

KLINIKUM
DER
UNIVERSITÄT
REGENSBURG
Anstalt des öffentlichen Rechts



Contact
University of Regensburg Medical Center
eHealth Competence Center
Franz-Josef-Strauß-Allee 11
93053 Regensburg
Germany

Ontology driven architectures

Bernd Blobel, PhD, Associate Professor
eHealth Competence Center Regensburg, Germany

Head, eHealth Competence Center

Chair, HL7

Chair CEN/ISSS eHealth Standardization Focus Group

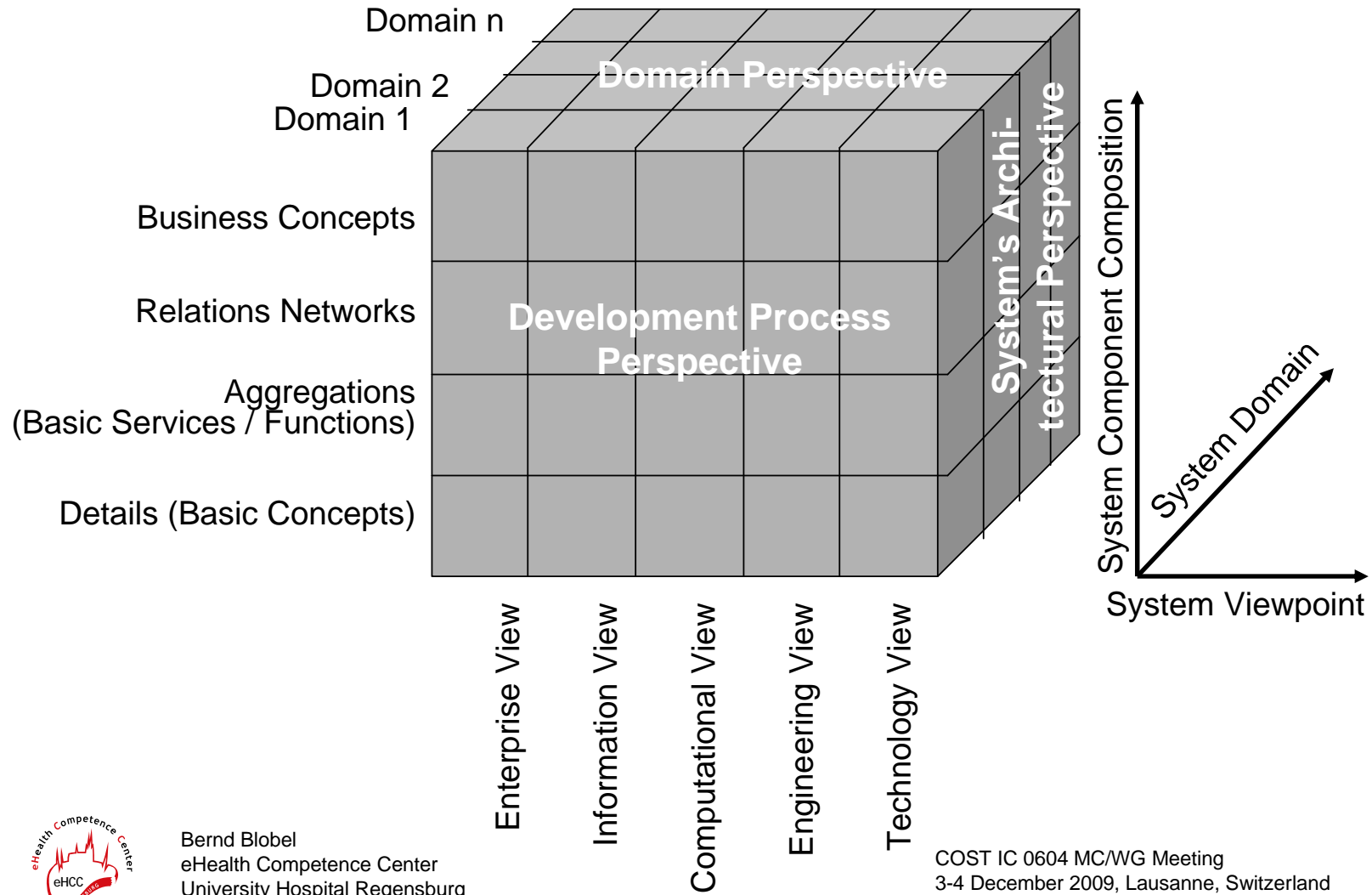
Chair EFMI WGs "Electronic Health Records" and "Security, Safety and Ethics"

Chair of the German Health Informatics Standards Committee

Head of German Delegation to ISO and CEN

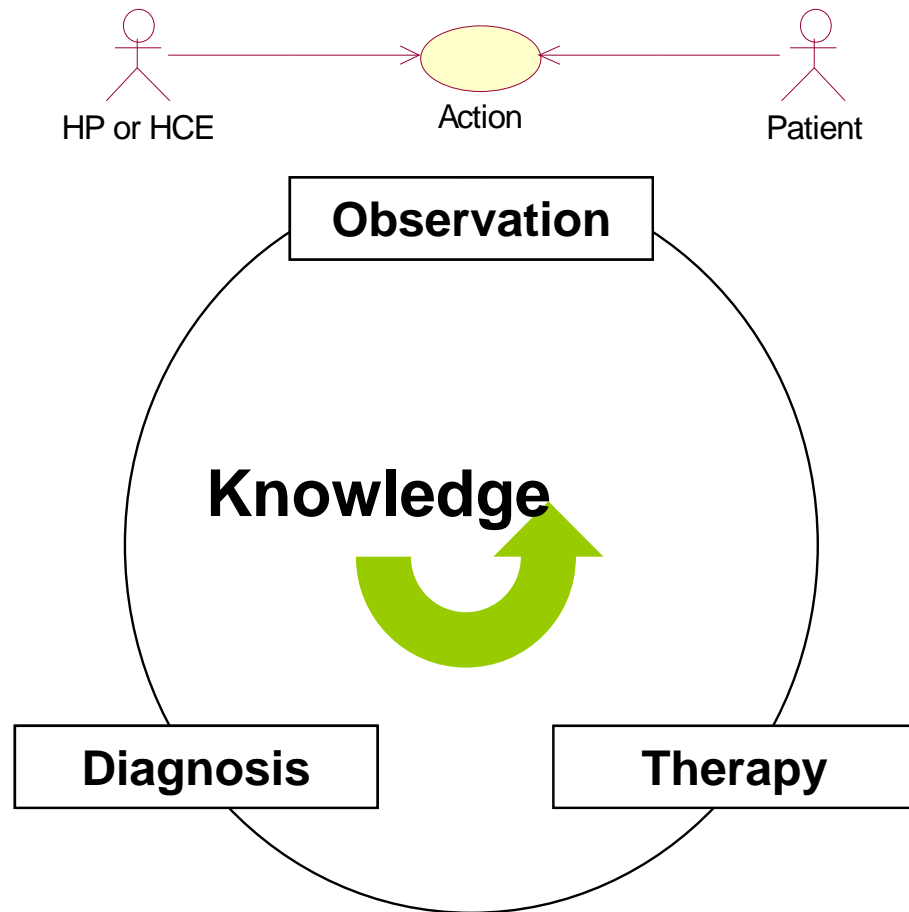
COST IC 0604 MC/WG Meeting
3-4 December 2009, Lausanne, Switzerland

Generic Component Model (GCM)



