

# Implementation of an ISO/IEC 11179 based Metadata Registry to foster interoperability of health telematics applications

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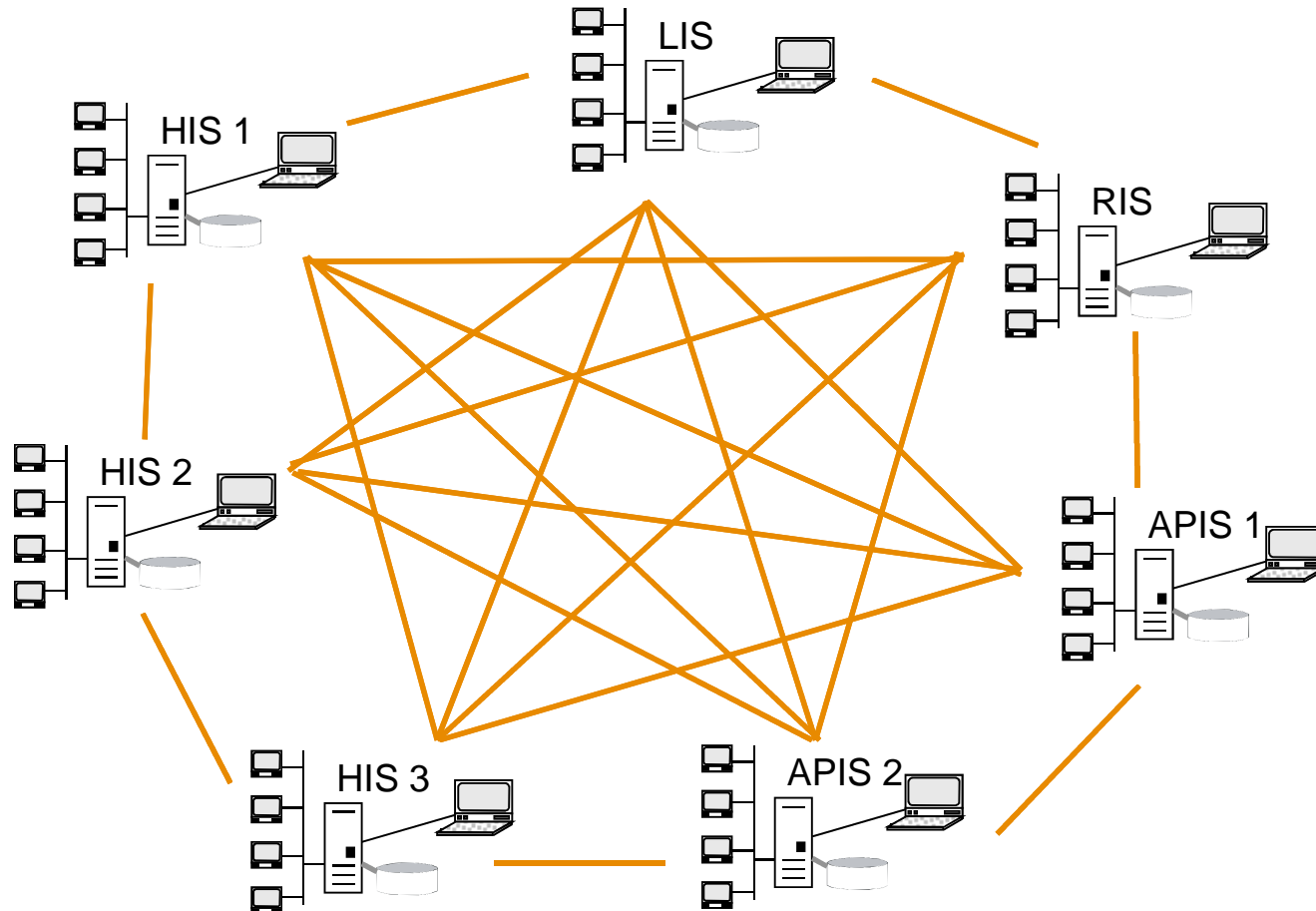
# Agenda

