

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

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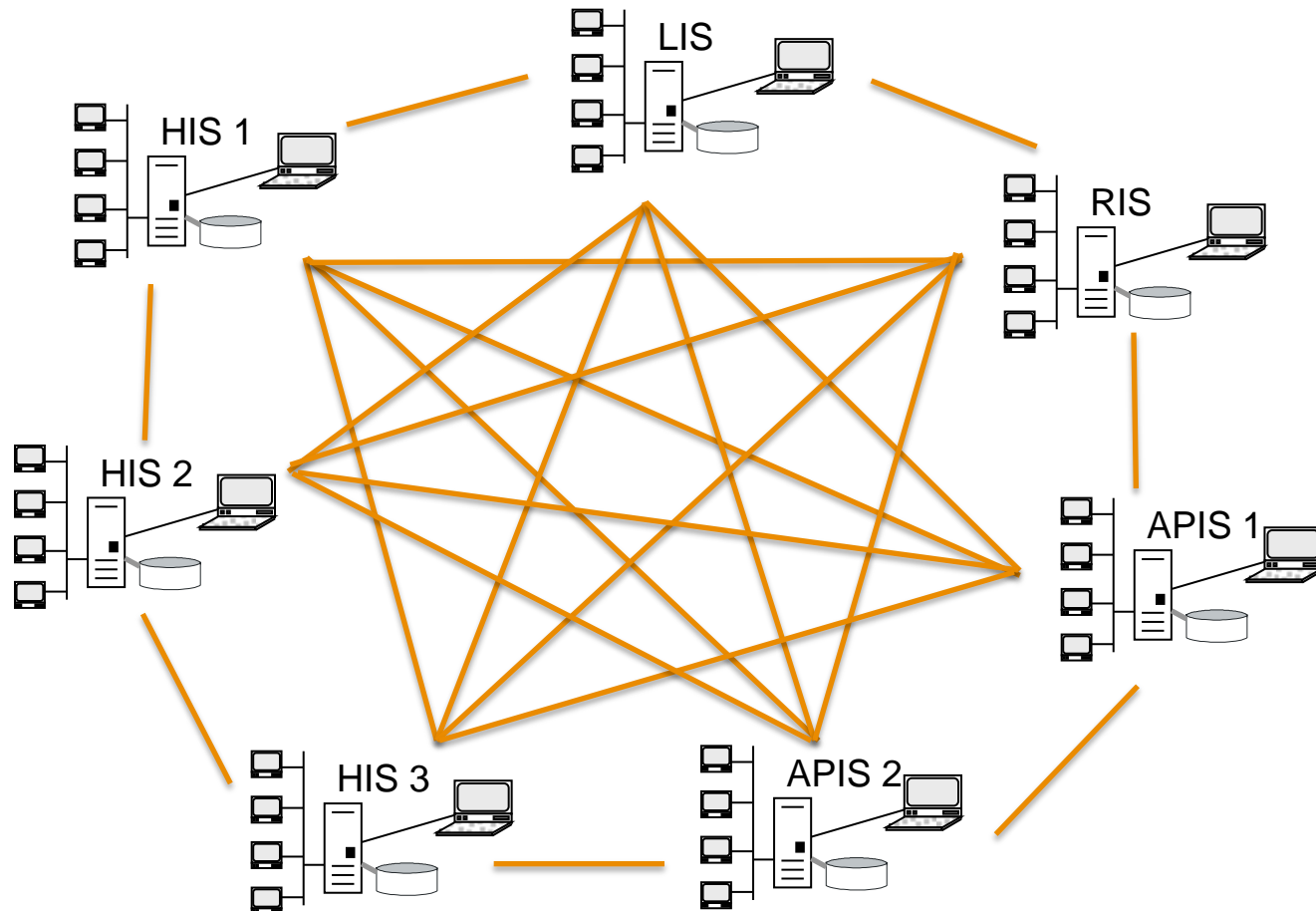
Agenda