Bernd Blobel
eHealth Competence Center
University Hospital Regensburg

COST IC 0604 MC/WG Meeting
3-4 December 2009, Lausanne, Switzerland



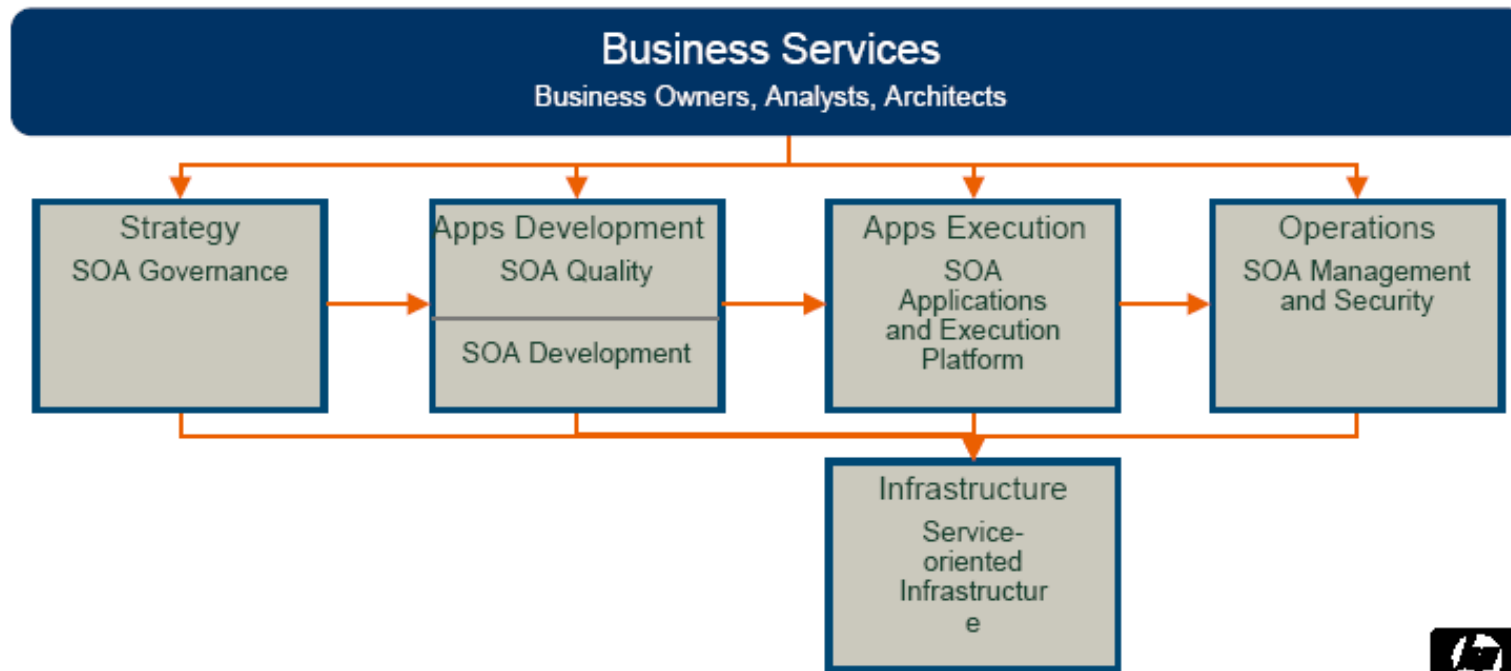
Interoperability Levels

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



SOA Transformation Requires more than Middleware

Critical need:
Manage and transform organization, processes and technologies



Service Aware Enterprise Architecture Framework (SAEAF)



Bernd Blobel
eHealth Competence Center
University Hospital Regensburg

COST IC 0604 MC/WG Meeting
3-4 December 2009, Lausanne, Switzerland

The Goal of the HL7 Enterprise Architecture

Working Interoperability

In the end, this is what we need for any interoperability:

- Definition of Information to be exchanged
- Definition of Functions by which the information is exchanged
- Mappings to Real World Events and Business Processes
- Reference Terminology / Language for understanding these things
- Engineering / Technology Bindings to deliver these things

HL7 and its Standardized Specifications should deliver these things for stakeholders so that actual Implementations may be built



Bernd Blobel
eHealth Competence Center
University Hospital Regensburg

COST IC 0604 MC/WG Meeting
3-4 December 2009, Lausanne, Switzerland

The SAEAF: *The HL7 Specification Stack – Detail of the Specification and Conformance Patterns*

Specification	Enterprise / Business Viewpoint	Information Viewpoint	Computational Viewpoint	Engineering Viewpoint	Conformance Level
<i>Reference</i>	EHR-FM, Clinical Statements	RIM, Structured Vocab, ADTs	EHR-FM	-	<i>Reference</i>
<i>Analysis</i>	Business Context, Reference Context	DIM	Dynamic Blueprint, Functional Profile(s)	N/A	<i>Blueprint</i>
<i>Conceptual Design</i>	Business Governance	CIM, LIM	Dynamic Model, Interface Specification	N/A	<i>Platform Independent</i>
<i>Implementable Design</i>	N/A	Transforms, Schema	Orchestration, Interface Realization	Execution Context, Specification Bindings, Deployment Model	<i>Platform Specific</i>

SAEAF Value Proposition: *Working Interoperability*

- 1: Introduction and Overview
 - SAEAF Structural Components
 - SAEAF Organizational Implications
- 2: Behavioral Framework
 - Contracts, Roles, Collaborations
 - Implementation Patterns for the BF
 - Mapping to HL7 Dynamic Model
 - More topics possible as deck is developed (Feb 09)