- Background/Problem
- Requirement/Solution
- Objective
- Results and Examples
- Conclusion
- Outlook

# Background

- institution spanning organization and documentation of patient treatments
- need for comprehensive support of
  - Patient treatment
  - Quality management
  - Health services research
- increasing networking of information systems

# Problem



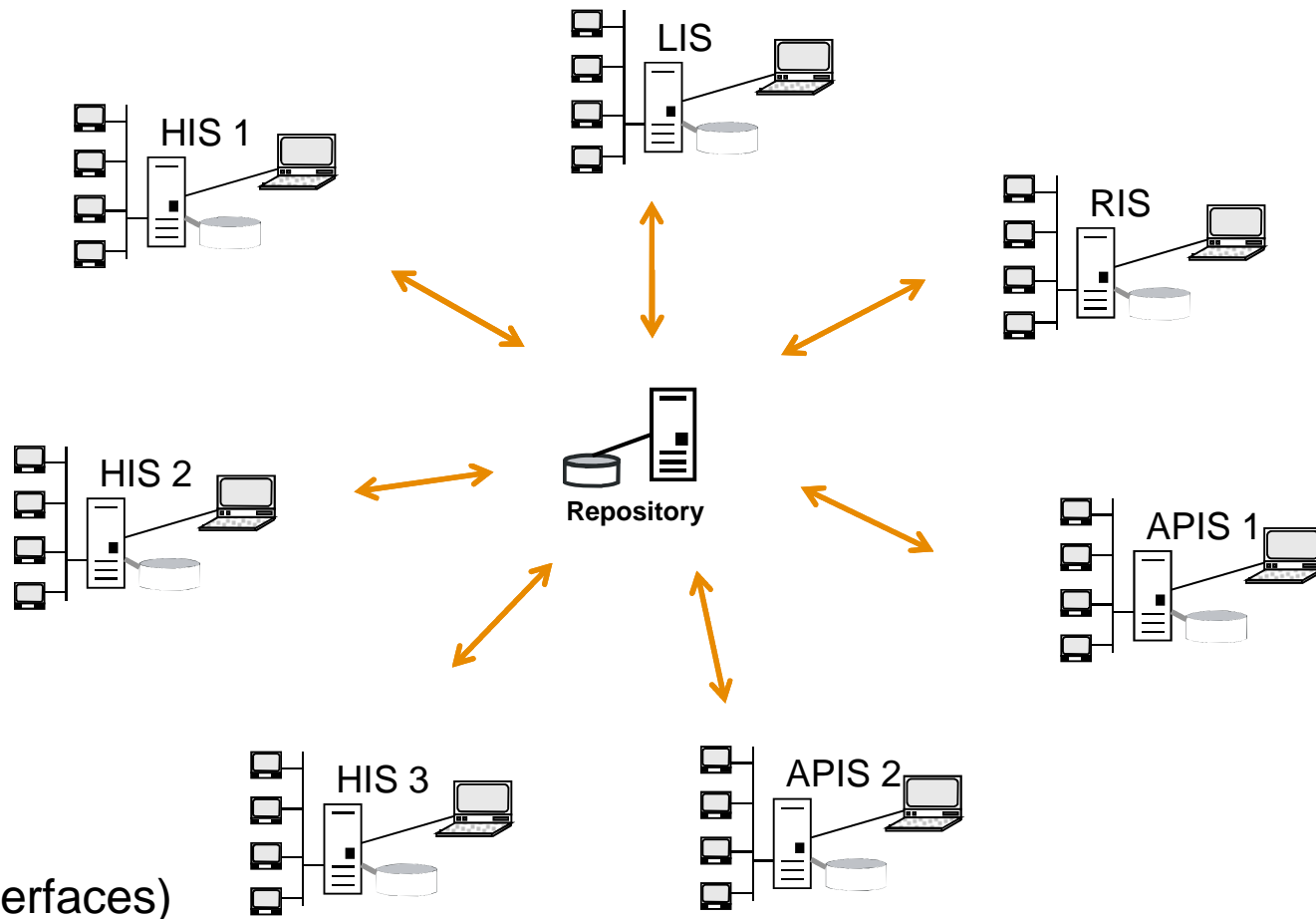
## Combinational Explosion

$$x = n(n-1)/2 \text{ (Interfaces)}$$

