaces

→ Implements (subset of) RPC protocol

- SOAP, REST

- some form of XML over HTTP

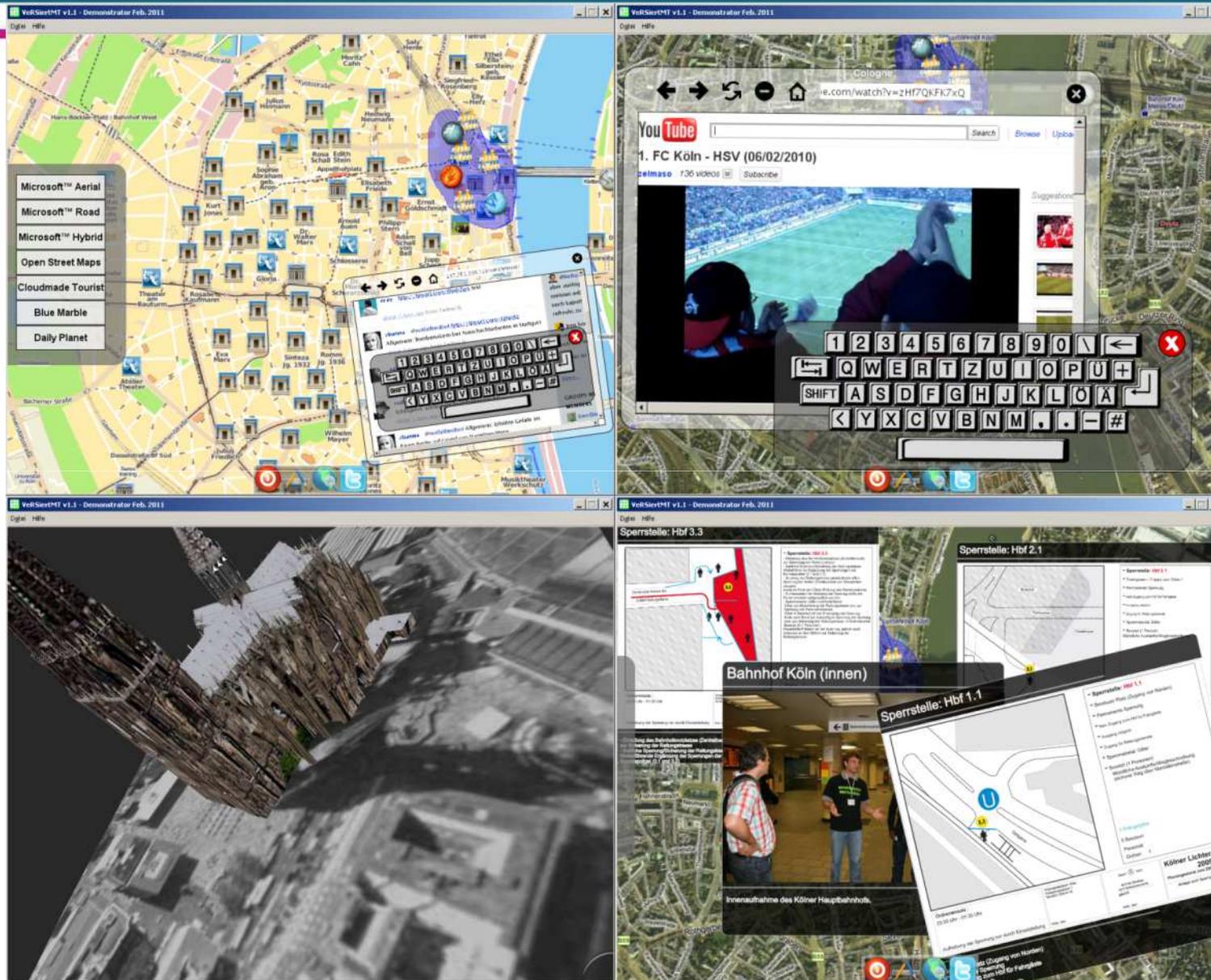
→ Reading from preferably generic sensor interfaces

