



# **VIEWPOINTS ON INSPIRE ARCHITECTURE**

Jerzy Gazdzicki

INSPIRE 2010 KRAKÓW

# CONTENTS

1. INTRODUCTION
2. ARCHITECTURE MODELING BASED ON ISO/IEC 42010:2007
3. ARCHITECTURE FRAMEWORKS
4. TIERS OF INSPIRE ARCHITECTURE
5. VIEWPOINTS IN INSPIRE ARCHITECTURE MODELING
6. THE CASE OF POLAND
7. ARCHITECTURE MODELING IN THE CONTEXT OF INSPIRE DEVELOPMENT TRENDS
8. CONCLUSION

# INTRODUCTION

INSPIRE is:

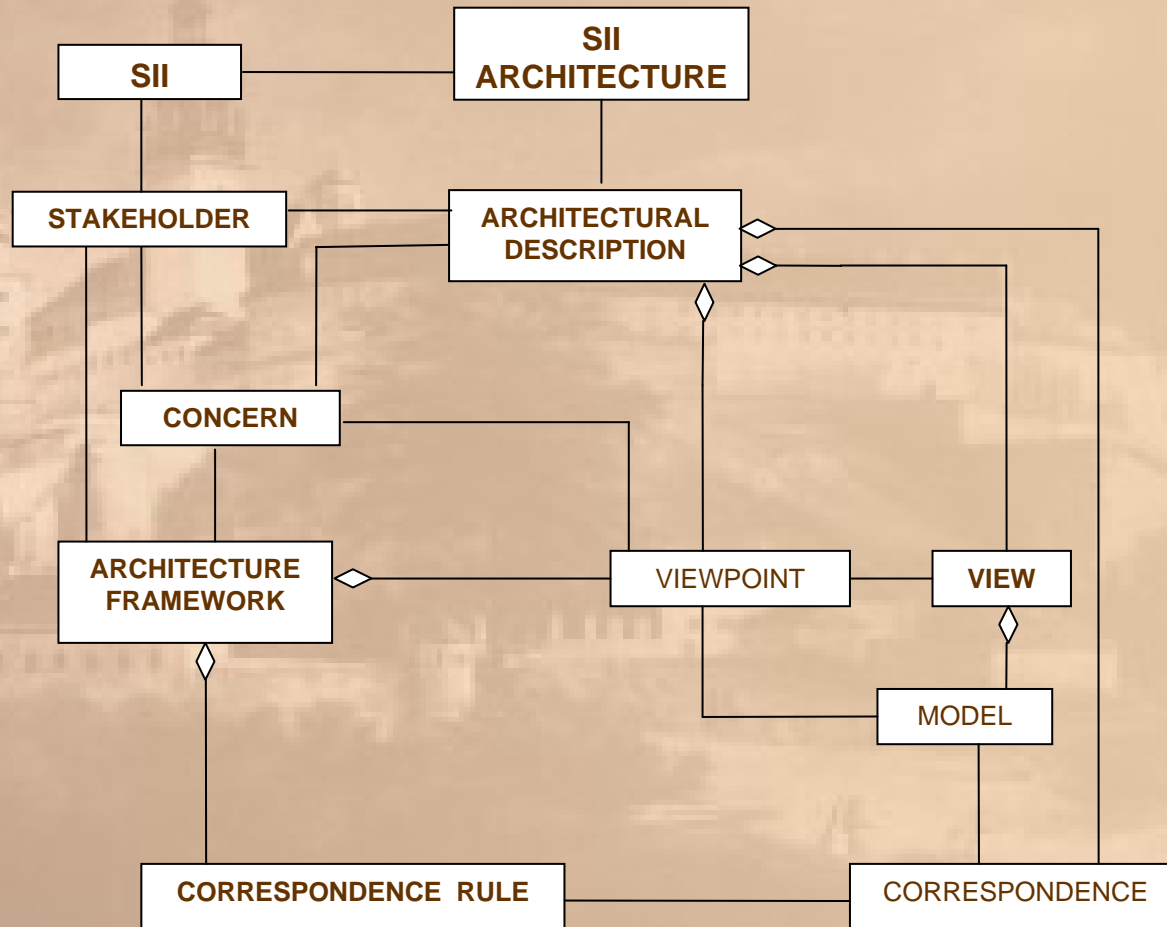
- an innovative and comprehensive project involving the European Commission and the governments of all EU Member States,
- an idea of uniform describing and monitoring of a common European space for the benefit of all European nations.