# Solution

- To achieve interoperability with realistic effort a *central service* as a repository for complex clinical concepts (structural description) of a health telematics platform is essential

# Solution



x = n (Interfaces)

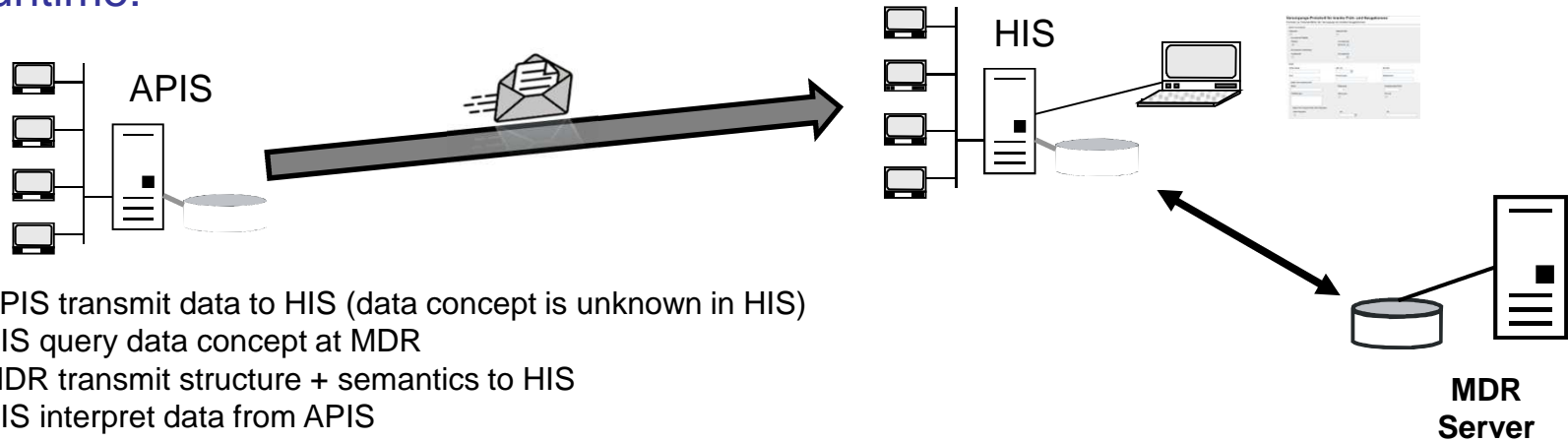
# Requirements

- overall availability of computer-interpretable definitions for clinical concepts
  - semantic (Terminology Server) and
  - structure (MDR)
  
- information systems with ability to react on
  - new
  - updatedinteroperability entity types automatically without any program modification



