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din Bucuresti

Healthcare Services - education and research - developed in the INSEED project

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Program Strategic pentru Promovarea Inovarii în Servicii prin Educaţie Deschisă, Continuă (INSEED)
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OAMENI

InSeED

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INSEED PROJECT

Mission and goal

Title: Strategic program to promote innovation in services through open, continuous education

The overall objective of INSEED project is to create a modern, educational framework for training and skills formating in higher education in science, design and services management and to promote innovation in services industries based on an open, continous learning model and on a distributed computing infrastructure of cloud type with virtualized and accessible resources as services, interconnected with European structures.

Context: Romanian research axis "Education and training in support of growth and development of knowledge-based society"

INSEED PROJECT

Specific objectives

The main are:

1. Developing an open, continous educational model for initial creation and maintenance of lifetime skills in designing, planning, implementation, operation and management of complex systems for services, based on IT
2. Development, implementation, accreditation and integration into the European university system of a new interdisciplinary program of studies "Design and Services Management“
3. Development of training capacity, improvement of quality, relevance and permanence of the educational supply of highly skilled labor market in services sectors (industry, **health**, public administration, supply chains, electricity and trade)

Developing services for healthcare sector means education and research efforts based on eHealth paradigm.

A draft vision for eHealth

Overall goal to improve health and quality of health-related information

Integrated eHealth systems for everyone, everywhere to improve access to quality health services, and allow for better health and well being of all citizens and better health systems management.

We believe eHealth should support:

- Personal, family, community, public health services and preventative interventions, particularly in resource-poor environments
- The most relevant health research, information and education, for health providers, researchers, policy makers and citizens
- Appropriate, complete, consistent and interoperable health information systems, that integrate public health and clinical requirements for overall health systems management and stewardship.

So eHealth offers support for all kind of Healthcare Services

INSEED vision on Healthcare

”eHealth” a broad and diverse realm of efforts

eHealth:

the use of information and communication technologies (ICT) to improve health

Health information systems

- *Public health informatics:*
  - Support for disease prevention
  - Disease and intervention surveillance (e.g. PDAs to community health workers for disease surveillance)
  - National health info systems to detect/track global threats to public health
- *Health and clinical informatics:*
  - Electronic health records (EHR), electronic medical records (EMR), patient health records (PHR)
  - Decision support for healthcare professionals
- *Health system administration and operations*
  - Pharmacy and supply chain management systems
  - Laboratory systems (e.g. electronic ordering, transmission processing)
  - Clinical administration software (e.g. billing)

Healthcare and expertise

- Telemedicine / telehealth

Health research, advisories and education

- eLearning for physician, nurse, healthcare personnel training
- Access to research for healthcare personnel
- Patient support and information (SMS reminders for drug compliance, online health information, etc.)
- Decision support for healthcare professionals

eHealth concept in INSEED

eHealth is an emerging field in the intersection of medical informatics, public health and business, refering to health services and information delivered or enhanced through the Internet and related technologies.

In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.

Going beyond Internet use, e-health solutions include tools for health regions, professionals and practitioners as well as personalized health systems for individuals.

INSEED Strategies for Healthcare Support (1)

- **Improving health service delivery**
  - **Equitable and timely access to health services**
  - **Appropriate and effective care**
  - **Improved workflow**
- **Ensuring health & safety for patients and health professionals**
  - **Absence of accidents or occupational illnesses**
  - **Physical, moral and social well-being**
  - **Reduction of adverse events due to errors**

INSEED Strategies for Healthcare Support (2)

- Enhancing responsiveness to health threats
  - Building capacity
  - Improving coordination
- Fostering health maintenance & disease prevention
  - Promotion of healthy lifestyle
  - Early disease detection
  - Moving care closer to home and community
  - Self-care management
- Improving health outcomes
- Fostering research and innovation
- Improving efficiency and reducing costs
- Improving health information and knowledge

INSEED research achievements in Healthcare

- Implementing SOA components for Health Information Systems
- Developing standards-based Healthcare Applications based on MDSD
- Improving Home care and mobile Health services