In both cases INSPIRE can be described and modeled in a broader context of software-intensive systems and their methodologies such as ISO/IEC 42010:2007 *Systems and software engineering -- Recommended practice for architectural description of software-intensive systems*

# ARCHITECTURE MODELING BASED ON ISO/IEC 42010:2007 - DEFINITIONS

- **System** – a collection of components organised to accomplish a specific function or set of functions. Note: **SDI/SII** is a system.
- **System stakeholder** - an individual, team, or organisation (or class thereof) with concerns relative to a system.
- **Architecture** – the fundamental organisation of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.
- **Architectural description (AD)** – a collection of products to document an architecture.
- **View** – a representation of a whole system from the perspective of a related set of concerns.
- Note: a view may contain one or more **models**.
- **Viewpoint** – a specification of the conventions for constructing and using a view.

# ARCHITECTURE MODELING BASED ON ISO/IEC 42010:2007 - DIAGRAM



# ARCHITECTURE MODELING BASED ON ISO/IEC 42010:2007 - PROCESS

The process of SII architecting includes the following activities:

- Framing and studying the vision, goals and functions of the system under consideration,
- Identifying stakeholders and their concerns,
- Selecting viewpoints,
- Elaborating and integrating models and views, and producing the system architecture,
- Overseeing system construction and implementation,
- Maintaining and evolving the SII architecture.

# ARCHITECTURE MODELING BASED ON ISO/IEC 42010:2007 - INSPIRE

**The architecture of the Infrastructure for Spatial Information in Europe (INSPIRE Architecture), is the fundamental organization of this infrastructure embodied in its components, their relationships to each other, and to its environment, and the principles guiding its design and evolution.**

# ARCHITECTURE FRAMEWORKS

**Architecture framework** – a set of predefined viewpoints, concerns, generic stakeholders and view correspondence rules, used to capture common practice for architecture descriptions in specific domains or user communities.

The total result of architecture describing depends on the architecture framework adopted. The standard ISO/IEC 42010:2007 does not recommend any specific framework, because architectural concerns vary from system to system being influenced by system stakeholders' concerns.


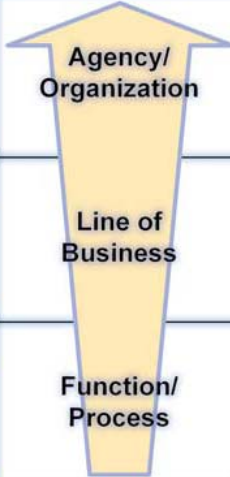
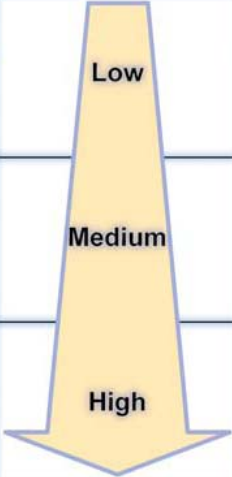






# ARCHITECTURE FRAMEWORKS RMODP

**The Reference Model for Open Distributed Processing (RM ODP)** introduced by the ISO/IEC 10746 Standard (ISO/IEC, 1998) provides 5 generic viewpoints:

- Enterprise viewpoint - The purpose and behaviors of the system in relation to the organisation objective and processes
- Information viewpoint - Nature, interpretation and constraints on the use of the information handled by the system
- Computational viewpoint - Functional decomposition of the system into a set of components that interact at interfaces
- Engineering viewpoint - Mechanisms and functions to support the interactions of components
- Technology viewpoint - Technologies selected for the implementation of the system, in particular for communication of components

# ARCHITECTURE FRAMEWORKS - FEA

**The US Federal Enterprise Architectures (FEA).** In this approach of the Office for Management and Budget (OMB), the total enterprise system is treated on its three levels (Office for Management and Budget, 2007) and three types of related architectures are distinguished (fig. 2). Each of these levels (enterprise, segment, solution) is characterized by four attributes (scope, detail, impact and audience).

