INTEROPERABILITY + SEMANTICS = CHECK!

Smart and Cost Effective Data Modelling and Tools of the Future

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Summary

- Interoperability challenges
- Interoperability case: Student Transcript
- Framework for Semantic Interoperability
- Implementing the Framework:
  - Interoperability workbench

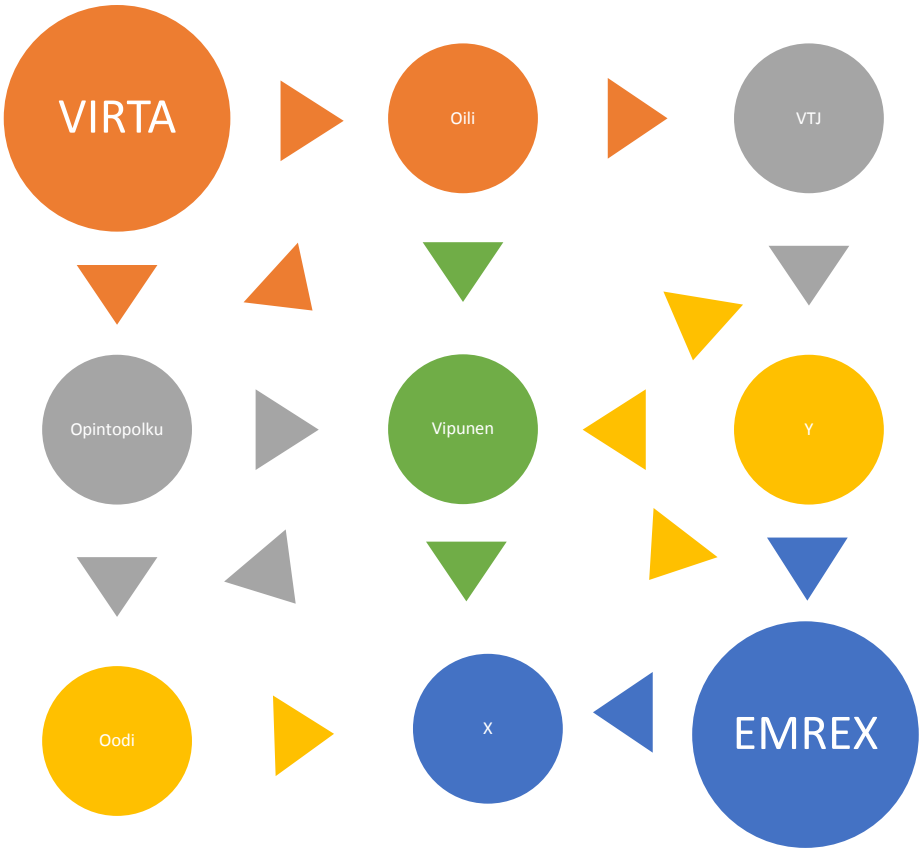
