Gemeinsame HL7/IHE Jahrestagung 2011:
Gemeinsam stark!
26.-28. Oktober 2011, Hotel Freizeit In, Göttingen

Infrastrukturstandards für Interoperabilität

Bernd Blobel

PhD, Associate Professor, FACMI, HL7 Fellow
Head, eHealth Competence Center, University Hospital Regensburg, Germany
Chair HL7 Germany
Chair, EFMI Working Groups “EHR” and “Security, Safety and Ethics
Chair, CEN/ISSS eHealth Standardization Focus Group
Chair, German Health Informatics Standards Committee
Head of the German Delegation to ISO and CEN
Chair, GMDS Working Groups “Standards for Interoperability and EHR”
Co-Chair ,GMDS Working Group “Datenschutz in Gesundheitsinformationssystemen”
Leiter, GDD-Arbeitskreis “Datenschutz und Datensicherheit im Gesundheitsd- und Sozialwesen”

Definition

- Interoperability is the ability of two or more principals (actors, such as person, organization, system, device, application, component) to cooperate for achieving common business objectives.
- Thereby, the entire information cycle from observation (data) through interpretation (information) up to action has to be processed.

Interoperability Levels

Interoperability Level	Instances
Technical interoperability	Technical plug&play, signal- & protocol compatibility
Structural interoperability	Simple EDI, envelopes
Syntactic interoperability	Messages, clinical documents, agreed vocabulary
Semantic interoperability	Advanced messaging, common information models and terminology
Organizations/Service interoperability	Common business process

Important SDOs in the Context of eHealth

- International Organization for Standardization (ISO TC 215)
- International Electrotechnical Commission (IEC)
- European Standardization of Health Informatics (CEN TC 251, CEN ISSS)
- European Telecommunications Standards Institute (ETSI)
- Object Management Group (OMG)
- ASTM International
- International Tele-communications Union (ITU)
- World Wide Web Consortium (W3C)
- The Open Group (TOG)
- Organization for the Advancement of Structured Information Standards (OASIS)
- openEHR Foundation
- Institute of Electrical and Electronics Engineers (IEEE)
- United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT)
- European Committee for Electrotechnical Standardization (CENELEC)
- Digital Imaging and Communications in Medicine (DICOM)
- World Health Organization (WHO)
- Health Level 7 International
- (Integrating the Healthcare Enterprise (IHE))

SDOs Specialized for Spec Types

Specification Type	SDOs (Selection)
Domain crossing technical/technological standards	ISO/IEC, ETSI, NIST
Domain specific specifications	HL7, ISO TC 215, CEN TC 251, ASTM, IHTSDO, WHO
Domain crossing architecture related specifications	OMG, TOG
Domain crossing process related specifications	OASIS
Internet related specifications	W3C, IETF
Business/trading specifications and instances	UN, CENELEC, GS1

The European Standardization System

- The European standardization system is lead by three European standardization bodies:

CEN - European Committee for Standardisation

CENELEC - European Committee for Electrotechnical Standardization

ETSI - European Telecommunications Standards Institute

- The European standardization is a coherent system based on the principle of national delegation.

EU Standardization Revision

- CEN and CENELEC are European organizations made up of national standards bodies (NSBs), which are members of CEN and of CENELEC
- ETSI is based on direct participation of industry (without NSBs or other intermediaries) and also foresees national votes on European standards.

- Commission proposal for a Regulation revising the regulatory framework of standardization in Europe and amending Council Directives 89/686/EEC, 93/15/EC and Directives 98/9/EC, 94/25/EC, 95/16/EC, 98/34/EC, 2004/22/EC, 2009/105/EC and 2009/23/EC

Reliability of Standards

- Norms (CEN, ETSI, CEN-ELEC, NEN, BSI, DIN)
- Standards
  - de jure standards (ISO, HL7, OASIS, IHTSDO, UN-CEFACT)
  - Industry standards (DICOM, OMG, Continua, Liberty Alliance,
  - de facto standards (Windows)