- 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



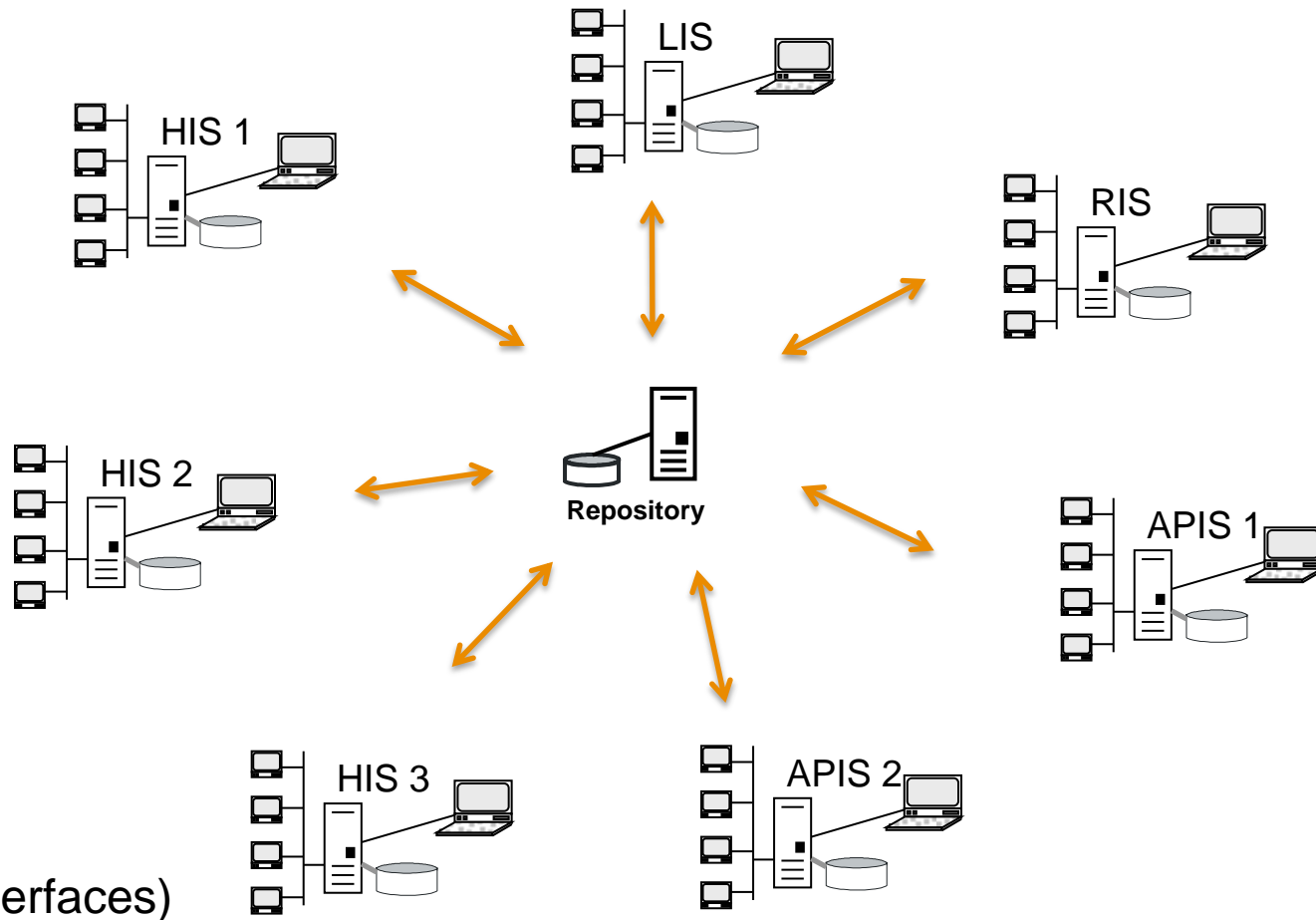
Combinational Explosion

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

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)