Present – Information chaos

Organisation and application specific documentation

Redefining data models

Point to point Integration

No change management over organisation borders



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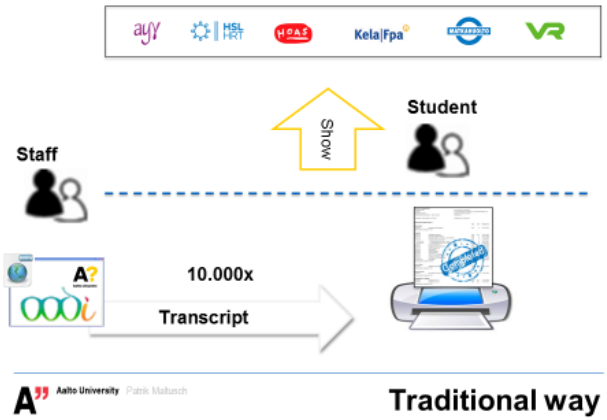
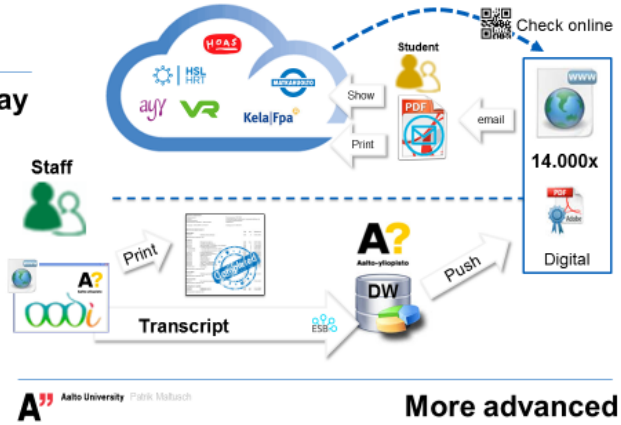
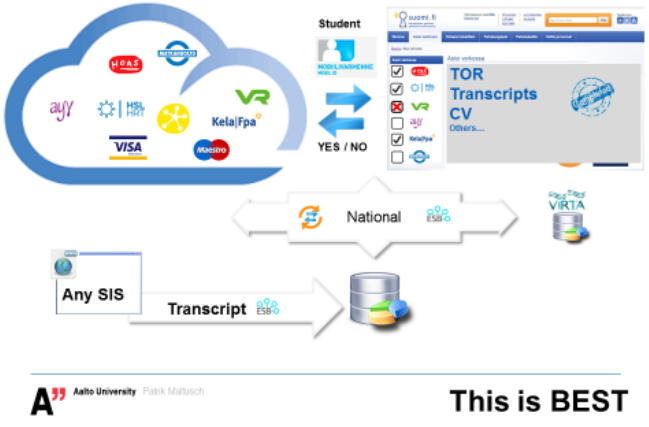
Interoperability CASE: Student Transcript