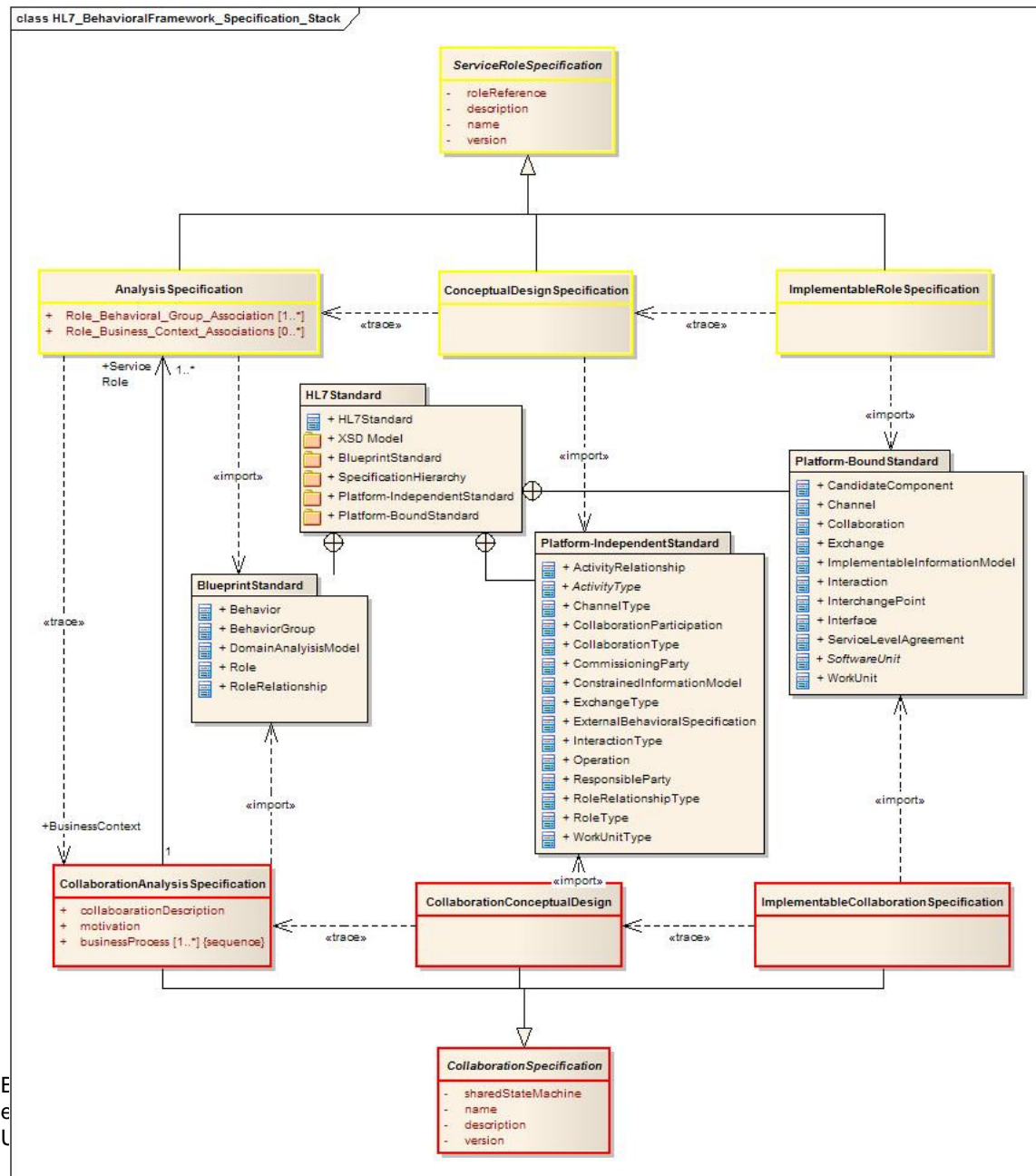


SAEAF Value Proposition: *Working Interoperability*

- 3: Enterprise Conformance/Compliance Framework (ECCF)
 - The ECCF Specification Stack and associated concepts
 - Conformance (Statements vs Assertions)
 - Compliance
 - Consistency
 - Certification (Conformance vs Compliance)
 - Traceability
 - Jurisdiction
 - Provenance
 - Building specifications using the Specification Stack
 - ECCF and Governance



