

Semantics – Interoperability – Integration

A multi-faceted problem

Ioannis Kotsiopoulos

Athens, March 2014

Who are we?

EUROPEAN DYNAMICS: a leading European ICT service provider and software developer.
International operation: Athens, Brussels, Luxembourg and elsewhere



● Offices - Antennas

▲ Customers - Partners

www.eurodyn.com

Client base:

- *The Council of the European Union*
- *The European Commission*
- *The European Parliament*
- *The European Court of Auditors*
- *The United Nations*
- *Eurocontrol*
- *Interpol*
- *The Office for the Harmonisation of the Internal Market (OHIM)*
- *The European Police Office (EUROPOL)*
- *The European Chemicals Agency (ECHA)*
- *The European Centre for Disease Prevention and Control (ECDC)*
- *The European Patents Office (EPO)*
- *National governments*

Customs & Excise

- *Interoperability started early 2000 by TAXUD*
- *Implemented though the exchange of structured messages between Member States applications via the private CCN/CSI network*
- *Semantics are defined as part of complex functional and technical specifications*
- *Currently at least four major functional areas are covered (e.g. transit, export, import etc)*
- *Important areas such as risk analysis are not covered.*

Common Communication Network (CCN/CSI) Interoperability

- *XML & EDIFACT messages defined by TAXUD*
- *Although message formats are well-defined, semantics are only indirectly defined via separate documents*
 - *e.g. same entities appear under different names and information structures*
- *Semantics today are incorporated in individual application logics developed by the Member States*
- *Despite those problems CCN/CSI does perform its basic function*

Risk analysis and fraud detection

Interchange of risk-related information is critical for customs processes as it is related to public safety and health

So far there have been no structured standard messages for the exchange of risk-related information at semantic level:

- ◆ What is a “suspicious trader”, “a suspicious route”, etc?
- ◆ Risk entities: financial and statistical information
- ◆ No behavioral models

Only abstract common risk criteria have been defined

The need:

- ◆ Definition of risk-related entities
- ◆ Semantic identification by machines

Is semantic interoperability and integration difficult?

- **YES!**
- *Database interoperability, cross-database search and integration of web services: Ontologies: formally logical axioms that relate predicates of interest*
 - *a higher level of abstraction for data modelling*
 - *data export, translation, queries, unification across independently developed database designs (logical or physical)*
- *However: when data integration is sought limitations emerge*:*
 - *Datasets with semantics given by different ontologies require integration of ontologies (ontology mapping, merging, top-level vocabularies, etc)*
 - *Integration of ontologies: integration of logics in which they are expressed and of schemas describing structure in different languages and different underlying data models (relational, object-oriented, etc)*
 - *Need for rigorous foundations not tied to any specific representational (e.g. category theory) or logical formalism (e.g. theory of institutions)*

* <http://epractice.eu/en/library/292976>

Then what?

Policy Technology
Research