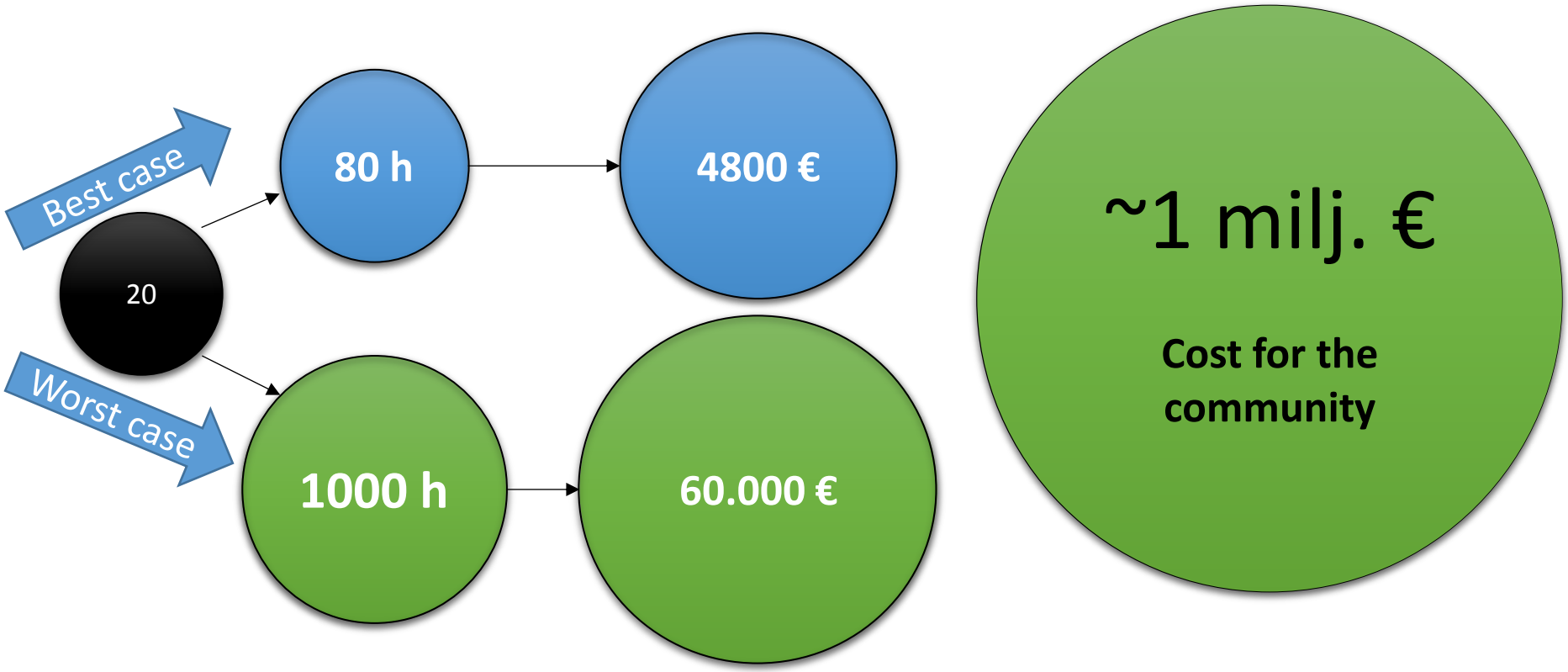
2016



2018?



Making data sources semantic interoperable for a DW



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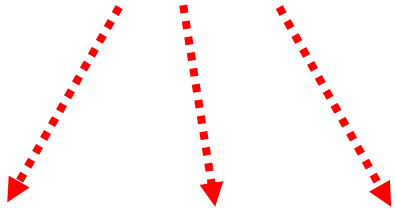
Equation for Interoperability

SEMANTIC IMPACT



$$ICC*ESB*EIM*DW = \frac{\sum benefits}{\sum cost} > 1$$

by Patrik Maltusch @aalto.fi

ICC	= Integration Competence Center
ESB	= Enterprise Service Bus
EIM	= Enterprise Information Management
DW	= DataWareHouse

Used methods for documenting APIs?