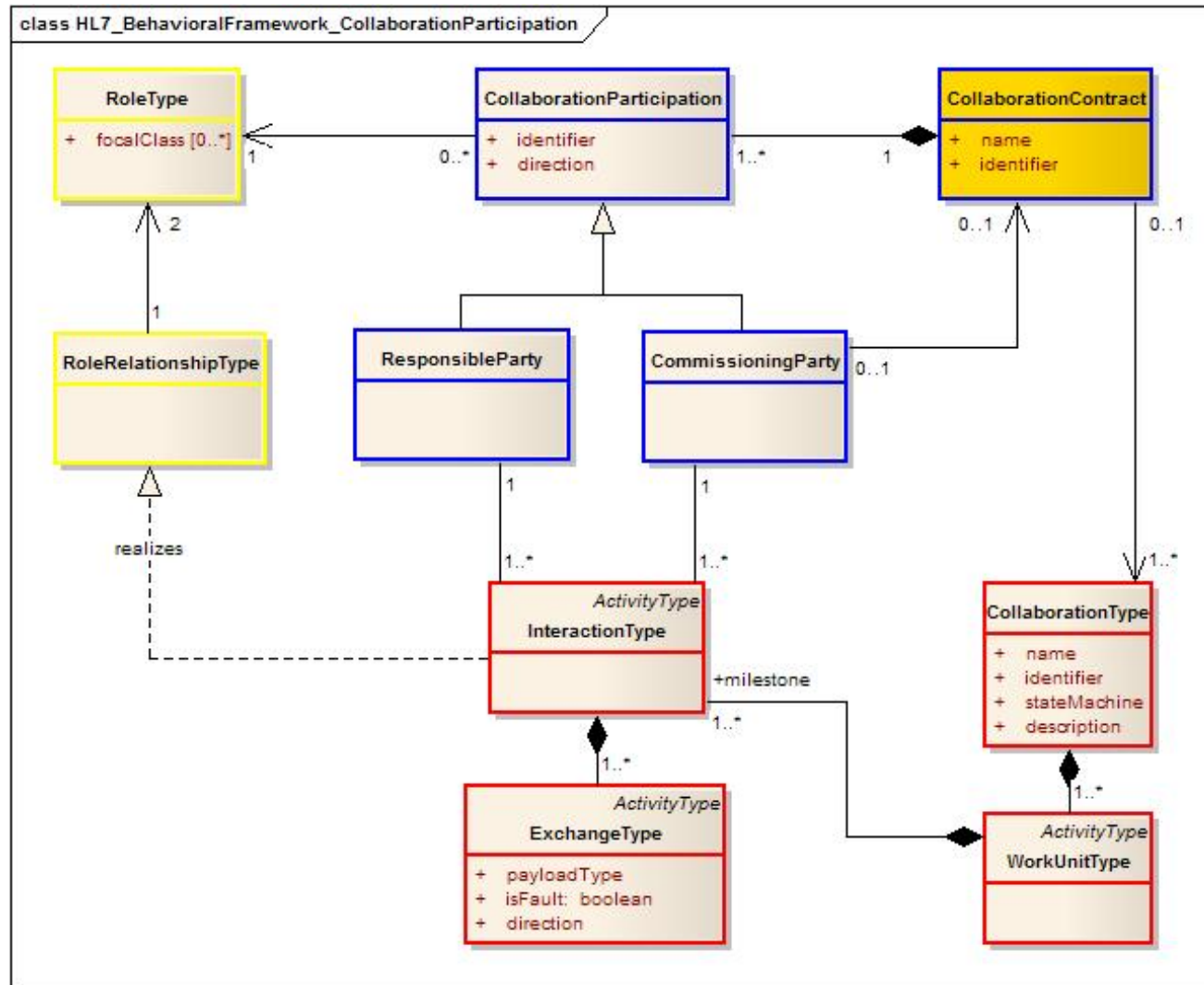
HL7 Specification Stack



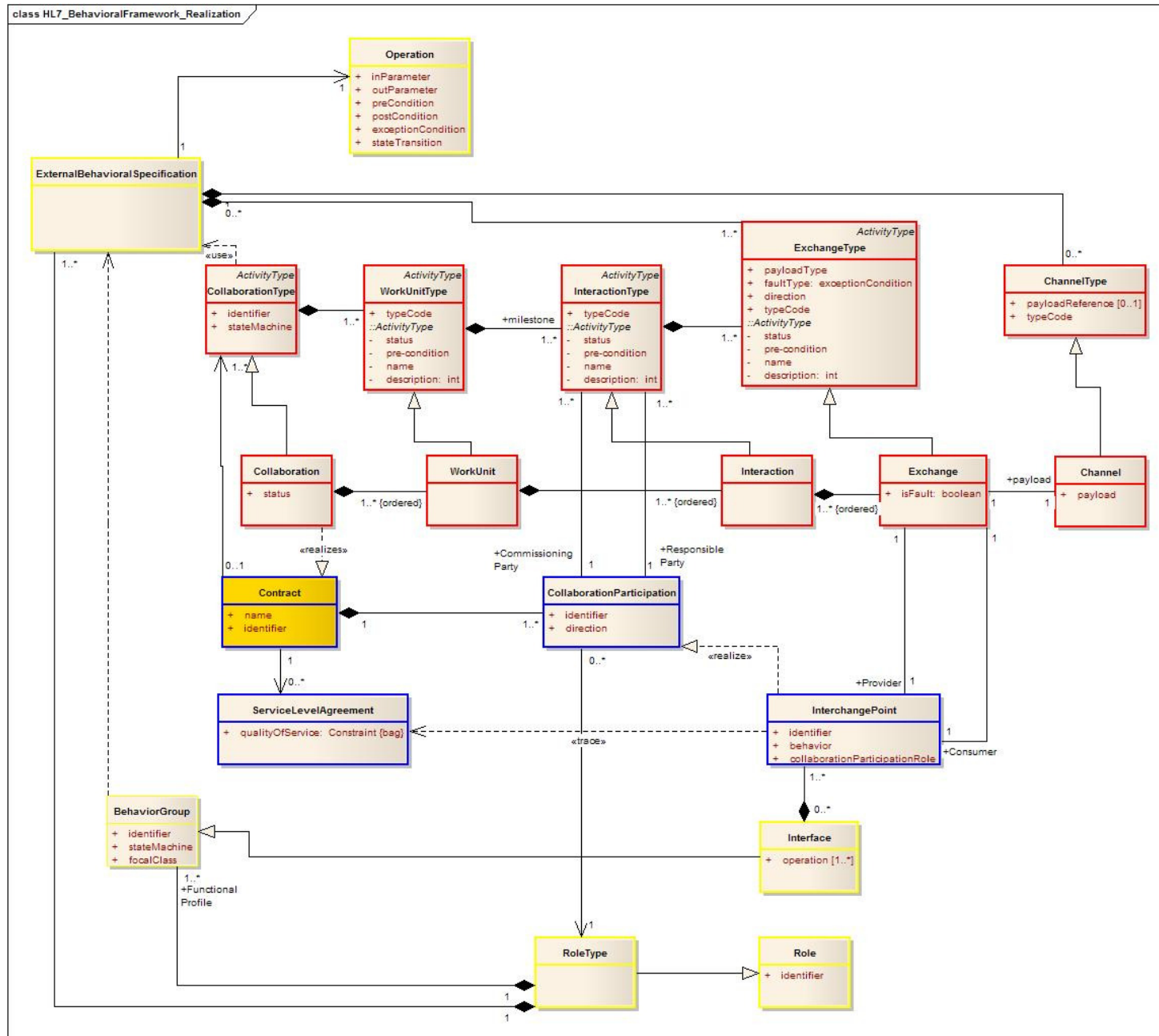
E
G
U

Meeting
Zürich, Switzerland

Collaboration Participation (Overview)



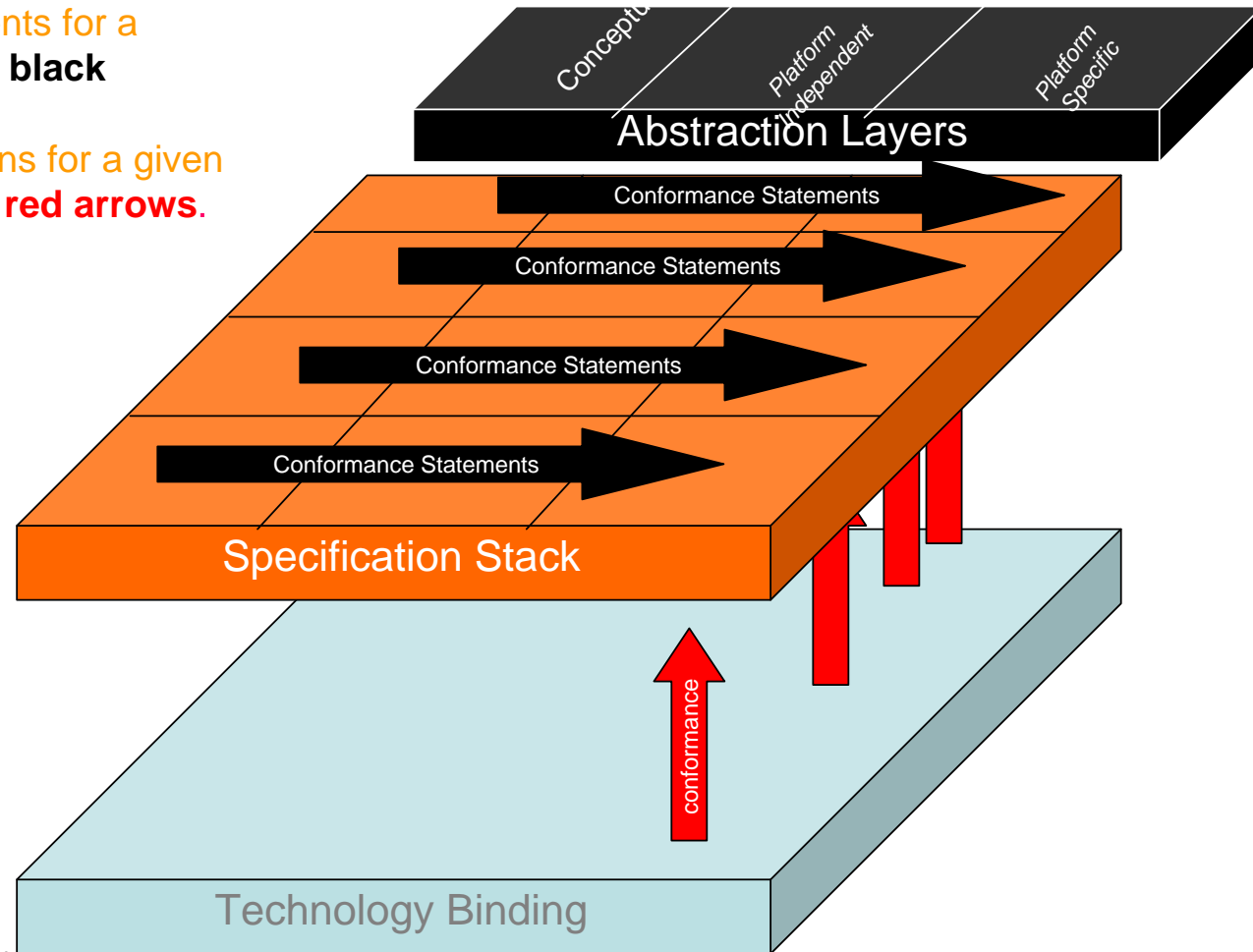
Collaboration Participation (Detail)



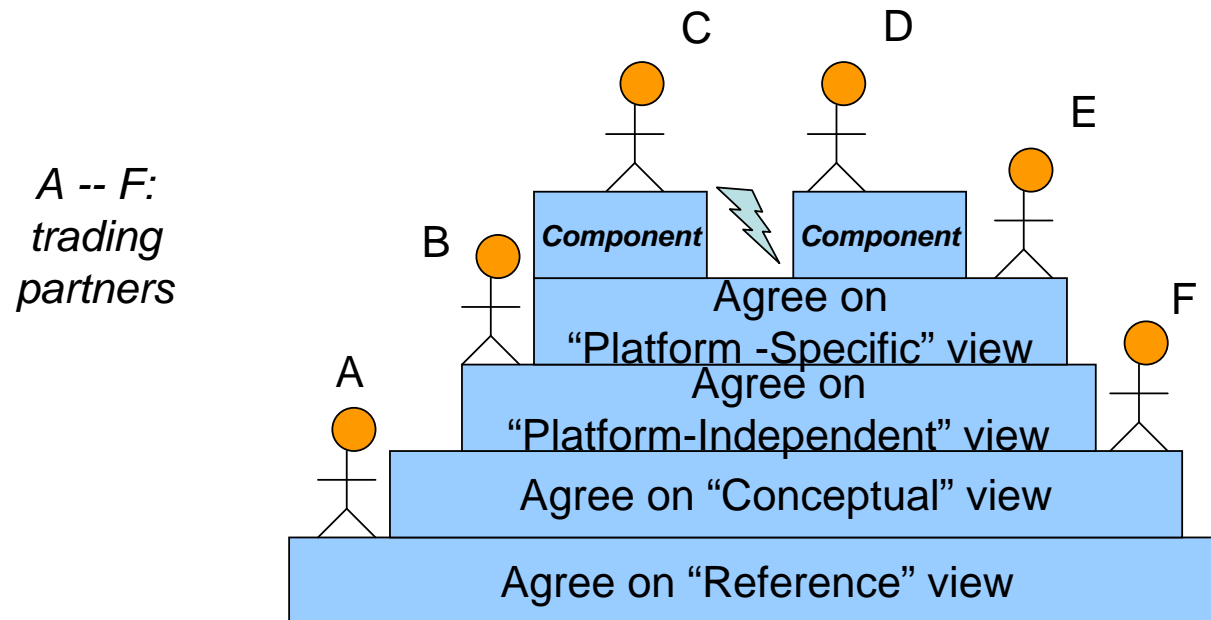
Testable Conformance in a Specification Stack

