A Systemic approach to Interoperability formalization

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Interoperability today:
- seen as a domain-specific concern
- domain still not formalized

Why not seeking for a general model of Interoperability?

Answer could be in General System Theory… and Interoperability could be formally described on this basis.

OoI: The Ontology of Interoperability

Presentation content:
- Objectives and model structure of the OoI
- Systemic approach:
  - from theory to model, and Interoperability definition
- Interoperability model (OoI)
- Specialization in the enterprise domain: merging with the FEI (CEN/ISO 11354)
- Perspectives
Objectives of the Ool

- Formalizing Interoperability as a systemic concern

- Providing a top-ontology for relating interoperability problems, solutions and domain-specific vocabulary

- Framework for Ool-based decision-support in Interoperability:
  - A Knowledge Base
    - Sets of known problem / known solutions descriptions
    - The Ool + a specialization to the domain
    - Domain ontology
  - Decision-aid system:
    - Inferences rules + Inference engine

  - Input: Descriptions of systems concerned by interoperation

  - Output: Localization and identification of interoperability problems + Solution proposals

  - At system-building or modification time, or for diagnosis
Framework & Model structure

System description → Decision-aide system (inference engine) → Problems identification/localisation

Rule Base

Solution proposals

upper models

Decisional model

Systemic model

general interoperability

Ontology of Interoperability

Domain: e.g. Service-based communities

Domain Problem ontology

Domain specialized Ool

Domain Solution ontology

Domain Problems KB

Domain Solutions KB
Since Von Bertalanffy (1968): in our conception of the world, all can be viewed as a system...

A system:
- Is a set of interconnected parts: Elements + Relations
- Has a set of properties...
- Has an objective,
- Is influenced by its environment

...Leads to our systemic model
**Definition:**

“An interoperability problem appears when two or more incompatible systems are put in relation.”

- Interoperability is usually seen as an objective to reach
- As soon as it is not reached, this becomes a problem to solve

**A pragmatic point of view: problem solving**

- Interoperability-as-a-problem
- General systemic approach:
  - not tied to a particular domain
  - allows precise localization of problems
Specialization to Enterprise Interoperability (1)

FEI (CEN/ISO 11354)
- Categorizes knowledge for Interoperability

Two general dimensions
- Barriers
  - Related to Interoperability levels [EIF]
- Approaches [ISO 1458]
- One Enterprise-specific dimension
  - Concerns
Two standard classification schemes introduced in the general model:

- Interop. Level and Interop. Approach
- Incompatibilities and Solutions localized in an Interoperability Level and an Enterprise Level
Perspectives

- Systemic model is still evolving
  - Grounding of Incompatibilities kinds in the theory
  - Refinement of Representation to make explicitly appear syntax / semantic
- Decision-aid system still to be built
- Specialization to enterprise can be further refined with going into more details
- Metrics to measure interoperability levels need to be added

- This is ongoing PhD. research