Java

Python

Terminological dictionaries

Programming

Application interfaces

Wikis

SKOS

Glossary

XML

Swagger

Javascript

WSDL

Documents

Classifications

SOAP

JSON

Concept models

Data warehouses

Enumerations

XML schema

Wiki

ER

SQL

Reference data

RDB

Data modelling

RDF

Codeservers

UML

Excel

XML

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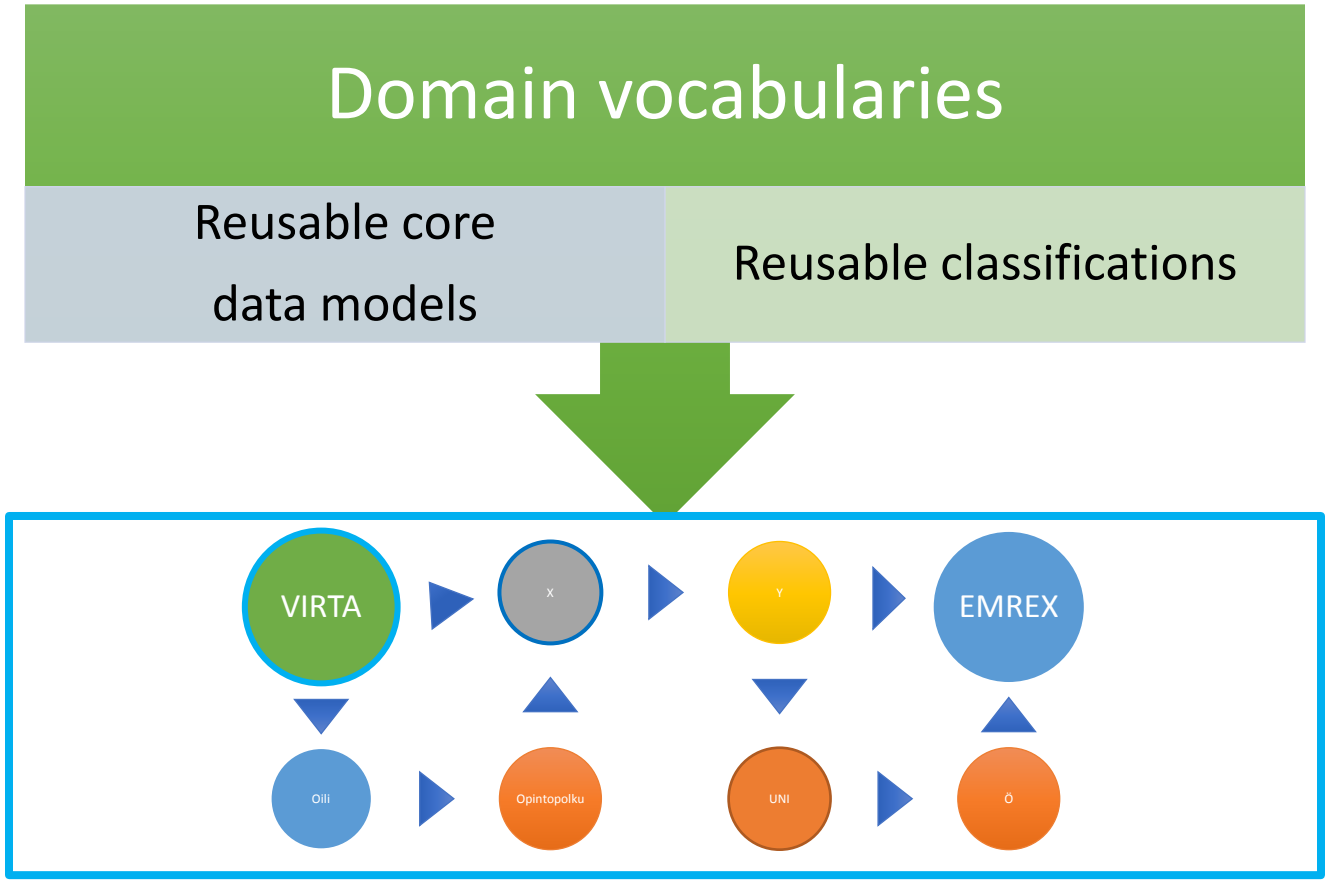
Vision – Data model reuse and uniform documentation

Shared semantics



Use of shared semantics

Application profiles

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Application profiles

An Application profile seeks to address the interoperability requirements between systems by:

- retaining conformance with a base standard
- defining new requirements in an open and interoperable manner

Examples of standard Application profiles:

CEN/CWA 15903: Metadata for Learning Opportunities
CEN/CWA 16132: European Learner Mobility Achievement Information
EMREX AP (2016): Report for the recognition of external studies

2000 - Idea of Application Profiles evolved from DESIRE Registry project: “mixing and matching” metadata elements

2003 - Guidelines for creating application profiles (CEN/CWA 14855)

2005 – Guidelines for machine-readable representation .. (CEN/CWA 15248)

2006 - Guidelines building application profiles in e-learning (CEN/CWA 15555)

2008 - Guidelines for Dublin Core Application Profiles

2011 - **2016** – MLR Framework (ISO/IEC 19788-1)

Need for common framework

Shared concepts with the business and IT:

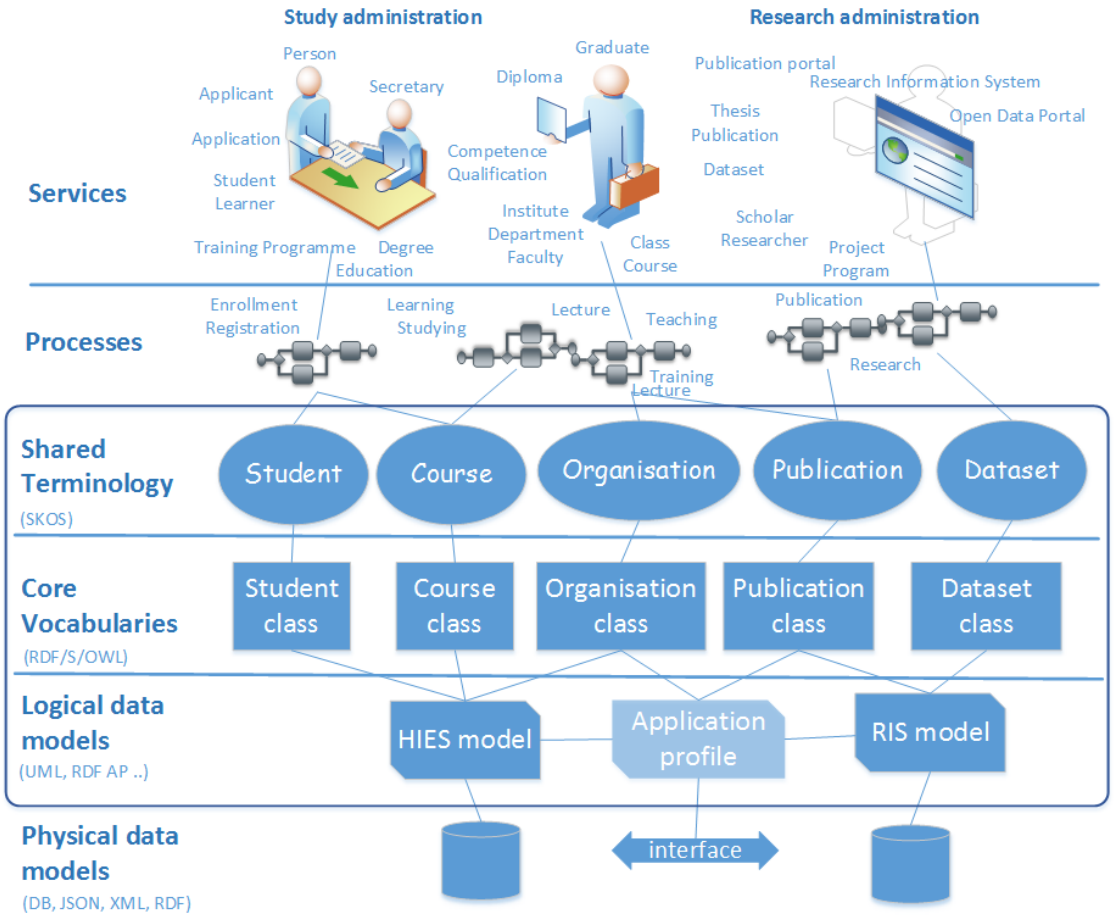
1. Well defined concepts
2. Unique identifiers
3. Machine readable format

Service innovation and data modeling based on business needs:

1. Reuse terms and definitions
2. Create reusable components
3. Focus on the interfaces and integration

Framework for semantic interoperability:

- How to publish core vocabularies
- and application profiles?
- How to reuse standards?
- How to reuse core vocabularies in the implementations?
- How to document the metadata reuse?
- How to document application interfaces?



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Semantic interoperability framework

Terminology	Core vocabularies	Application Profiles
• Concepts • Definitions • Classifications	• Classes • Attributes • Associations	• Context • Constraints • Extensions

Common metadata architecture for data modelling:

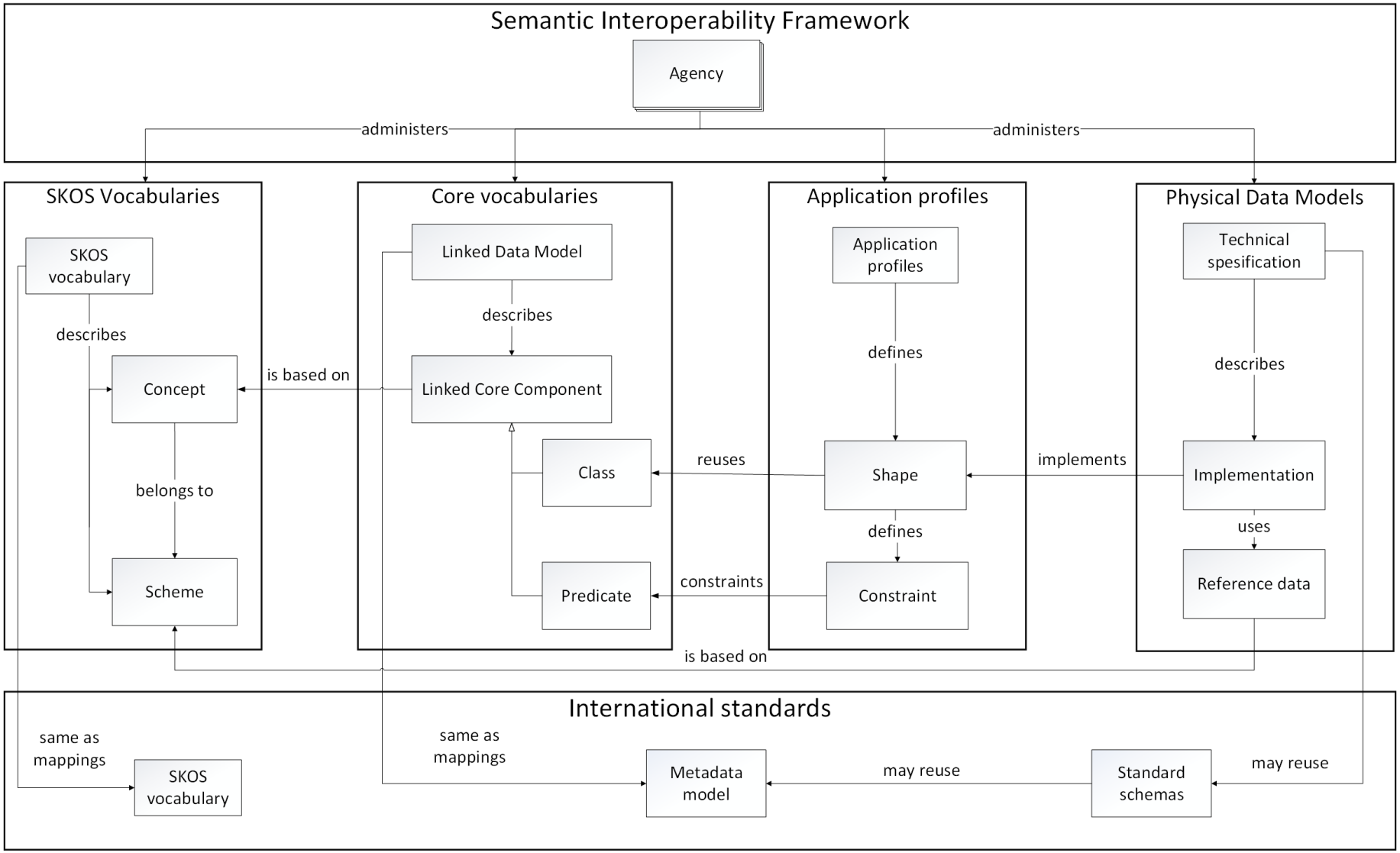
- Machine readable terminology
- Reusable core vocabularies and core components
- Documented reuse of core components