Types of Standards

- Technical Reports
- Technical Specifications
- International Standards

- Narrative specifications
- Semiformal specifications
- Formal specifications
- Platform-independent specifications
- Platform-specific specifications

Standards and Publicly Available Specifications (PAS)

- Domain-Independent Specifications
- Domain-Specific Specifications
- General Specifications
- Application-Related Specifications
- Infrastructural Specifications
- Architecture Standards
- Modelling and Methodology Standards
- Requirements Standards
- Communication Standards
- Infrastructure Standards
- Privacy Standards
- Safety Standards
- Token Standards
- Quality Standards
- Policy Standards
- Terminology and Ontology Standards
- ID Management Standards

Standards Classification Health Informatics (1/2)

- Architecture standards
  - TOGAF, ISO/IEC 10746, CORBA, MDA, HISA, OASIS Reference Model for SOA, OASIS Ref. Architecture for SOA Foundation, …
- Modeling standards
  - UML, ISO/IEC 19793 UseUML4ODPSpec, ISO/IEC 15414 (ODP-RM Enterprise Language), ISO 25720 Genomic sequence variation markup language
- Process standards
  - RUP, The Open Group Service Integration Maturity Model, SOA Governance Framework
- Communication standards
  - HL7 v2.x/3, ISO 17113 Health informatics – Exchange of information between healthcare information systems – Development of messages, ISO/ IEEE 11073 Health informatics -- Point-of-care medical device communication, UN CEFACT, ebXML
- Terminology and ontology standards
  - UMLS, LOINC, SNOMED, SOA Ontology Infrastructure standards

Standards Classification Health Informatics (2/2)

- Requirements Standards
  - EHRS FM, SFM, DAMs
- Infrastructure standards
  - LOINC, ASTM E1714-00: “Standard guide for properties of a Universal Healthcare Identifier”
  - ISO 17090: “Public key infrastructure”, ETSI TS 101733: “Electronic Signature Formats”
- Privacy standards
  - ASTM E1987-98: “Standard guide for individual rights regarding health information”, CEN 13729: “Secure user identification - Strong authentication using microprocessor cards”; ISO/IEC PDTS Pseudonymisation Practices for the Protection of Personal Health Information and Health Related Services
- Safety standards
  - CEN 13694: “CEN Report: Safety and security related software quality standards for healthcare”; ISO/DTS 25238 Classification of Safety Risks

Who Cares for the Harmonization of Standards and PAS and Provides Proof of Concepts?

- Joint Interoperability Council
- Intergating the Healthcare Enterprise (IHE)
  - Definition of use cases
  - Selection of the base standards
  - Specification of integration profiles
  - Commenting and approving the specs
  - Proof of concepts at IHE Connet-A-Thons

- Just a few SDOs provide proof of concepts by aproving only successfully implemented standards:
  - Object Management Group (OMG)
  - Integrating the Healthcare Enterprise (IHE)