Level	Scope	Detail	Impact	Audience
 Enterprise Architecture	 Agency/ Organization	 Low	 Strategic Outcomes	 All Stakeholders
 Segment Architecture	Line of Business	Medium	Business Outcomes	 Business Owners
 Solution Architecture	Function/ Process	High	Operational Outcomes	 Users and Developers

# ARCHITECTURE FRAMEWORKS - FEA

Segment Architectures inherit the framework used by the Enterprise Architecture. It reuses important assets defined at the enterprise level including: data, applications and technologies. A Solution Architecture refers to an individual IT system which is part of a segment.

Special attention is paid to segments and their architecture which comprise a series of work products describing baseline architecture, target architecture, and a transition strategy for a defined segment of the enterprise.



# ARCHITECTURE FRAMEWORKS - DoDAF

**The US Department of Defense Architecture Framework (DoDAF)** organizes architecture concepts, principles, assumptions, and terminology about operations and solutions into meaningful patterns to satisfy specific Department of Defense purposes. It supports change in organisations through the building and utilization of architectures that:

- enhance decision-making processes by leveraging knowledge and opportunities for reusing existing information assets,
- respond to stakeholder, customer, and client needs for effective and efficient processes, systems, services, and resource allocation,
- provide mechanisms to manage configuration of the current state of the enterprise and maintain validity of the expected performance,
- facilitate the design of future states of the enterprise,
- establish a baseline architecture for solutions under development.

Eight viewpoints are defined and described in detail.

# ARCHITECTURE FRAMEWORKS - ZACHMAN

The Zachman Framework is a widely known approach for enterprise architecture. This evolving framework uses five or six so called reification transformations (viewpoints) such as scope, business, system, technology and representations, and six communication interrogatives (abstractions):

- data (what),
- functions (how)
- network (where),
- people (who),
- time (when),
- motivation (why).

# ARCHITECTURE FRAMEWORKS - TOGAF

**The Open Group Architecture Framework (TOGAF)** provides a comprehensive approach to the design, implementation and management of enterprise architectures. It is based on four so-called architecture domains:

- business architecture which defines the business strategy, organisation and processes of the enterprise,
- applications architecture which provides a blueprint for the individual application systems to be implemented,
- data architecture which describes the structure of logical and physical data assets,
- technical architecture, which describes the hardware, software and network infrastructure.

The Architecture Development Method (ADM) is applied to develop an enterprise architecture meeting the identified business and IT requirements. The ADM process is iterative and cyclic.

# TIERS OF INSPIRE ARCHITECTURE

## **Characteristics of SDIs, which influence modeling of their architectures:**

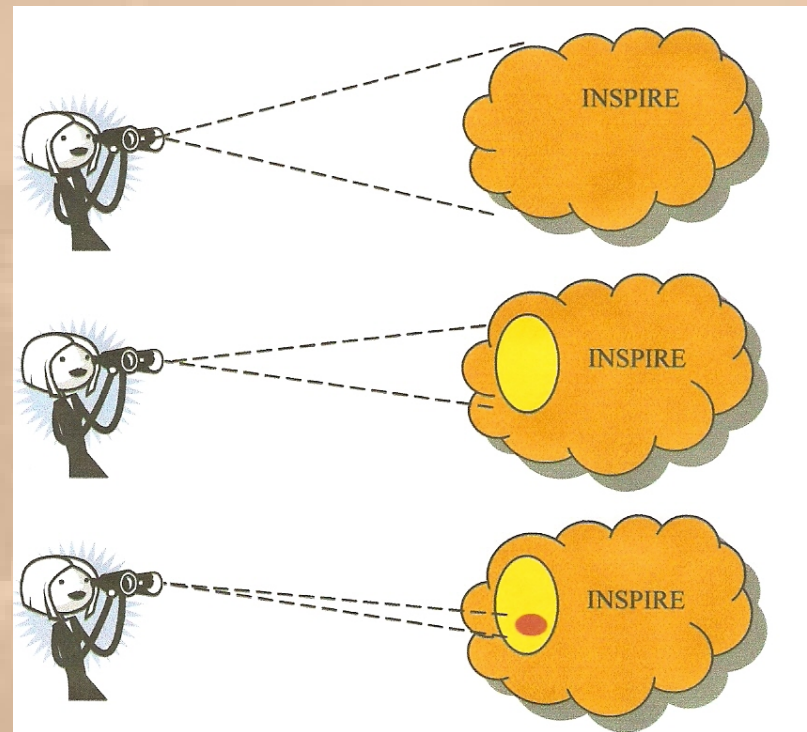
- a large number of stakeholders and diversity of their concerns,
- the focus on making spatial data widely and easily available,
- the establishment and maintenance based on cooperation and input of many organisations,
- ensuring interoperability by means of legislation, standards and specifications,
- a network services oriented architecture,
- a sound conceptual base.