Conformance Statements for a given SS are shown in **black arrows**,

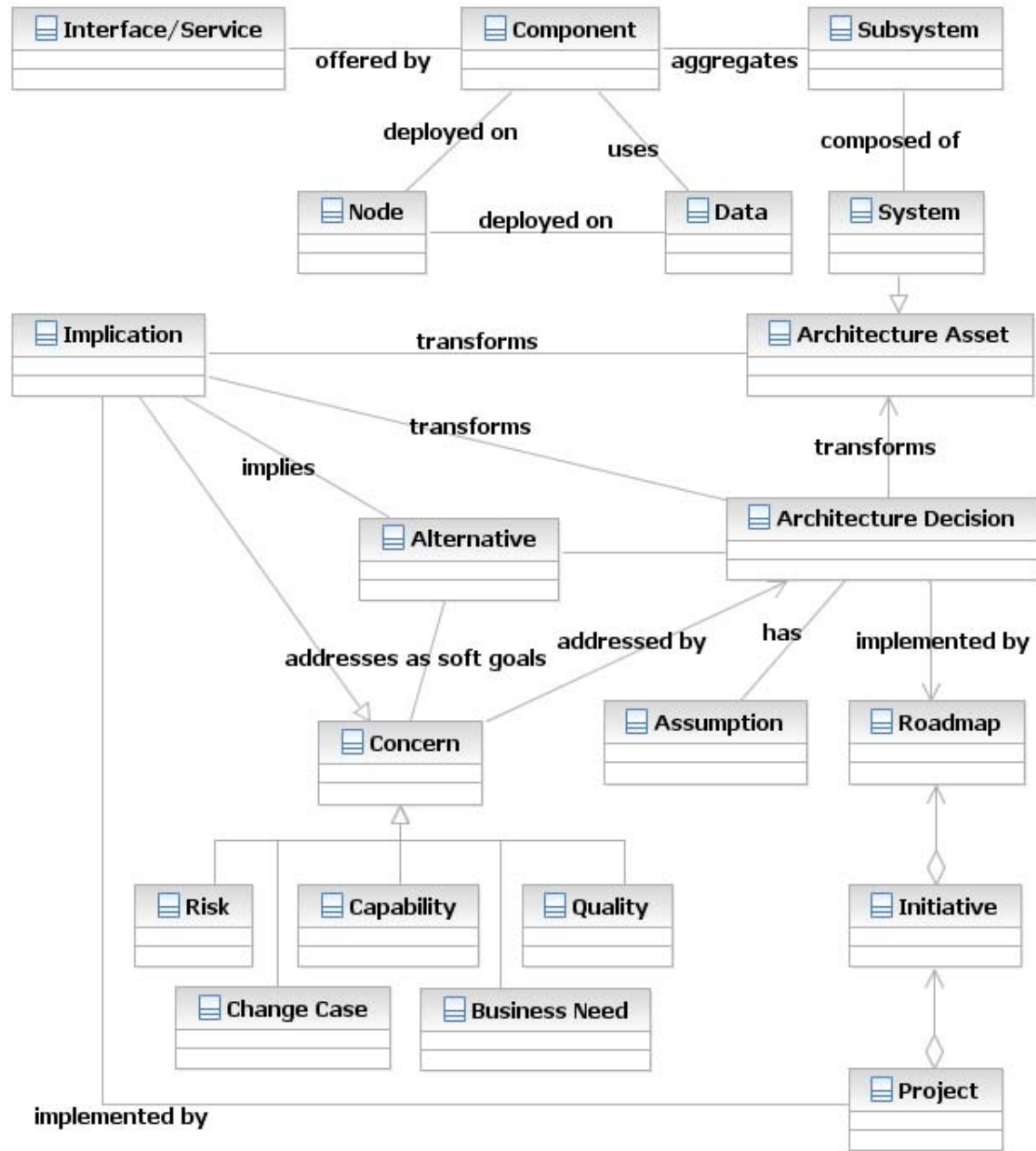
Conformance Assertions for a given Technology Binding in **red arrows**.



SAEAF Value Proposition (3): *Working Interoperability*



- *Interoperability*: the deterministic exchange of data/information in a manner that preserves shared meaning
- Two "trading partners" interoperate based on a certified "level of shared compliance" to interoperability specifications/standards
- Certified "level of conformance" determine degree of *automated* interoperability that is possible and/or difficulty of the *transformations* that are required to enable interoperability



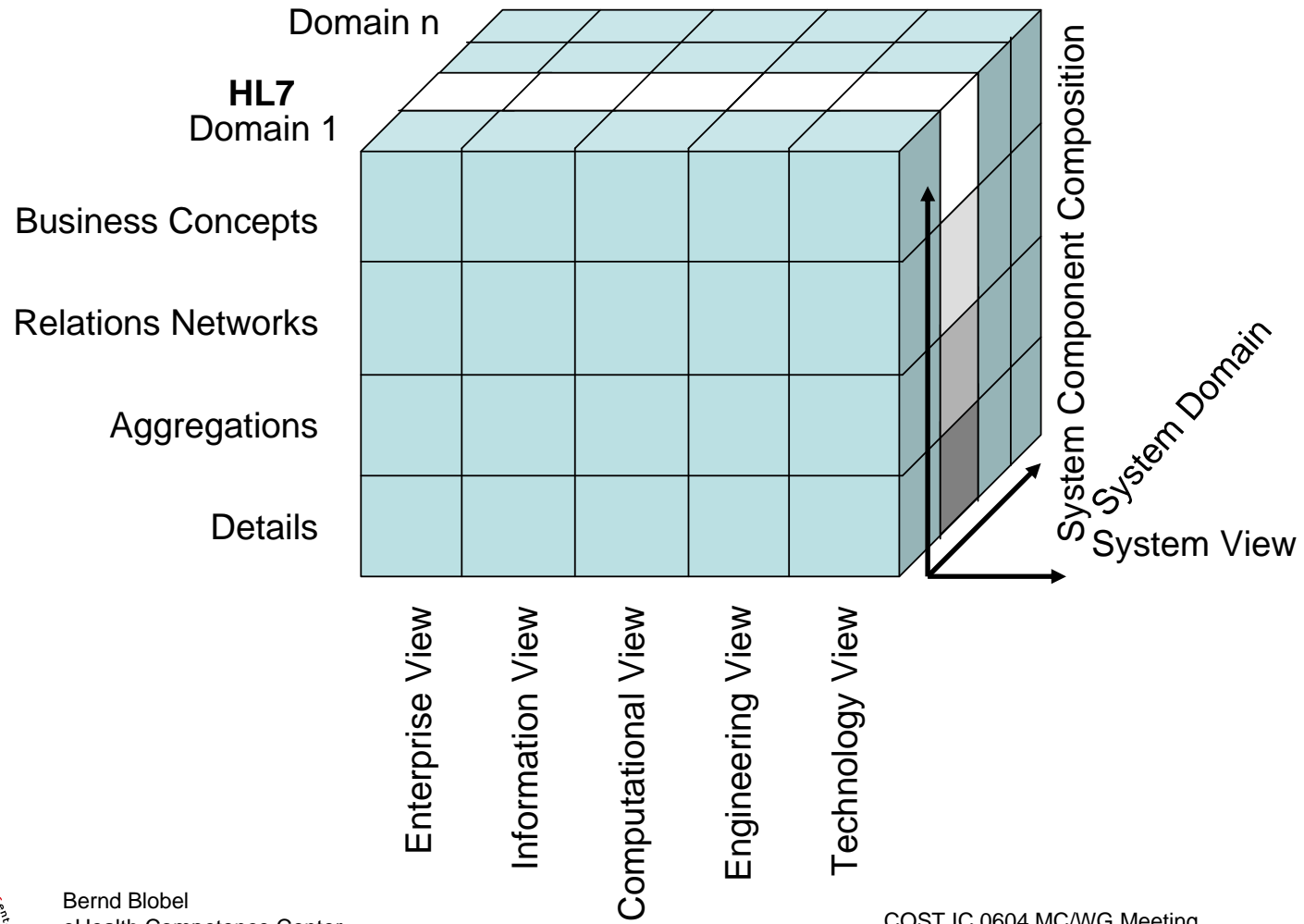
ICT Ontology

(after Akerman)

Conclusions for Issues Missing

- Interoperability is more than technology.
- For mastering the domain business requirements, we have to represent the business domain properly. This requires the inclusion of /reference to ontologies.
- The domain ontology must be represented properly following a hierarchical system of ontologies.
- The resulting ontology-driven architecture must master ontology management and ontology harmonization (mapping, bridging, etc.).