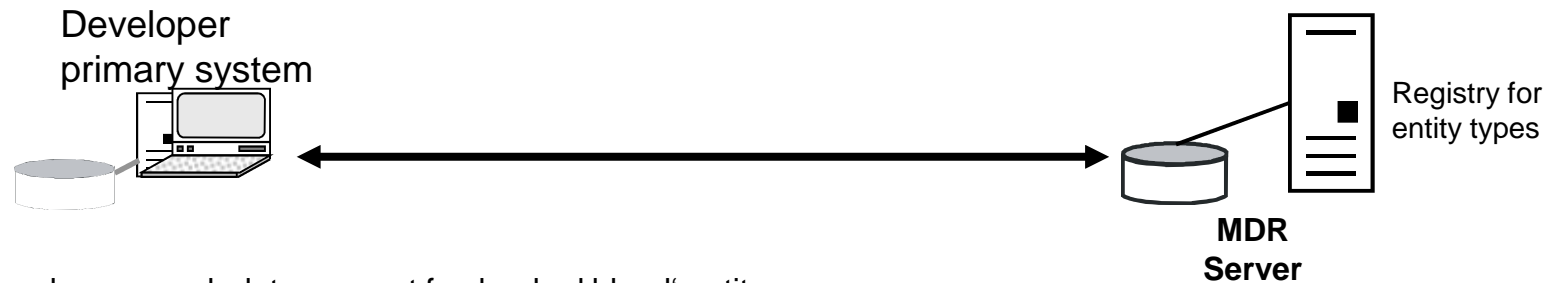
# Objective

on runtime:



1. APIS transmit data to HIS (data concept is unknown in HIS)
2. HIS query data concept at MDR
3. MDR transmit structure + semantics to HIS
4. HIS interpret data from APIS

on development time:



1. Developer search data concept for ,banked blood'-entity
2. MDR provide data concept
3. Developer implements proposed concept

# Objective

- Industry-wide repository for exchangeable entity types
- Prevent schema mismatches between interoperating information systems
- Foundation for self-learning systems

# Results

- Based on ISO/IEC11179 V2 we implemented a persistence layer and additional web services for administration and retrieval of MDR content.
- The essential features are
  - web services to administer and maintain entity types incl. their relations amongst themselves and derivations

# Webservices

Search WS	
<b>ListIO</b>	Listet die (freigegebenen) Informationsobjekttypen auf.
<b>ListDerivation</b>	Listet die (freigegebenen) Berechnungsvorschriften auf.
<b>ListDatatypes</b>	Listet die Datentypen auf.
<b>ListStatus</b>	Listet die Status für Informationsobjekttypen auf.
<b>ReturnIODetails</b>	Gibt detaillierte Informationen zu einem Informationsobjekttypen.
<b>ReturnDerivationDetails</b>	Gibt detaillierte Informationen zu einer Berechnungsvorschrift.

Authoring WS	
<b>CreateIO</b>	Erstellt ein Vorschlag für ein neuen Informationsobjekttyp.
<b>UpdateIO</b>	Legt ein Vorschlag für eine neue Version eines bestehenden Informationsobjekttyps an.
<b>ChangeIOStatus</b>	Ändert den Status eines Informationsobjekttyps.
<b>CreateDerivation</b>	Erstellt eine neue Berechnungsvorschrift.
<b>UpdateDerivation</b>	Ändert die bestehende Berechnungsvorschrift.

Administration WS	
<b>ListRoles</b>	Listet die verfügbaren Rollen auf.
<b>ListUser</b>	Listet die User des MDR Servers auf.
<b>CreateUser</b>	Legt einen neuen Benutzer an.
<b>UpdateUser</b>	Ändert die Daten eines Benutzers.
<b>DeleteUser</b>	Löscht einen Benutzer aus der Datenhaltung

Security WS	
<b>Login</b>	Erstellt einen temporären Anmelde-Schlüssel, welcher an Anfragenden gesendet wird.
<b>Logout</b>	Löscht den temporären Anmelde-Schlüssel des Benutzers.

Execute WS	
<b>ExecuteDerivation</b>	Führt eine Berechnungsvorschrift aus.