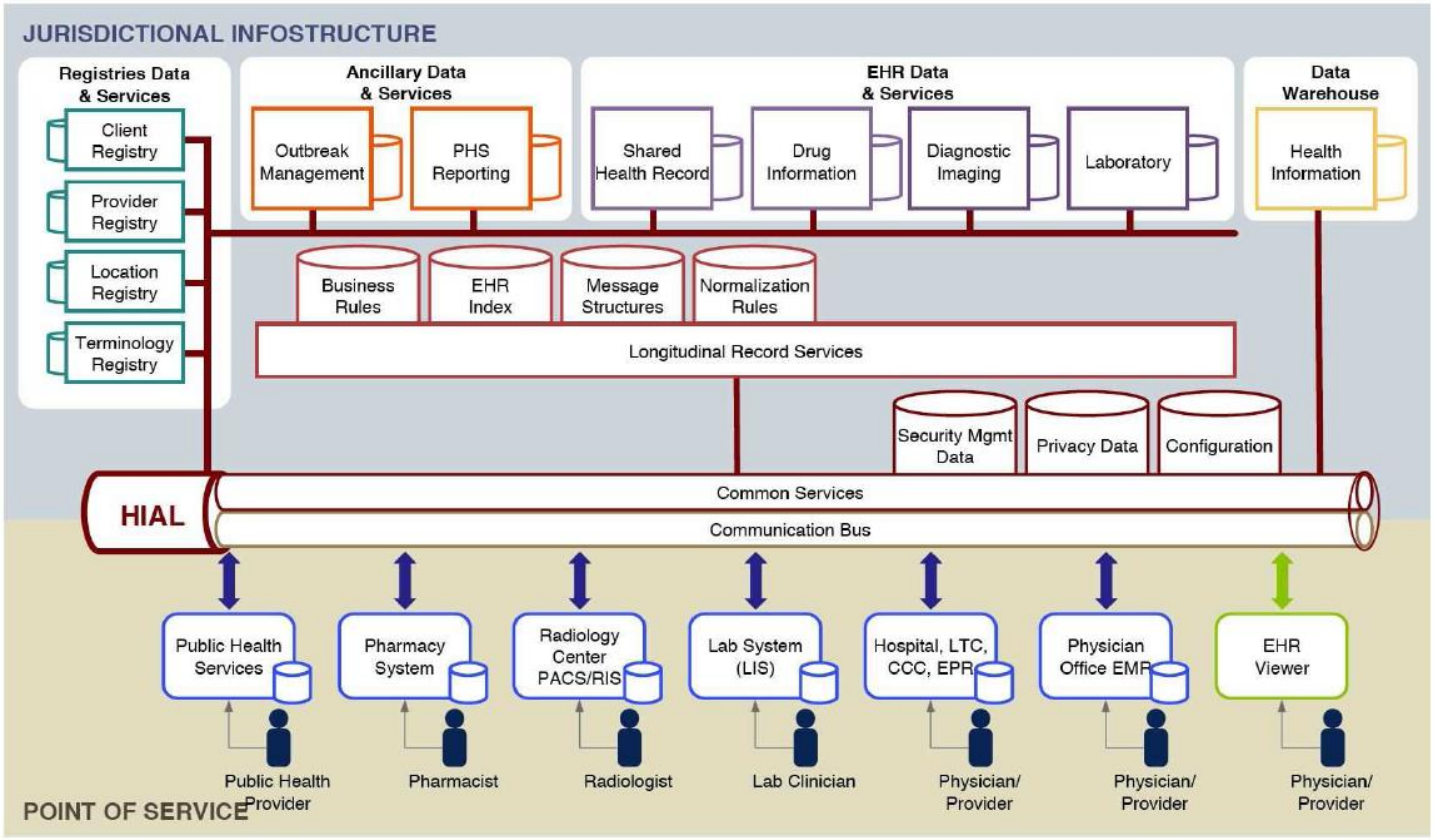
SOA for Healthcare Services

Service Oriented Architecture (SOA) plays a key role in the integration of heterogeneous systems by the means of services that represent different systems' functionality independent from the underlying platforms or programming languages. SOA will contribute in relaxing the complexity, leveraging the usability, and improving the agility of the business services.

The specific SOA services used in health care allow to incorporate mined-knowledge interoperability as services, along with data interoperability.