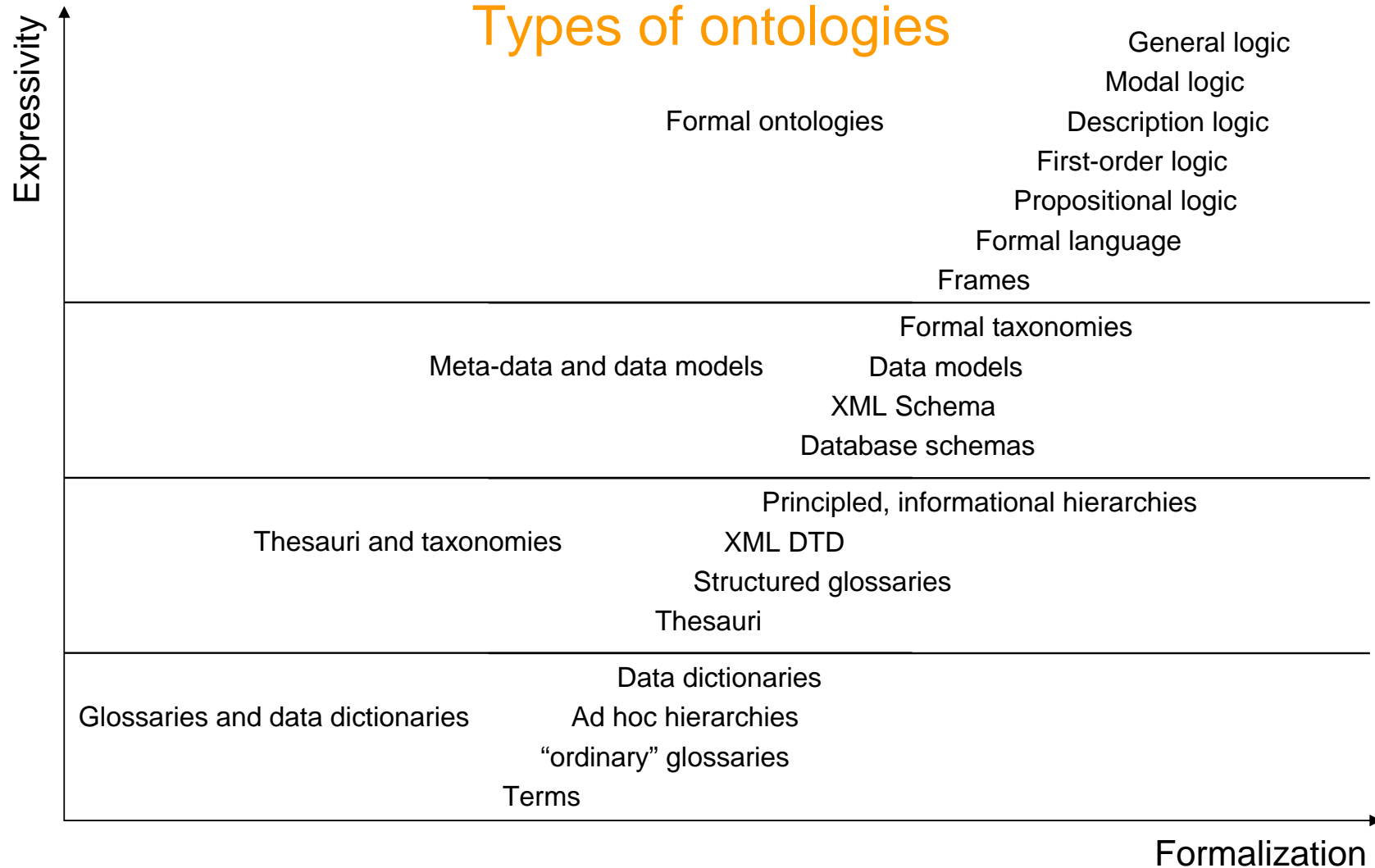


Ontology Hierarchy

- Using a computation-independent approach, the domain knowledge for performing a specific business has to be represented defining Business Domain, Business Process, Location, Business Organization, Event, and Business Motivation regarding meta-models, concepts and relationships.
 - general ontologies
 - upper level ontologies
 - domain ontologies
 - application ontologies
 - ICT ontology



Types of ontologies



Goal				
<i>Topic Specification</i>	Enterprise / Business Viewpoint	Information Viewpoint	Computational Viewpoint	Engineering Viewpoint
<i>Conceptual</i>	Business Context, Reference Context	Concepts from Domain Analysis (Information) Model	Collaboration Analysis, Functional Profile(s), Service Roles and Relationships	Existing Platform capabilities, essential requirements regarding compatibility
<i>Platform Independent (logical)</i>	Business Governance	Project-oriented Domain Information Model, Constrained Information Model, Localized Information Model, Hierarchical Message Definition	Collaboration Types, Interface Specification and Functional Groups, Interaction Types and Collaboration Participations, Contracts Parts	Existing Platform models, libraries, intended transparencies of the platform.
<i>Platform Specific (implementable)</i>	Rules, Procedures	Localized Information Model, Schema	Collaboration scripts, Orchestrations, Realized Interfaces	Execution Context (channels, stubs, binders, protocols, and interceptors), Transforms, Deployment Model
IP differences appear at the PIM level				