Interoperability objectives

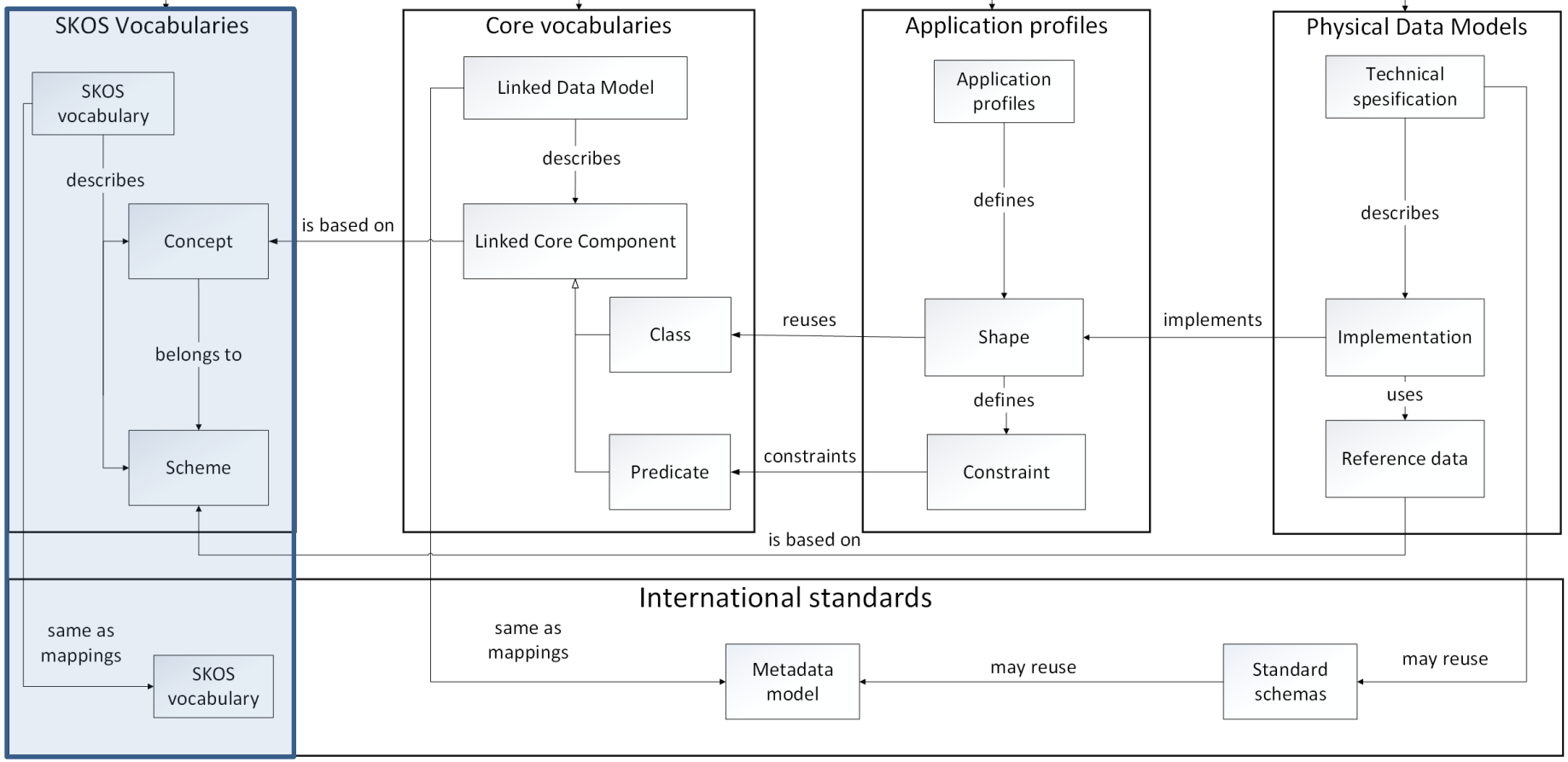
- Shared metadata models for education and research
- Modular and reusable metadata definitions
- Improve readability and understandability of data models
- Interoperability with international standards
- Promote standard reuse
- Formal and semantic mappings to CEN and ISO standards