IHE IT Infrastructure

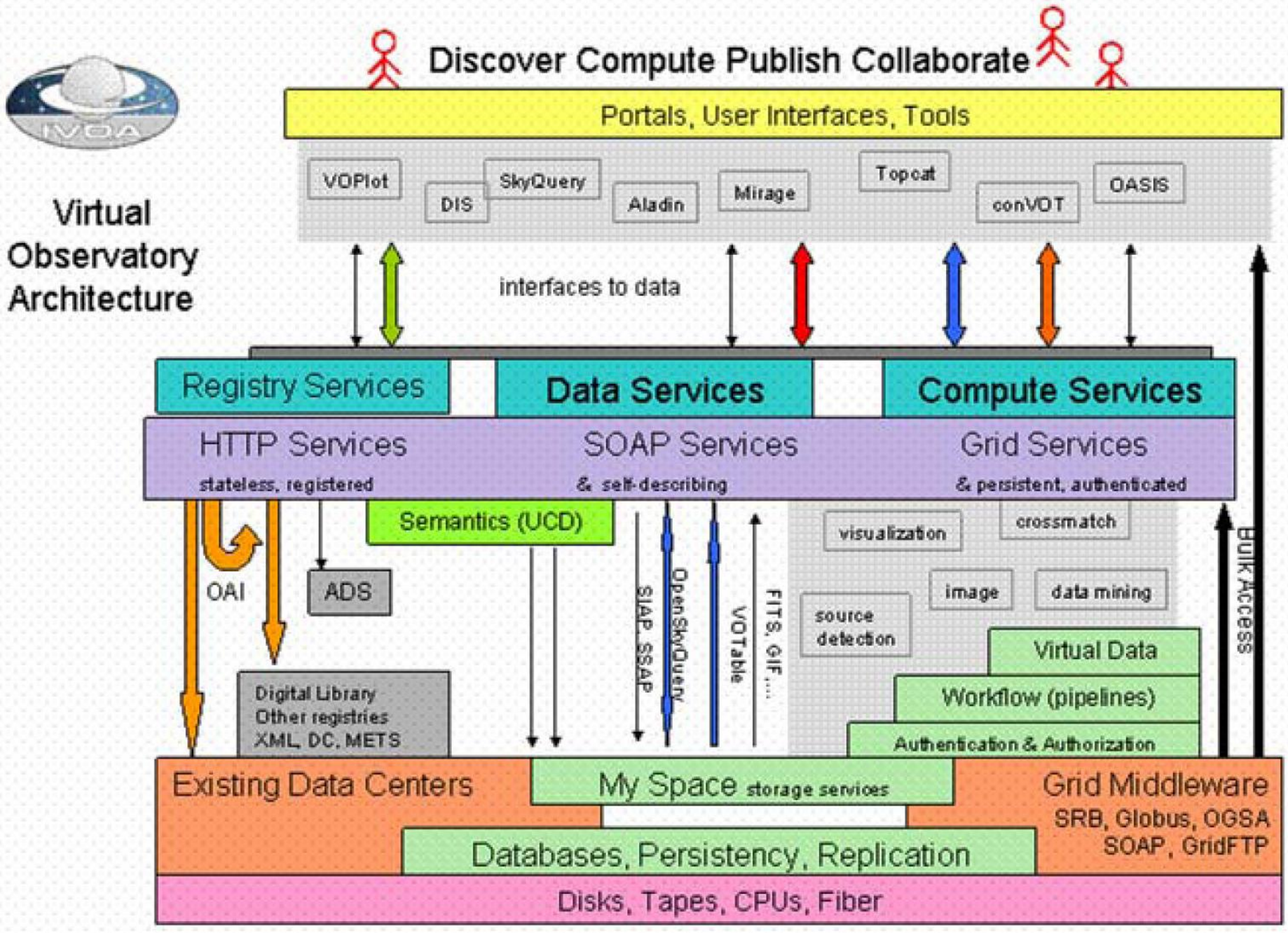
- Audit Trail and Node Authentication (ATNA)
- Basic Patient Privacy Consents (BPPC)
- Consistent Time (CT)
- Cross-Community Access (XCA)
- Cross-Enterprise Document Media Interchange (XDM)
- Cross-Enterprise Document Reliable Interchange (XDR)
- Cross-Enterprise Document Sharing (XDS.b)
- Cross-Enterprise Sharing of Scanned Documents (XDS-SD)
- Cross-Enterprise User Assertion (XUA)
- Enterprise User Authentication (EUA)
- Multi-Patient Queries (MPQ)
- Patient Administration Management (PAM)
- Patient Demographic Query HL7 V3 (PDQ V3)
- Patient Demographics Query
- Patient Identifier Cross-Referencing (PIX)
- Patient Identifier Cross-Reference HL7 V3 (PIX V3)
- Patient Synchronized Applications (PSA)
- Personnel White Pages (PWP)
- Retrieve Information for Display (RID)