The mission of a SOA based infrastructure is to foster and accelerate the development and adoption of an interoperable Health Information System (HIS) which is compatible with standards and communications technologies and includes information relating to the current and historical health, medical conditions and medical tests of its subjects and is typically accessed on a computer or over a network.

SOA based HIS infostructure



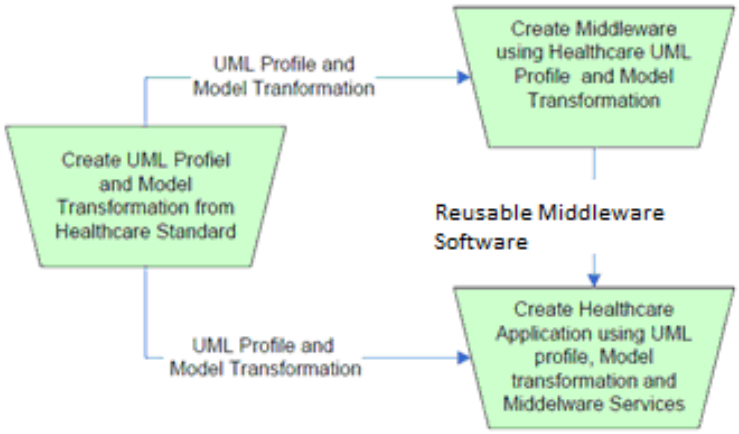
SOA consists of the following concepts:
application frontend, service, service repository, and *service bus*

Model Driven Software Development

To address the information system interoperability problems, new techniques and methodologies have been introduced in the Software Engineering community. One of these is the Model Driven Development, or more precisely Model Driven Software Development (MDSD). The goals of MDSD can be summarized as follows:

- Increase development speed and software quality through automation
- Higher level of reusability as the architectures, modelling languages and transformations are generic for the domain (abstract)
- Improved manageability of complexity through abstraction
- MDSD is based on the Object Management Group's Model Driven Architecture (MDA). OMG's focus in on interoperability, portability and reusability through architectural separation of concerns