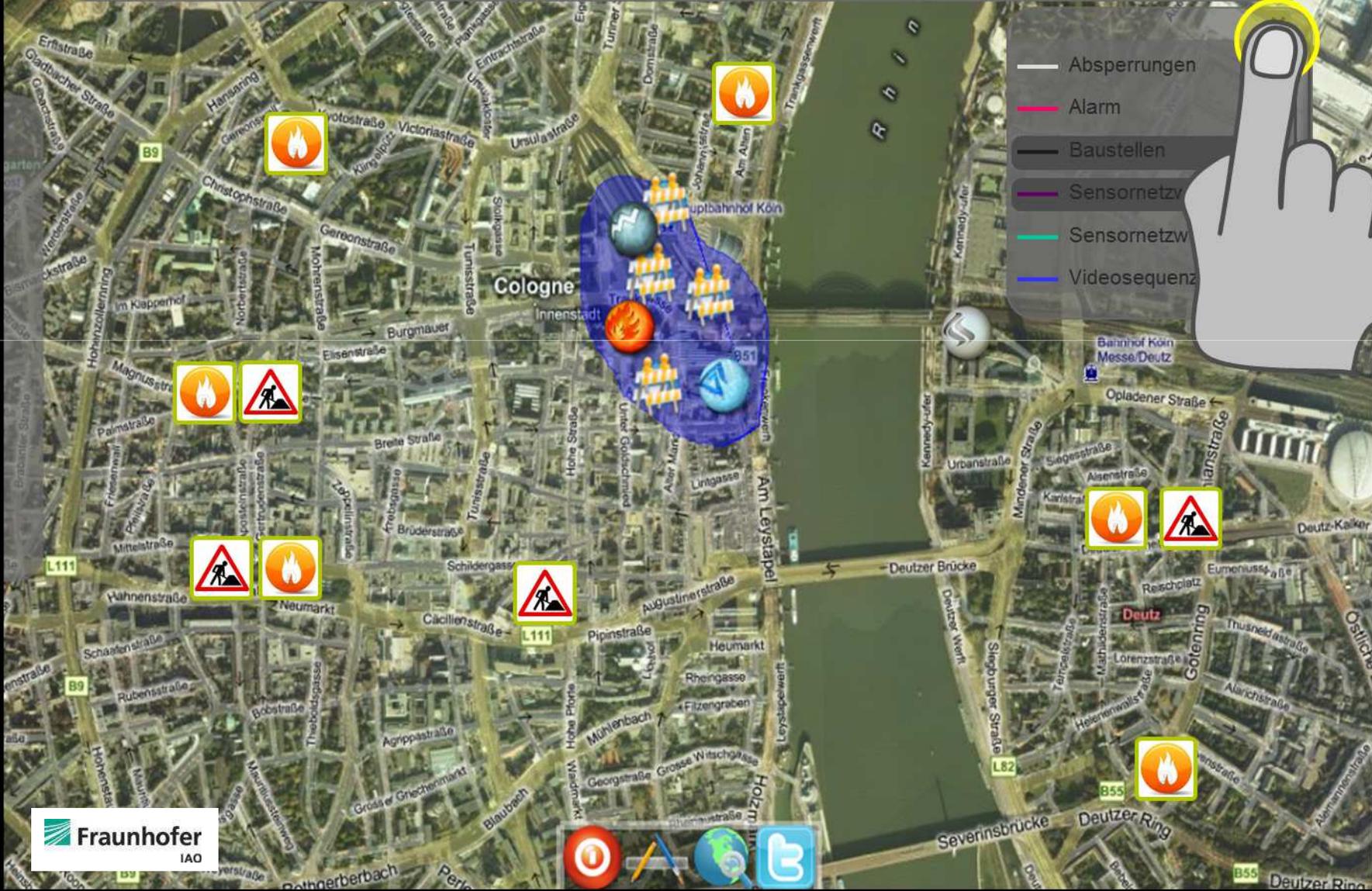
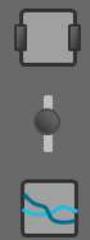
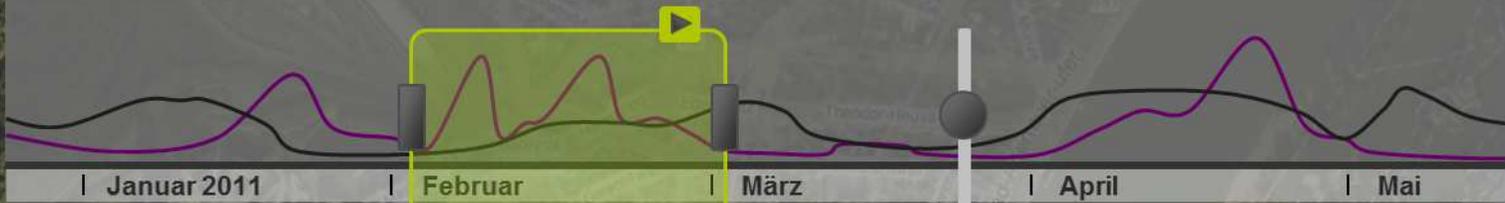


www.mt4j.org

[www.MT4j.org]

MultiTouch System in action





- Absperrungen
- Alarm
- Baustellen
- Sensornetz
- Sensornetz
- Videosequenz





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→ Work in Progress

- Evaluation Interoperability Concept and Notation
- Implementation Simulation in Demo Cities
- Implementation Multi-Touch-Analysis in Demo Cities

→ After SECUR-ED

- **Applicability** both for mid-size and big European cities
- **Methods, process, tools**, etc. making multi-operators work together
- Preparing the “**city of the future**” with increased interoperability and collaboration capabilities



For more information, visit:
www.secur-ed.eu



www.ict.iao.fraunhofer.de
www.swm.iao.fraunhofer.de



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Thank you



[Kurowski et al 2012] Kurowski, S., Zibuschka, J., Roßnagel, H., and Engelbach, W. 2012. “A Concept for Interoperability of Security Systems in Public Transport,” In Proceedings of the 9th International Conference on Information Systems for Crisis Response and Management Presented at the ISCRAM 2012, Vancouver, Canada.

[Turnitsa 2005] Turnitsa, C. D. 2005. “Extending the Levels of Conceptual Interoperability Model,” In *Proceedings IEEE Summer Computer Simulation Conference*

[Sautter et al 2012] Sautter, J., Roßnagel, H., Kurowski, S., Engelbach, W. and Zibuschka, J. 2012. “Interoperability for Information Systems in Public Urban Transport Security: The SECUR-ED Interoperability Notation,” In Proceedings of the 9th International Conference on Information Systems for Crisis Response and Management Presented at the ISCRAM 2012, Vancouver, Canada.

[Schneider et al 2012] Steffen Schneider, Therese Friberg et al: „~Requirements Engineering Method to Identify Adequate Simulation Models“. Proceedings of the Future Security Conference. Presented at the Future Security Conference, Bonn, Germany, September 2012

[Laufs et al 2012] Uwe Laufs, Jan Zibuschka, Heiko Roßnagel, Wolf Engelbach: „Entwurf eines Multi-touch-Systems für die organisationsübergreifende Zusammenarbeit in nichtoperativen Phasen des Notfallmanagement“, 2012