

# IHE based Interoperability for Service Oriented Architectures

**Florian WOZAK<sup>a</sup>, Elske AMMENWERTH<sup>b</sup>, Alexander HÖRBST<sup>b</sup>  
Peter SÖGNER<sup>a</sup>, Richard MAIR<sup>c</sup>, Thomas SCHABETSBERGER<sup>a</sup>**

<sup>a</sup> University of Health Sciences Medical Informatics and Technology, Research  
Division for eHealth and Telemedicine, Hall, Austria

<sup>b</sup> University of Health Sciences Medical Informatics and Technology, Institute for  
Health Information Systems, Hall, Austria

<sup>c</sup> ITH icoserve information technology for healthcare, Innsbruck, Austria

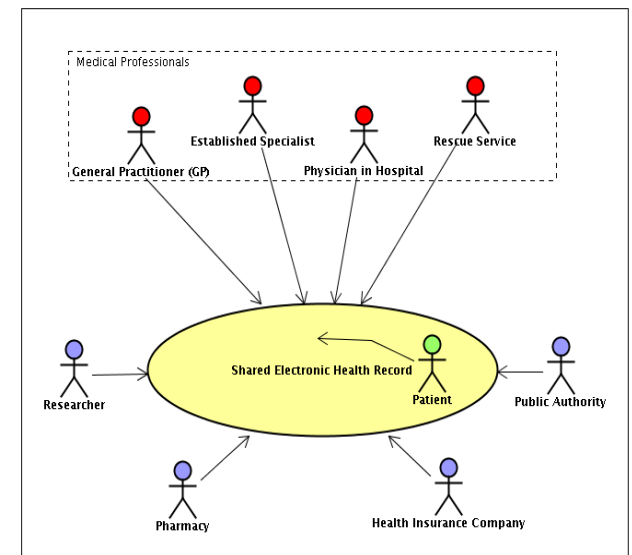
# UMIT

## Subject and Motivation

- Cooperation and optimized work flows in healthcare institutions is expected to improve quality and efficiency while reducing costs.

[Collen, 1970]

- A Shared Electronic Health Record (SEHR) requires a variety of subsystems to collaborate:
  - HIS / CIS in hospitals
  - GP's Praxis systems
  - Infrastructure components
    - Data Repository and Indices
    - Patient Identification Systems, etc...



Components are more and more incorporating the SOA paradigm (web services)  
 --> Standardized Interfaces (WSDL) facilitate implementation

**But is this sufficient for interoperability in clinical context?**

## ***Problem Context***

IHE (founded in 1998) defines actors (service providers) and transactions (interactions) for vendor independent support of common clinical workflows using existing standards (web services, ebXML, Dicom, HL7, etc...)

- It is unclear if existing IHE Integration Profiles fully support interoperability for Shared Electronic Health Records
  - What is covered by SOA and IHE?
  - Which issues are still open?
  
- It is unclear which extensions have to be applied to IHE Profiles to support required interoperability

## ***Objectives***

- Definition of interoperability with special emphasis on
  - Service Oriented Architectures for SEHRs and
  - Interoperability beyond the SOA paradigm
- Extraction of assessment criteria for interoperability evaluation
- Evaluation of existing IHE Integration Profiles with regard to:
  - Coverage of extracted criteria in respect to SOA
  - Modifications of IHE Integration Profiles required to support those criteria

## **Methods**

- Analysis of existing literature for identification of interoperability requirements
  - PubMed
  - IEEE
- Interviews with domain experts in the fields of:
  - Structured documents conversion of non-structured data (Innsbruck University Hospital)
  - Security, patient identification, accounting and billing (Sozialversicherungs-Chipkarten Betriebs- und Errichtungsgesellschaft m.b.H (SVC) e-card operating company)
  - Security, availability considerations (Österreichische Datenschutzkommission: Austrian data protection experts)
  - Data standards, user and domain requirements (Österreichische Ärztekammer: Austrian Medical Association)
- Experiences in implementing IHE Profiles and Connectathons

# Results



# Interoperability

IEEE defines interoperability as the:

**“Ability of a system or a product to work with other systems or products without special effort on the part of the customer”  
[IEEE, 2007]**

- But what are the exact requirements for SEHRs?
- **--> Use the same requirements for interoperability consideration as for the design of SEHRs!**