SOA, MDSD and HealthCare

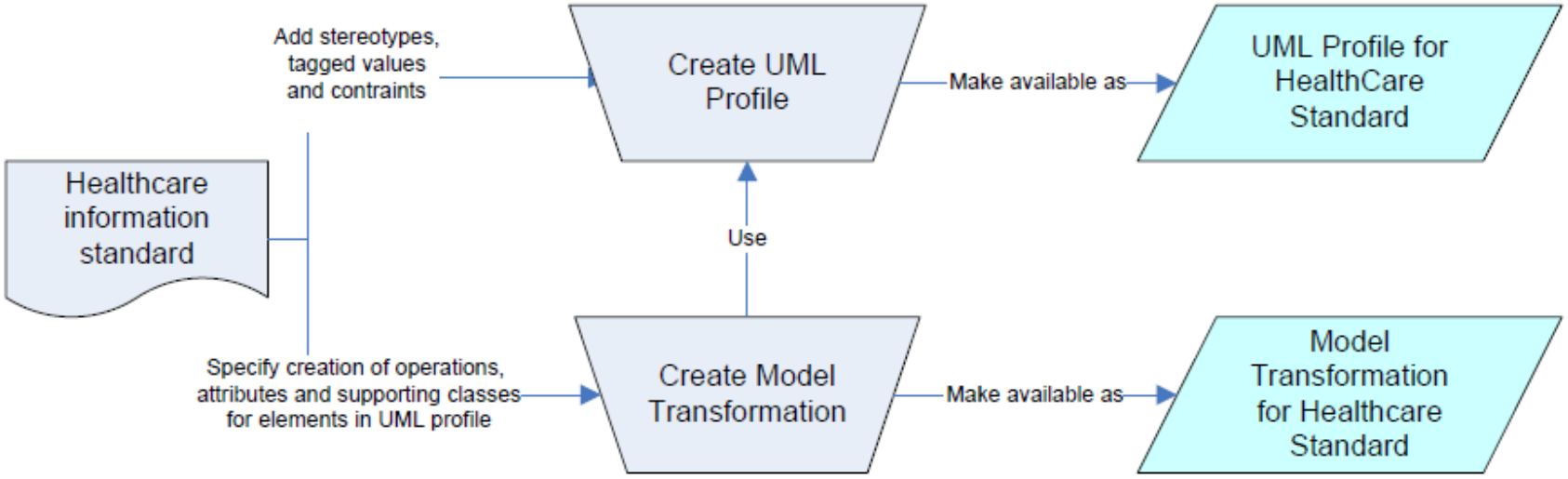


High-level conceptual process model

The process of creating a standards-based Healthcare Application based on MDSD and reusable services can be summarized in three steps:

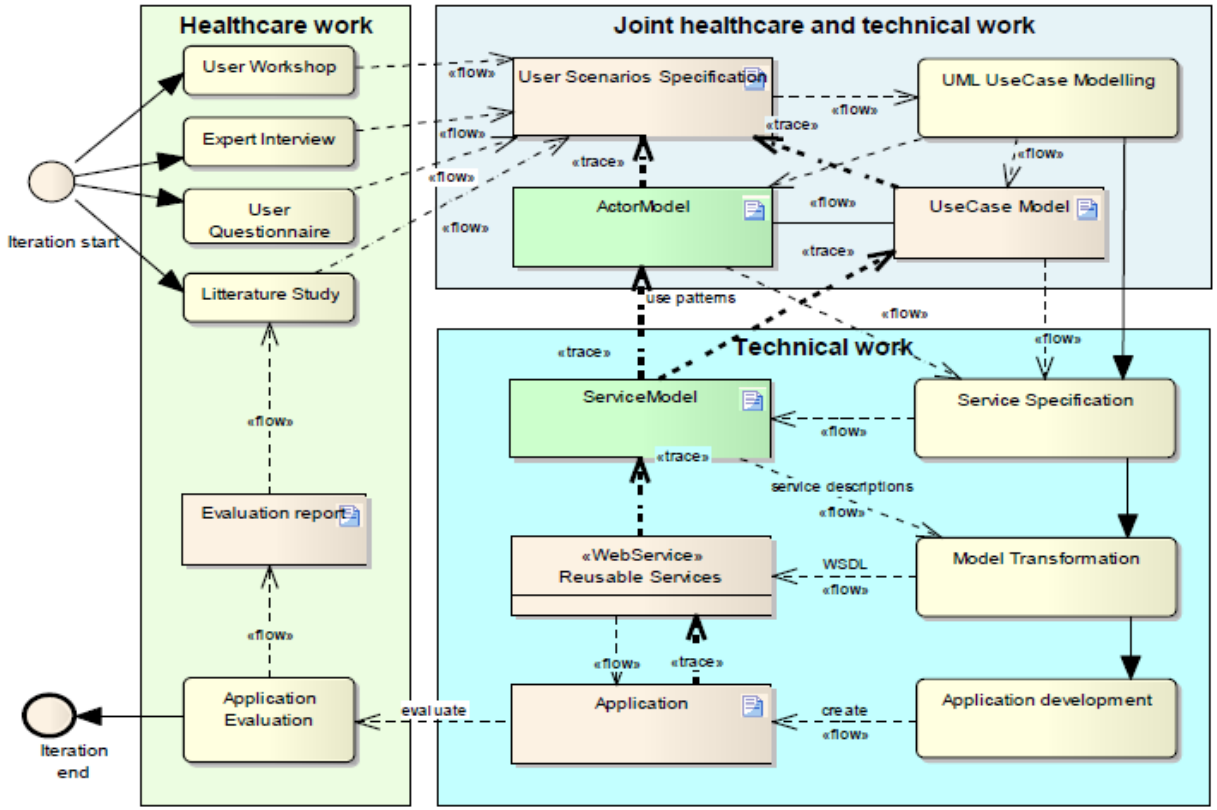
1) Create UML Profile and Model Transformation from Healthcare Standard
2) Create reusable Healthcare Middleware Service applying UML Healthcare Profile
3) Create Healthcare Application using UML Healthcare Profile and reusing Healthcare Middleware Service(s)

Healthcare Model transformation



Creating a UML Healthcare profile and Model transformation to support a Healthcare Information Standard