# TIERS (LEVELS) OF INSPIRE ARCHITECTURE

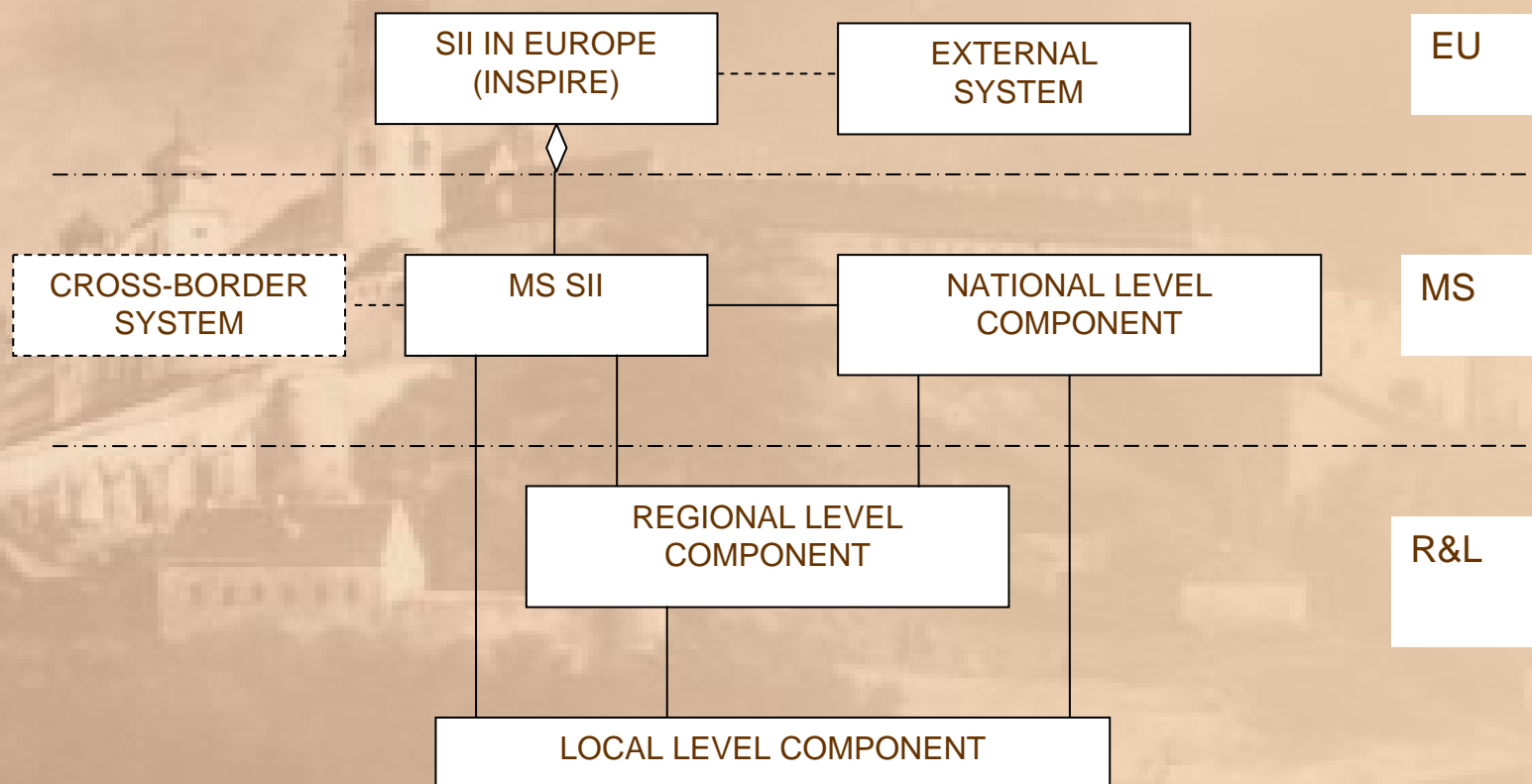
**Supranational**, i. e. the European Union (EU) level, where INSPIRE as a European infrastructure is formed; this level includes EU institutions and bodies as well as links to external systems;

**National**, i. e. the Member State (MS) level, where for each MS a national SII is formed that may include national level thematic components and cross-border systems;

**Subnational**, i. e. the level of regional and local (R&L) spatial information systems, registers or infrastructures, that may be linked to its MS SII.



