



# **WHAT IS INTEROPERABILITY? (AND HOW DO WE MEASURE IT?)**

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# Motivation

- Interoperability is a core objective of INSPIRE
- Interoperability a major element of GEOSS Strategic Targets
- IEEE Position Paper noted that
  - The word “interoperability” has become ubiquitous in usage, but remains vague in its definition.

# Goals

- Explore dimensions of interoperability
- Context
  - INSPIRE, GMES, GEOSS
  - Integrated Systems, System of Systems, Federation of Systems
  - European eGovernment and eServices
    - Digital Agenda for Europe
    - European Interoperability Strategy
    - European Interoperability Framework

# GEOSS Interoperability Approach


- Strategic Goals of GEOSS include:
  - Sustain operations of the shared architectural GEOSS components and related information infrastructure;
  - Address the need for timely, global and open data sharing across borders and disciplines, within the framework of national policies and international obligations, to maximize the value and benefit of Earth observation investments;
  - Implement interoperability amongst observational, modelling, data assimilation and prediction capabilities;
- Interoperability = the ability to get information from multiple sources using a single approach
- Achieved by having contributed systems declare their “interoperability arrangements”

# GEOSS Performance Monitoring and Evaluation Framework

- Outcomes to assess GEOSS maturation:
  - Level 1 Uptake and application of GEOSS-registered **standards and special arrangements**
  - Level 2 Improvement of **information systems interoperability** and information accessibility
  - Level 3 Increase of the use of Earth observation information by end users as valuable inputs to decision support systems. Increase in number and improvement in performance of decision support products and services
  - Level 4 Effects of the use of improved decision support systems (responses by affected populations to improved decision support)

# EIF Definition of Interoperability

- The ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems.'



# ISO/TC211 Standardization of Geographic Information

- The ability of a system or system component to provide information sharing and inter-application cooperative process control
- Facilitated through a set of standards that integrates geographic information concepts with IT concepts
- Interoperability provides the freedom to mix and match information system components without compromising overall success

# ISO 19101 - Interoperability refers to the ability to:

- Find information and processing tools, when they are needed, independent of physical location.
- Understand and employ the discovered information and tools, no matter what platform supports them, whether local or remote.
  - NOTE Data exchange is a special case of this level of interoperability.
- Evolve a processing environment for commercial use without being constrained to a single vendor's offerings.
- Build upon the information and processing infrastructures of others in order to serve niche markets, without fear of being stranded when the supporting infrastructure matures and evolves.
- Participate in a healthy marketplace, where goods and services are responsive to the needs of where commodity channels are opened as the market expands sufficiently to support them.



# EIF: Levels of Interoperability

- Legal – constraints on, validity of information
- Organizational – MOUs, SLAs, etc.
- Semantic
  - Ensuring the precise meaning of exchanged information is understandable by the people, applications and institutions involved;
- Technical – linking information systems
  - Definition of open interfaces, data formats and protocols, syntactic interoperability

# Evaluation of Technical Interoperability in GEOSS

- How easy is it for the community to discover, access, understand, share and integrate data from various systems?
- Use of interoperability standards (international standards, community profiles, community best practices, etc.)
- Impediments in achieving technical interoperability with GEOSS?
- Technical support for legal interoperability - access constraints, licensing and IPR through single sign-on, encouraging attribution and displaying licensing information.



# Evaluation of Semantic Interoperability in GEOSS

- Use and maintenance of common lexicons, taxonomies, or ontologies
- IT standards for semantic interoperability (use of RDF, OWL, SPARQL, GML, other W3C Semantic Web standards, etc.)
- Community-based data models?
- Queryable metadata fields in catalogue services



# Evaluation of Legal and Organizational Interoperability in GEOSS

- Promote GEOSS Data Sharing Principles, Best Practices, Capacity Building and co-operation
- Anything further is outside of GEO's purview
  - Aligning information architectures with organizational goals



# Standards and Interoperability

- How do standards enable interoperability?
- Applies to technical interoperability only?

# Further questions to ponder

- Is interoperability a principle or best practice practice to follow?
- Is it a condition that can be measured, assessed, quantified?
- Compatible vs. interoperable systems
- Reconciling different goals, levels of comittment

# Discussion Topics

1

- What are the interoperability objectives of your organization?

2

- How are you working to achieve interoperability?

3

- What metrics are being applied to measure progress towards goals?



# APPENDIX



# Definitions of Interoperability

- IEEE Conference on Interoperability for the National Health Information Network:  
“The ability for people to interact with each other, between organizations, across domains of influence and geographical boundaries—supported by the proper decisioning tools and services—to achieve a goal/objective/decision, within set/accepted limits of performance.”

# OAI Definition of Interoperability

- The ability of systems, services and organisations to work together seamlessly toward common or diverse goals, supported by open standards for communication between systems and for description of resources and collections
  - Context: resource discovery and access