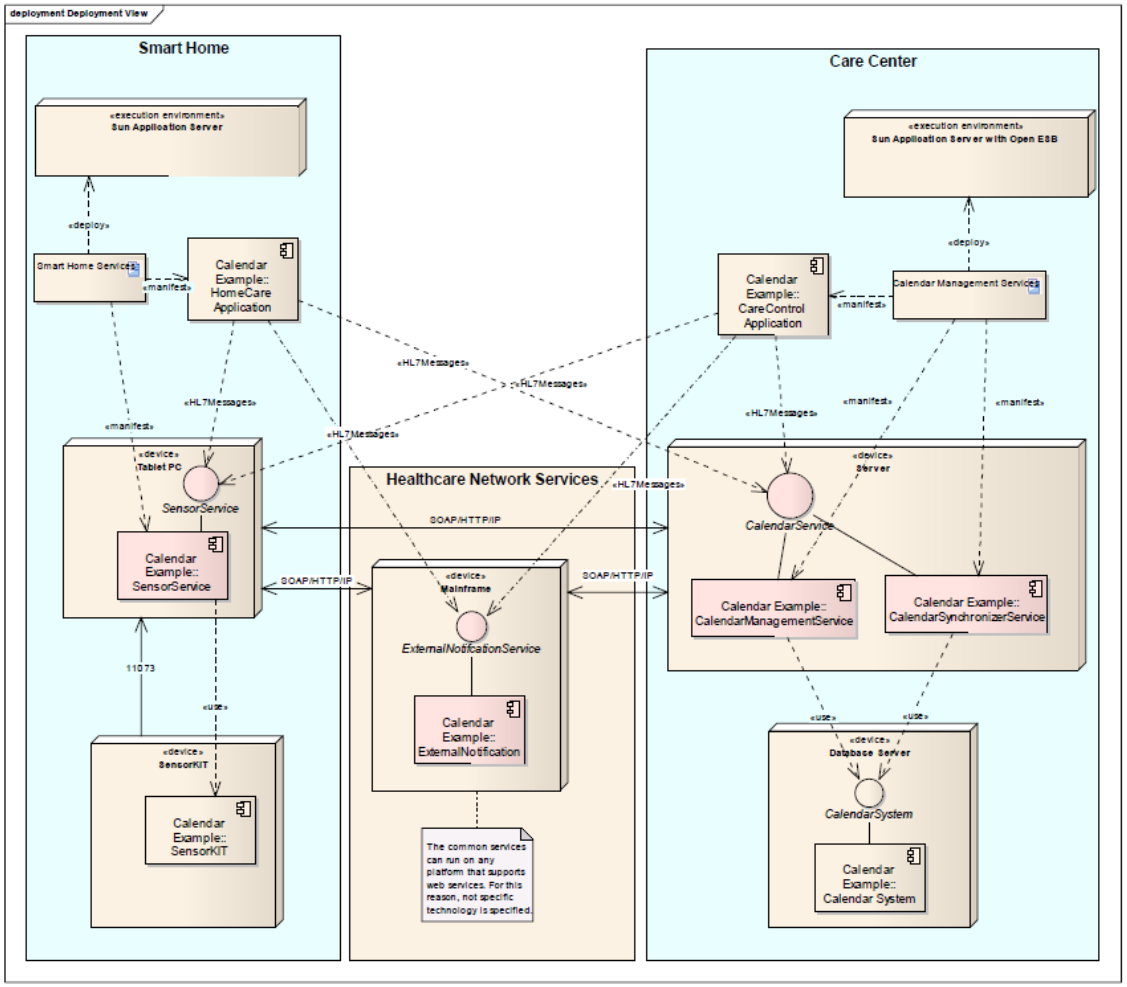
MDA based Deployment Platform for Home Care



The iterative model-driven development process

The Use Case Model, Actor Model and Service Model were developed using Unified Modelling Language (UML), according to Service Oriented Architecture concepts. The services in the Service Model were identified according to best practice SOA in general and for healthcare especially

Home Care system deployment



The application uses a Sensor Service that is provided by a SAS server. The HomeCare application uses a service in the Healthcare Network Services to send SMS and emails securely. In addition, it reads updated calendar information from the Care Center's Calendar Service interface. In the Care Center, a SAS server hosts the Care Control application.