© 1996 by Randy Glasbergen.  
E-mail: randyg@norwich.net



**“Hello, Bob? It’s your father again. I have another question about my new computer. Can I tape a movie from cable TV then fax it from my VCR to my CD-ROM then E-mail it to my brother’s cellular phone so he can make a copy on his neighbor’s camcorder?”**

Source: The World Wide Web Consortium (W3C) [lists.w3.org]

## ***Interoperability Criteria***

- **Interfaces:**
  - Has a common structure of interfaces been agreed on?
- **Semantics:**
  - Are data interpreted identically on systems of different vendors?
- **Legal and organizational aspects:**
  - Are local legal and organizational requirements correctly considered?
- **Security:**
  - Is the security level of a system to be decreased for the sake of interoperability?

**--> Evaluate to which extent each requirement is covered by existing IHE Integration Profiles <--**

## ***Interoperability on Interface Level***

- IHE incorporates the SOA paradigm and furthermore defines restrictions on interfaces (methods, parameters and data types)
  - Systems compliant to IHE support basic interoperability of their technical interfaces

## **Challenges...**

- IHE leaves many details open for implementation
  - Supports the market
  - Affects interoperability because of different interpretation of the standard
- Systems can be further developed after conformity has been attested
  - Systems can be further improved after the Connectathon
  - Side effects can break interoperability

## ***Interoperability on Semantic Level***

- IHE starts to cover semantic interoperability (beyond SOA)
  - Clinical Document Architecture (CDA) as common data standard
  - Content profiles for standardization of medical contents based on clinical semantics
- CDA allows language independent sharing of medical content
  - Level 3 supports LOINC, SNOMED and other medical dictionaries/codes

## **Challenges...**

- Different understanding of clinical terms even in a regional context
- A fine-grained structure of CDA level 3 is necessary
- Workflow of data capturing has to be changed
  - No free text entries
  - Organizational challenge
  - Medical staff must be motivated to use rigid form-based data input

## ***Interoperability on Legal and Organizational Level***

- IHE originates from mainly from US and English speaking countries
  - IHE covers “global” requirements for clinical workflows
  - IHE only slowly starts to care about regional requirements
  - IHE Europe is slowly gaining power

## **Challenges...**

- It is important for IHE to support regional requirements
- Development of local extensions
- Integration of local extensions to a holistic concept without braking interoperability
  - Local extensions must remain interoperable with the internationally agreed on Integration Profiles
- To which extent may local extension be “localized”??

## ***Interoperability on Security Level***

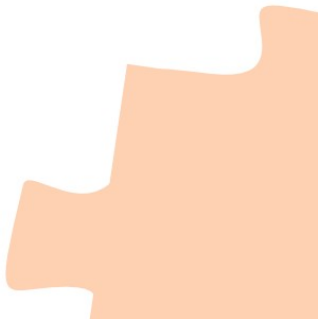
- IHE uses a modular approach (dedicated Integration Profiles) to solve Security issues
- IHE supports secure communication on network level (TLS) and audit messages (ATNA)
  - Covers basic security features of existing systems

### **But...**


- Integration Profiles to support application level security and authentication / authorization have been developed recently
  - Practical experiences are missing
  - Do not fully cover (at least Austrian) legal requirements
- Coverage of fine grained patient-controlled access control policies with existing Integration Profiles is a mayor challenge for IHE



## ***Discussion***

- Incorporation of the SOA paradigm (mainly web services) to IHE
    - supports interoperability on interface level and partly on security level
    - but leaves open semantics and legal / organizational aspects
  - Integrated and consistent security for all IHE Profiles remains a major challenge
  - Existing Integration Profiles could benefit from incorporating local and regional requirements
    - Local extensions without breaking interoperability
  - Coordination of regional initiatives
  - Feedback of implementors can help profiles to improve
- 

Thank you for  
your attention!





## **Contact**

Dr. Florian Wozak

University for Health Sciences, Medical Informatics and Technology

Research Division for eHealth and Telemedicine

A-6068 Hall, Eduard Wallnöfer Zentrum 1

Tel: +43.50 8648 3813

E-Mail: [florian.wozak@umit.at](mailto:florian.wozak@umit.at)