After Zachman

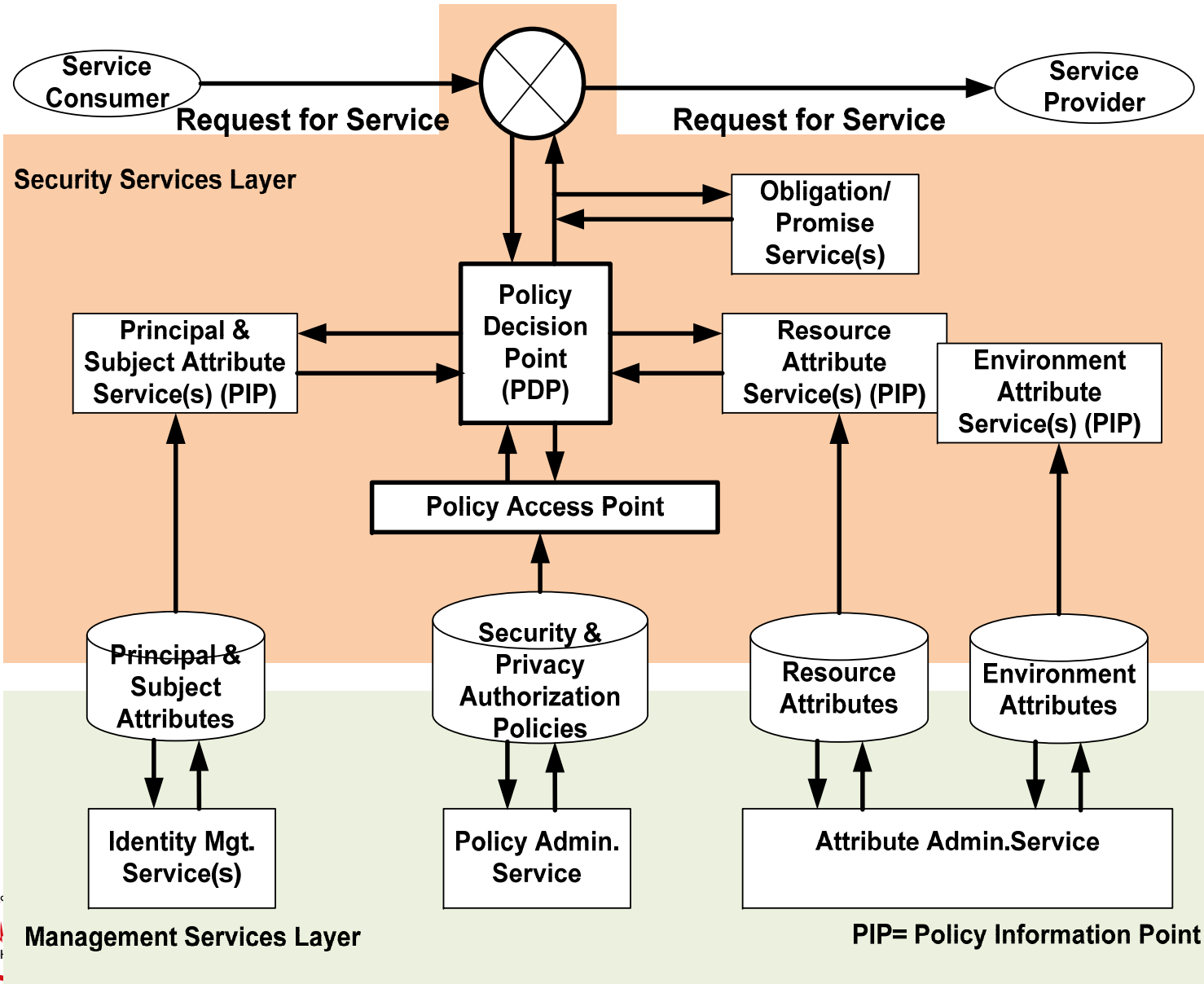
	WHAT DATA	HOW FUNCTION	WHERE NETWORK	WHO PEOPLE	WHEN TIME	WHY MOTIVATION
SCOPE (contextual)	List of Things Important to the Business  Entity = Class of Business Thing	List of Processes the Business Performs  Process = Class of Business Process	List of Locations in Which the Business Operates  Node = Major Business Location	List of Organizations Important to the Business  People = Major Organizational Unit	List of Events/Cycles Significant to the Business  Time = Major Business Event/Cycle	Lists of Business Goals/Strategies  Ends/Means = Major Business Goal/Strategy
Planner						
BUSINESS MODEL (conceptual)	e.g., Semantic Model  Entity = Business Entity Relationship = Business Relationship	e.g., Business Process Model  Process = Business Process I/O = Business Resources	e.g., Business Logistics System  Node = Business Location Link = Business Linkage	e.g., Work Flow Model  People = Organization Unit Work = Work Product	e.g., Master Schedule  Time = Business Event Cycle = Business Cycle	e.g., Business Plan  End = Business Objective Means = Business Strategy
Owner						
SYSTEM MODEL (logical)	e.g., Logical Data Model  Entity = Data Entity Relationship = Data Relationship	e.g., Application Architecture  Process = Application Function I/O = User Views	e.g., Distributed System Architecture  Node = I/S Function (Processes, Storage, etc.) Link = Line Characteristics	e.g., Human Interface Architecture  People = Role Work = Deliverable	e.g., Processing Structure  Time = System Event Cycle = Processing Cycle	e.g., Business Rule Model  End = Structural Assertion Means = Action Assertion
Designer						
TECHNOLOGY MODEL (physical)	e.g., Physical Data Model  Entity = Segment/Table/etc. Relationship = Pointer/Key/etc.	e.g., System Design  Process = Computer Function I/O = Data Elements/Sets	e.g., Technology Architecture  Node = HW/System Software Link = Line Specifications	e.g., Presentation Architecture  People = User Work = Screen Formats	e.g., Control Structure  Time = Execute Cycle = Component Cycle	e.g., Role Design  End = Condition Means = Action
Builder						
DETAILED REPRESENTATIONS (out-of-context)	e.g., Data Definition  Entity = Field Relationship = Address	e.g., Program  Process = Language Statement I/O = Control Block	e.g., Network Architecture  Node = Address Link = Protocol	e.g., Security Architecture  People = Identity Work = Job	e.g., Timing Definition  Time = Interrupt Cycle = Machine Cycle	e.g., Rule Specification  End = Sub-condition Means = Step
Subcontractor						
FUNCTIONING ENTERPRISE	e.g.: DATA	e.g.: FUNCTION	e.g.: NETWORK	e.g.: ORGANIZATION	e.g.: SCHEDULE	e.g.: STRATEGY