INSEED education achievements in Healthcare

- Compact Module for initial training (specialization) in technologies and systems for health services
- Continous training program in technology and systems for Health services sector
- Master module Informatics Systems and Services in Medicine (SSIM)
- eHealth component for an ontology of Service Science

Compact Module: **Health Services with IT support**

This compact module offers a specialisation in the field of Health Information Systems and a basis for advanced research in translational medicine. It presents the impact of health information technology on quality of services, work efficiency and related costs of healthcare. The major benefits on quality of health services are considered to be the increased adequacy to standard based care procedures, improved surveillance and decreased medication errors. The gathering of knowledge about the complex service oriented architectures allows to obtain extended competences on the organization, planning, logistics and mentenance for medical services.

Continous training programs

Two programs in the field of Healthcare:

Information systems for medical services

Marketing, communication and management for health services

Access:
http://www.inseed.cimr.pub.ro/formare.html

Master Module

Master of Science in Health Information Systems – Main Objectives

- Developing conceptual and methodological Information and Communications Technology based framework used in modeling / simulation of complex systems for medicine and biology
- Understanding the mechanisms that govern complex systems of the living world and finding equivalents in designing artificial complex adaptive systems
- Generate new tools and technologies for applications in bioengineering
- Using ICT to support healthcare activities
- Preparation of competent specialists in fundamental research with interdisciplinary applications
- Increased internationally visibility of Romanian research in the field of intelligent medical information systems.

Knowledge in Services Science

Elaborating the eHealth ontology component of the SSKE (Service Science Knowledge Environment) developed in the, interactive collaboration area INSER @SPACE between universities and industry, government institutions and european structures for the promotion of innovation in services.

Access:

http://sske.cloud.upb.ro/sskemw/index.php/E-Health

Conclusions

Hospitals and provider practices are also seeing an increasing need for interoperability with other systems outside of their organizations. SOA provides a useful strategy for either an incremental or more comprehensive approach to system redesign. One can conclude, considering the next evolution of HIS, that in a foreseeable future the managers of the medical organizations will be able to improve medical services, patients will become more empowered and healthcare will be delivered more appropriate to the needs of the people.

Conclusions

Hospitals and provider practices are seeing an increasing need for interoperability. INSEED research results provides a SOA based useful strategy for either a comprehensive approach to Hospital Information Systems redesign. One can conclude, considering the next evolution of HIS, that in a foreseeable future the managers of the medical organizations will be able to improve medical services, patients will become more empowered and healthcare will be delivered more appropriate to the needs of the people.

Ongoing work and expectations (1)

INSEED will provide new Service-Oriented Solutions for Healthcare

Service-oriented solutions have three components: behavioral interfaces, semantic signifiers, and business-focused interactions (“choreographies”) of services. For any given solution, these three components are modeled and implemented in support of a particular business process. The resulting models and their realizations take different shapes as they process through a methodology, but they adhere to certain common characteristics.

Ongoing work and expectations (2)

INSEED will provide a formal ontology adapted to medical research

The usual intuition of an ontology is "*a specification of a conceptualization of a knowledge domain".*