# Results

- Based on ISO/IEC11179 V2 we implemented a persistence layer and additional web services for administration and retrieval of MDR content.
- The essential features are
  - web services to administer and maintain entity types incl. their relations amongst themselves and derivations
  - a web based user interface for data administration, using abovementioned services
  - versioning of entity types
  - a form generator to create dynamic web forms based on the definitions in the MDR
    - input data of these forms are stored in CDA-Level1 documents

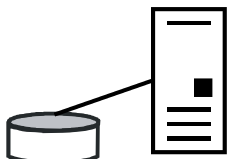
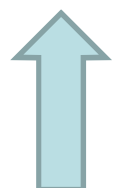
# Form generator

## Versorgungs-Protokoll für kranke Früh- und Neugeborene

Formular zur Dokumentation der Versorgung von kranken Neugeborenen

Geburt Anwesende		
Hebamme <input checked="" type="checkbox"/>	Geburtshelfer <input type="checkbox"/>	
Anwesende Pädiater		
Pädiater <input checked="" type="checkbox"/>	Anwesenheit 23:10:0	
Anwesende Anästhesist		
Anästhesist <input checked="" type="checkbox"/>	Anwesenheit 00:00:5	
Mutter		
Erkrankungen keine	Medikamente Aspirin	Mutter-Name Herta
Schwangerschaft		
FW	Fieber <input type="checkbox"/>	HbsAg pos <input type="checkbox"/>
ANS-Propylaxe		
ANS-Propylaxe <input type="checkbox"/>	am	
Labor	HIV pos <input type="checkbox"/>	
Keimnachweis	GBS pos <input type="checkbox"/>	
Gestationsalt		

form generator



MDR Server

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <result>
3 <formID>2</formID>
4 <verfasser> Dr. med. Testarzt</verfasser>
5 <erstellungsdatum>Thu May 24 10:01:16 CEST 2012</erstellungsdatum>
6 <Geburt_Anwesende>
7 <Hebamme formPartID="104">Hebamme</Hebamme>
8 <Geburtshelfer formPartID="105" />
9 <Anwesende_Pädiater>
10 <Pädiater formPartID="106">Pädiater</Pädiater>
11 <Anwesenheit formPartID="101">23:10:00</Anwesenheit>
12 </Anwesende_Pädiater>
13 <Anwesende_Anästhesist>
14 <Anästhesist formPartID="107">Anästhesist</Anästhesist>
15 <Anwesenheit formPartID="102">00:00:59</Anwesenheit>
16 </Anwesende_Anästhesist>
17 </Geburt_Anwesende>
18 <Mutter>
19 <Mutter-Name formPartID="130">Herta</Mutter-Name>
20 <Mutter_Geburt>

```

CDA Level 1

MDR to foster interoperability of health telematics applications

30.05.2012 - 15<sup>th</sup> International Open Forum on Metadata  
M. Sc. B. Rimatzki, Prof. Dr. P. Haas



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  - a web based user interface for data administration, using abovementioned services
  - versioning of entity types
  - a form generator to create dynamic web forms based on the definitions in the MDR
    - input data of these forms are stored in CDA-Level1 documents
  - associations to a terminology server based on CTS2, which administer the semantic of the entities of the MDR

# Conclusion

- Implemented MDR is suitable to
  - administer jointly used entity types of health telematics applications
  - provide entity types computer-interpretable and independent of location and time
  - administer structurally complex clinical concepts
- ISO insufficient differentiated
  - for representing terminologies
- Plugged with
  - Form generator
  - Terminology Server based on CTS2



# Outlook

- compatibility verification and model mapping with
  - HL7 - DCM
  - openEHR Archetype
  - UML and XMI
- Import/export module for compatible abovementioned specifications
- User Interface for browsing the content

## Literature:

- **ISO/IEC11179. 2004.** Information technology — Metadata registries (MDR). 2004.
- **Nadkarni, Prakash M. 2011.** Metadata-driven Software Systems in Biomedicine - Designing Systems that can adapt to Changing Knowledge. Heidelberg : Springer, 2011.
- **HL7-CTS2.** CTS 2.0 Specification page. CTS 2.0 Specification page. <http://wiki.hl7.org/index.php?title=CTS2>.



Thank you for your attention!