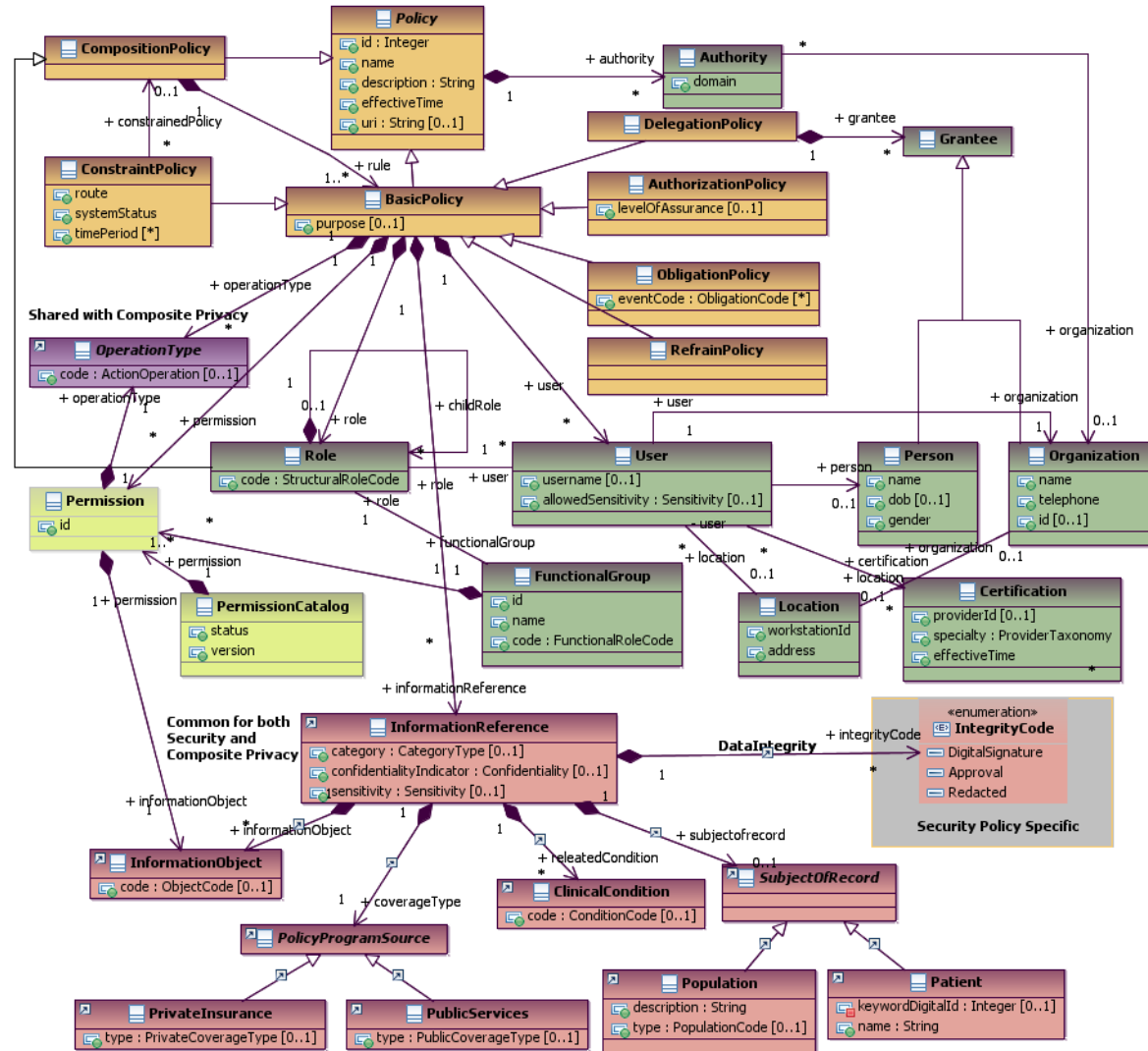
EHR-S Function Model At a Glance

Direct Care	C1.0	Care Management
	C2.0	Clinical Decision Support
	C3.0	Operations Management and Communication
Supportive	S1.0	Clinical Support
	S2.0	Measurement, Analysis, Research, Reporting
	S3.0	Administrative and Financial
Information Infrastructure	I 1.0	EHR Security
	I 2.0	EHR Information and Records Management
	I 3.0	Unique identity, registry, and directory services
	I 4.0	Support for Health Informatics & Terminology Standards
	I 5.0	Interoperability
	I 6.0	Manage business rules
	I 7.0	Workflow



Policy Enforcement Point (PEP)



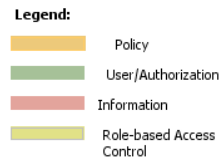
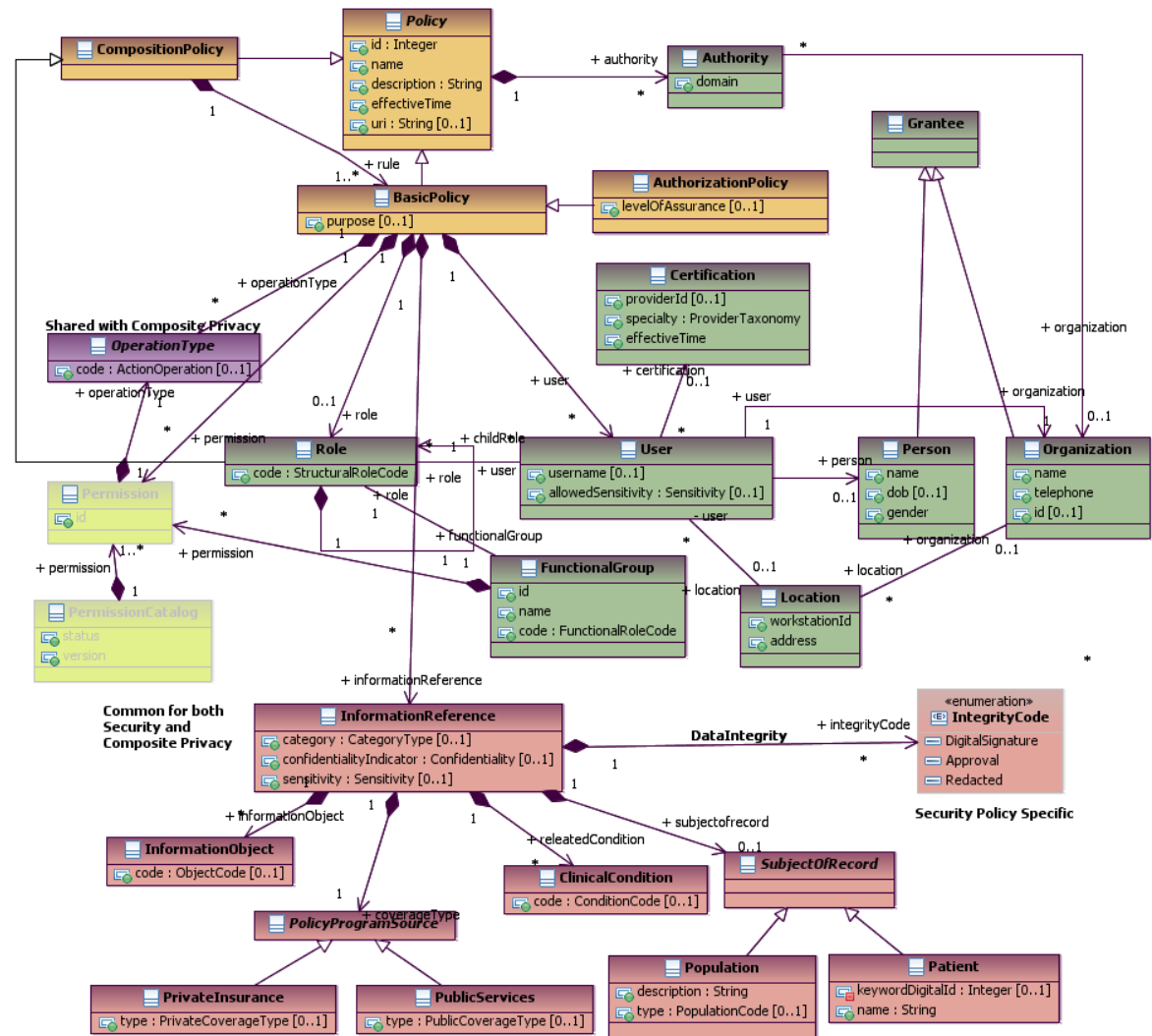


- Legend:**
- Policy
 - User/Authorization
 - Information
 - Role-based Access Control

Healthcare Security Domain Analysis Model Overview



Bernd Blobel
 eHealth Competence C
 University Hospital Reg



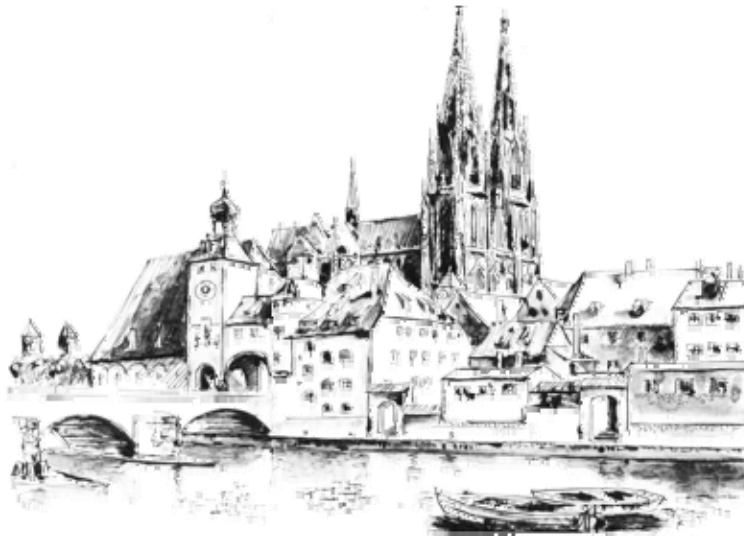
Use Case 1.3: Authorize users and systems



Bernd Blobel
eHealth Competence C
University Hospital Reg

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>



Weitere Informationen finden sich z.B.

Blobel B, Pharow P, Nerlich M (Eds.): eHealth: Combining Health Telematics, Telemedicine, Biomedical Engineering and Bioinformatics to the Edge - Global Experts Summit Textbook. Series "Studies in Health Technology and Informatics", Vol. 134. IOS Press, Amsterdam, Berlin, New York, Tokyo 2008.

<http://www.cehr.de>



Bernd Blobel
eHealth Competence Center
University Hospital Regensburg

COST IC 0604 MC/WG Meeting
3-4 December 2009, Lausanne, Switzerland