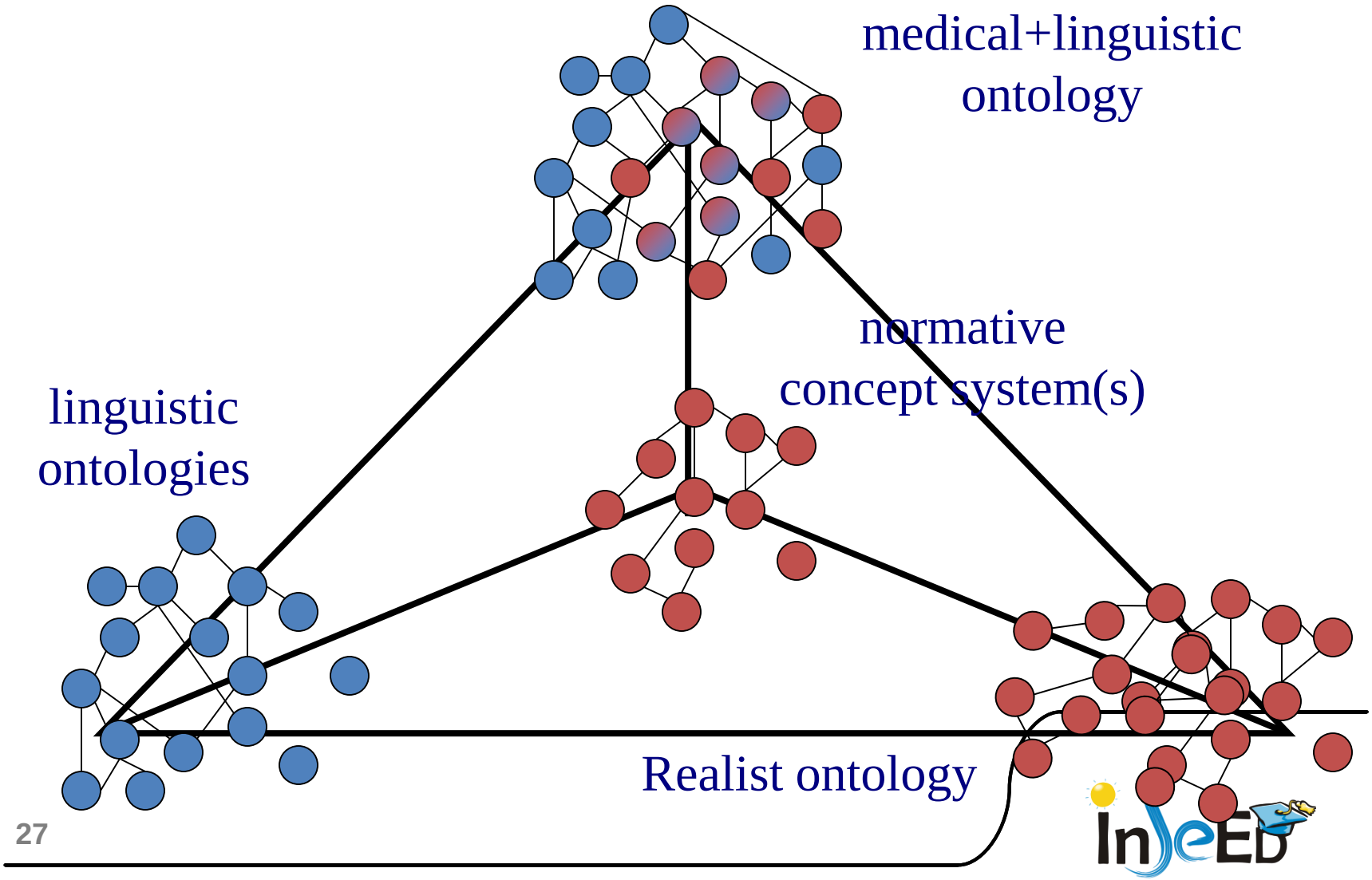
Formal ontology deepens this intuition requiring a clear semantics for the language, clear motivations for the adopted distinctions as well as strict rules about how to specify terms and relationships.

This is obtained by relying on ontological analysis (in the philosophical sense) and by using formal logic where the meaning of the terms is guaranteed by formal semantics.

The complexity of a representation system splits into two distinct aspects:
- the organization of knowledge structure and
- the specific information for an application domain.

The structure of the future medical ontology proposed by INSEED is shown in the next slide.

INSEED proposal for a formal medical ontology



Ongoing work and expectations (3)

INSEED will offer

On-Demand Innovative Services for *e-Healthcare*

Available Services

- ***Notification of important clinical events (similar to reminder)***
  - using a variety of means protecting patient privacy
- ***Portal-based mobile, integrated access*** of personalized and summarized medical and clinical information
- ***Biometric monitoring*** of patients and ***automated detection*** of abnormalities and delivery of resulting alerts ***(Remote Monitoring)***
- ***m-Health (Wireless)****** domain expertise combined with other technologies such as information integration, collaboration and mobile infrastructure ***(Data collection and communication)***