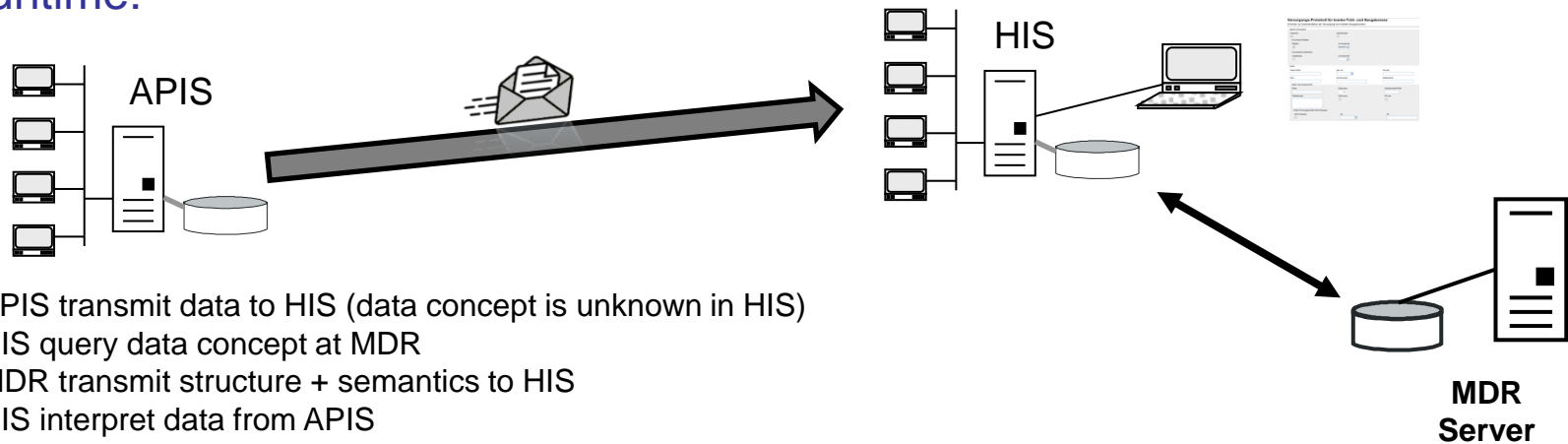
Requirements

- 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

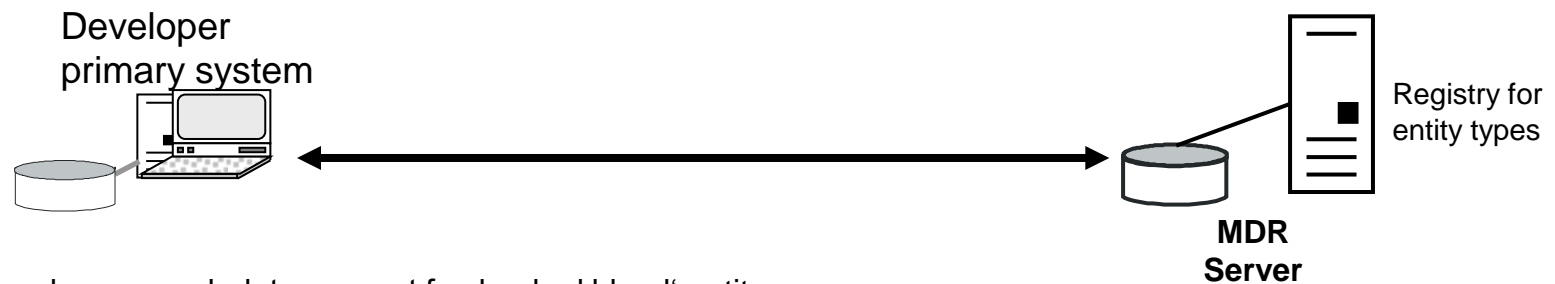
Objective

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

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

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

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

Execute WS	
ExecuteDerivation	Führt eine Berechnungsvorschrift aus.

Results

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- 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

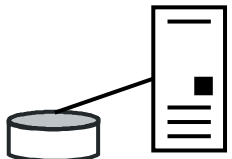
Form generator

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 - 15th International Open Forum on Metadata
M. Sc. B. Rimatzki, Prof. Dr. P. Haas



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 - 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!