# TIERS OF INSPIRE ARCHITECTURE - DIAGRAM



# VIEWPOINTS IN INSPIRE ARCHITECTURE MODELING

For each of the three tiers the following domain viewpoints\* are proposed:

- Political,
- Legal,
- Organisational,
- Semantic,
- Technical,
- Economic.

\*based on the European Interoperability Framework (EIF) for European Public Services

In total:  $3 \times 6 = 18$  viewpoints of the proposed Generic INSPIRE Architecture Framework (GIAF).

# EIF - RELEVANCE FOR INSPIRE

## European Interoperability Framework (EIF)

- is an agreed approach to interoperability as an ability of organisations to work together towards the joint delivery of public services\*,
- specifies a set of common elements: vocabulary, concepts, principles, policies, guidelines, practices and recommendations (23),
- introduces interoperability types (levels): legal, organisational, semantic, technical, with added political context, corresponding to domain viewpoints proposed.

INSPIRE meets the recommendations of EIF.

\*mostly ICT supported

# GIAF – THE CASE OF POLAND

The three tiers represent the existing situation:

INSPIRE – SII – regional/municipal geoinformation initiatives

Six domains proved to be useful:

1. Political – the legislative process to transpose the INSPIRE directive has been influenced by changing political situation in Poland,
2. Legal – obsolete geodetic and cartographic law hinders the initiatives to develop the SII,
3. Organisational – one of the key factors is fragmentation of spatial information resources being under responsibility of numerous administration bodies,
4. Semantic – the problems of semantics must be considered due to interdisciplinarity of INSPIRE and fragmentation of spatial information resources,
5. Technical – the scope of issues is enormous, including selection of appropriate technical solutions offered by ICT and geomatics,
6. 6) Economic – it has always been the problem of using available limited resources in the most effective way.

# ARCHITECTURE MODELING VERSUS INSPIRE DEVELOPMENT TRENDS (1)

The interest in INSPIRE Architecture will grow due to the following trends:

- 1. Expansion of INSPIRE in terms of geographical extent.** This will result from the fact that the neighboring countries are more and more interested in the idea of INSPIRE.
- 2. Expansion of INSPIRE in terms of information content.** New needs for spatial data will emerge calling for new data themes, sets and services.
- 3. Integration of INSPIRE with other public services.** INSPIRE is realized as a network of public spatial data services which are interconnected with other public services of e-government. The process of their integration is unavoidable.
- 4. Change of INSPIRE orientation.** INSPIRE will become more citizen-oriented and less administration-oriented due to the development of information society.

# ARCHITECTURE MODELING VERSUS INSPIRE DEVELOPMENT TRENDS (2)

- 5. Use of top-down and bottom-up development strategies.** INSPIRE is being developed following the top-down strategy. At present, the INSPIRE development is concentrated at the EU level. In the near future, work at the MS level will become dominant. To meet the requirements of information society, the role of R&L level and, consequently, the role of bottom-up development approach will grow significantly.
- 6. Diversification of MS and R&L infrastructures.** They will be developed to meet not only the INSPIRE requirements but also those resulting from national, regional and local priorities, experiences and conditions.
- 7. Proliferation of INSPIRE methodology and technology.** This will stimulate development of new solutions and their innovative uses.

# CONCLUSION

In the context of this paper INSPIRE can be interpreted as:

- A system which can be described and analyzed using software intensive systems engineering,
- A public enterprise and large project in the same time,
- A pioneering and advanced implementation of EIF.

The interest in INSPIRE Architecture modeling will grow because of the INSPIRE development trends predicted. **The overall objective is to support the unity of INSPIRE in the European evolving diversity.**