Integration Platforms

Bernd Blobel
eHealth Competence Center
University Hospital Regensburg

Relevant Technologies

- Service Oriented Architecture (SOA)
- Integration Platform
- Enterprise Service Bus (ESB)
- Web Services
- Business Process Management
- Business Activity Monitoring
- Enterprise Information Integration (EII)


Virtual Observatory Architecture
Discover Compute Publish Collaborate
Portals, User Interfaces, Tools
VOPlot
DIS
SkyQuery
Aladin
Mirage
Topcat
conVOT
OASIS
interfaces to data
Registry Services
Data Services
Compute Services
HTTP Services
stateless, registered
SOAP Services
& self-describing
Grid Services
& persistent, authenticated
Semantics (UCD)
OAI
ADS
SIAP, SSAP
OpenSkyQuery
VOTable
FITS, GIF, ...
visualization
crossmatch
image
data mining
source detection
Virtual Data
Workflow (pipelines)
Authentication & Authorization
BULK Access
Digital Library
Other registries
XML, DC, METS
Existing Data Centers
My Space storage services
Grid Middleware
SRB, Globus, OGSA
SOAP, GridFTP
Databases, Persistency, Replication
Disks, Tapes, CPUs, Fiber

Relevant Protocols

- Web-based Distributed Authoring and Versioning (WebDAV)
- Hypertext Transfer Protocol (HTTP)
- Simple Object Access Protocol (SOAP)
- Universal Description, Discovery and Integration (UDDI)
- Simple Mail Transfer Protocol (SMTP)
- Post Office Protocol (POP)3
- Internet message access protocol (IMAP)
- Network News Transfer Protocol (NNTP)

Typical Data Sources

- SQL
- XML exposed via URIs
- Free Text

Universal Integration Platform Solutions

- Virtuoso Universal Server from OpenLink Software
- Ensemble from InterSystems
- Prova

Conclusions1

- Distributed cooperating health services require advanced infrastructural services for enabling interoperability in a flexible, scalable, heterogenous and intelligent environment.
- All systems have to be architecture-centric and policy-driven.
- Interoperability is based on shared knowledge. Knowledge management und representation are therefore crucial challenges to be mastered.
- Cooperation for meeting the business objective requires different interoperability levels from structural up to service interoperability.
- For many aspects, international standards are available or under development.

Conclusions 2

- “Personal Care“ and individualized ubiquitous health services extend eHealth towards pervasive and autonomous systems, requiring the integration of personal, body-worn or implanted mobile systems as part of the eHealth infrastructure.
- Mobile Body Area Networks provide an essential platform for future personal, ubiquitous health systems.
- Interoperability of personal mobile systems covers all layers of the ISO/OSI Reference Model for Open Systems‘ Communication, including terminology, knowledge concepts, coding aspects, etc.
- The CEN/ISO/ IEEE 11073 Standards family also offers corresponding profiles usable for personalized systems.

Conclusions 3

- Distributed environments require platforms with corresponding infrastructure services. Accepted platforms are Common Object Management Broker, Enterprise Service Bus, InfoSphere, Sun Java™ Composite Application Platform Suite, BizTalk, SharePoint, …
- Despite extending the HL7 scope, the cooperation with many different SDOs is inevitable for enabling interoperability.

Conclusions 4

- Security, safety and privacy services are essential infrastructure services to enable interoperability.
- One challenges is the huge number of identifying properties and information, which leads to privacy problems regarding the de-identification.
- Micro and nano systems are essential components for personal care, requiring an extension of existing approaches and interoperability chains.
- Personal care requires the integration of Medical Informatics, Telemedicine, Biomedical Engineering and Bioinformatics/Genomics.

Personal health is unquestionably accompanied by huge ethical challenges.

Vielen Dank für Ihre Aufmerksamkeit!

Bernd Blobel, PhD, Associate Professor
eHealth Competence Center
University of Regensburg Medical Center
Franz-Josef-Strauss-Allee 11
D-93042 Regensburg, Germany
Email: bernd.blobel@klinik.uni-regensburg.de
Phone: +49-941-944 6769
Fax: +49-941-944 6766
http://www.ehealth-cc.de