Interoperability benefits

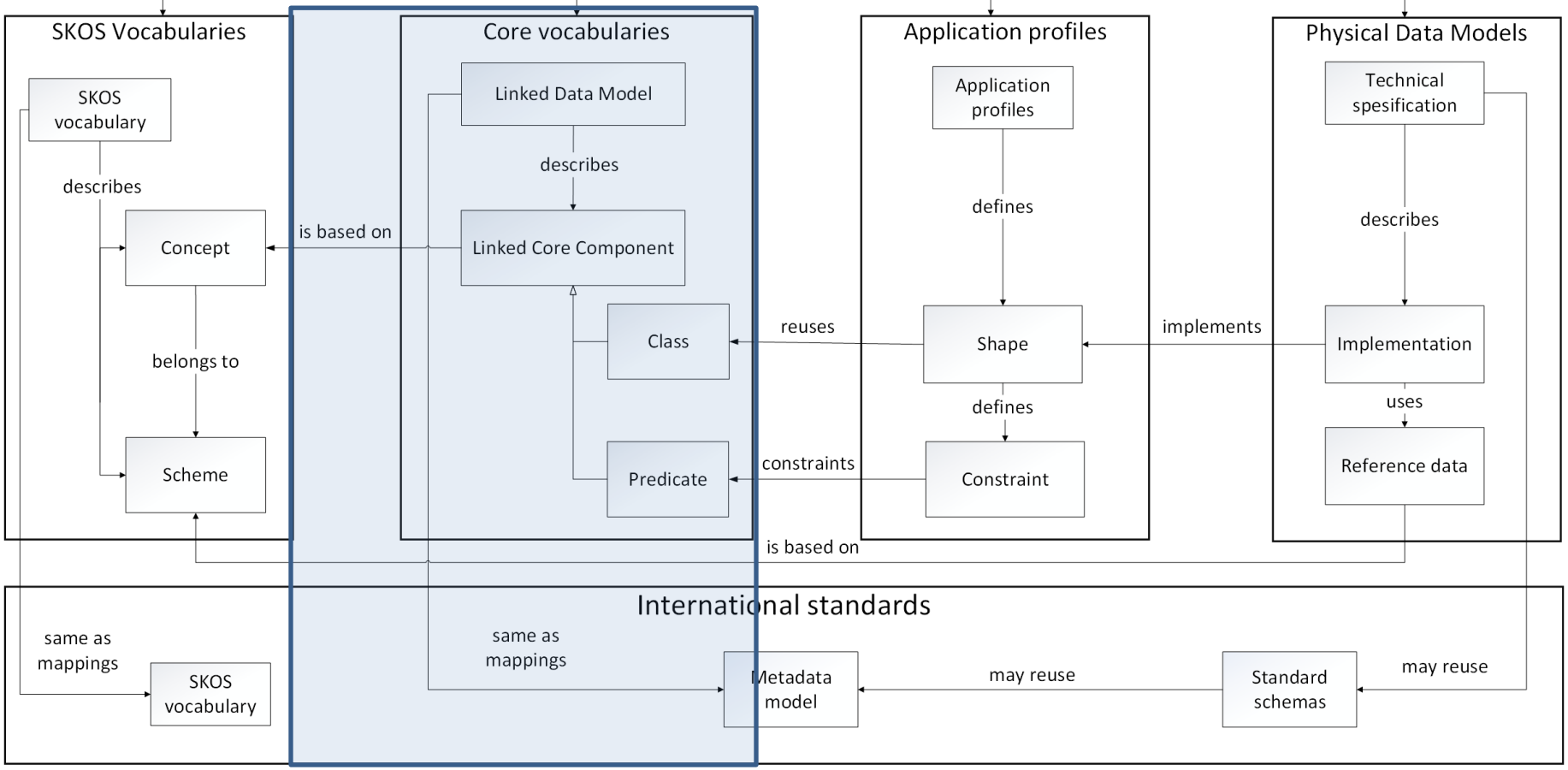
- Collaborative tool for metadata publishing
  - Benefit from external expertice
- Avoid redefinition of data models
  - Lower integration costs
- Shared terminology
  - Less confusion
- Same terms for many communications needs
  - Study administration
  - User interfaces


Semantic Interoperability Framework
Agency
administers
administers
SKOS Vocabularies
SKOS vocabulary
describes
Concept
belongs to
Scheme
is based on
Core vocabularies
Linked Data Model
describes
Linked Core Component
Class
Predicate
reuses
constraints
Application profiles
Application profiles
defines
Shape
defines
Constraint
implements
Physical Data Models
Technical spesification
describes
Implementation
uses
Reference data
is based on
International standards
same as mappings
SKOS vocabulary
same as mappings
Metadata model
may reuse
Standard schemas
may reuse

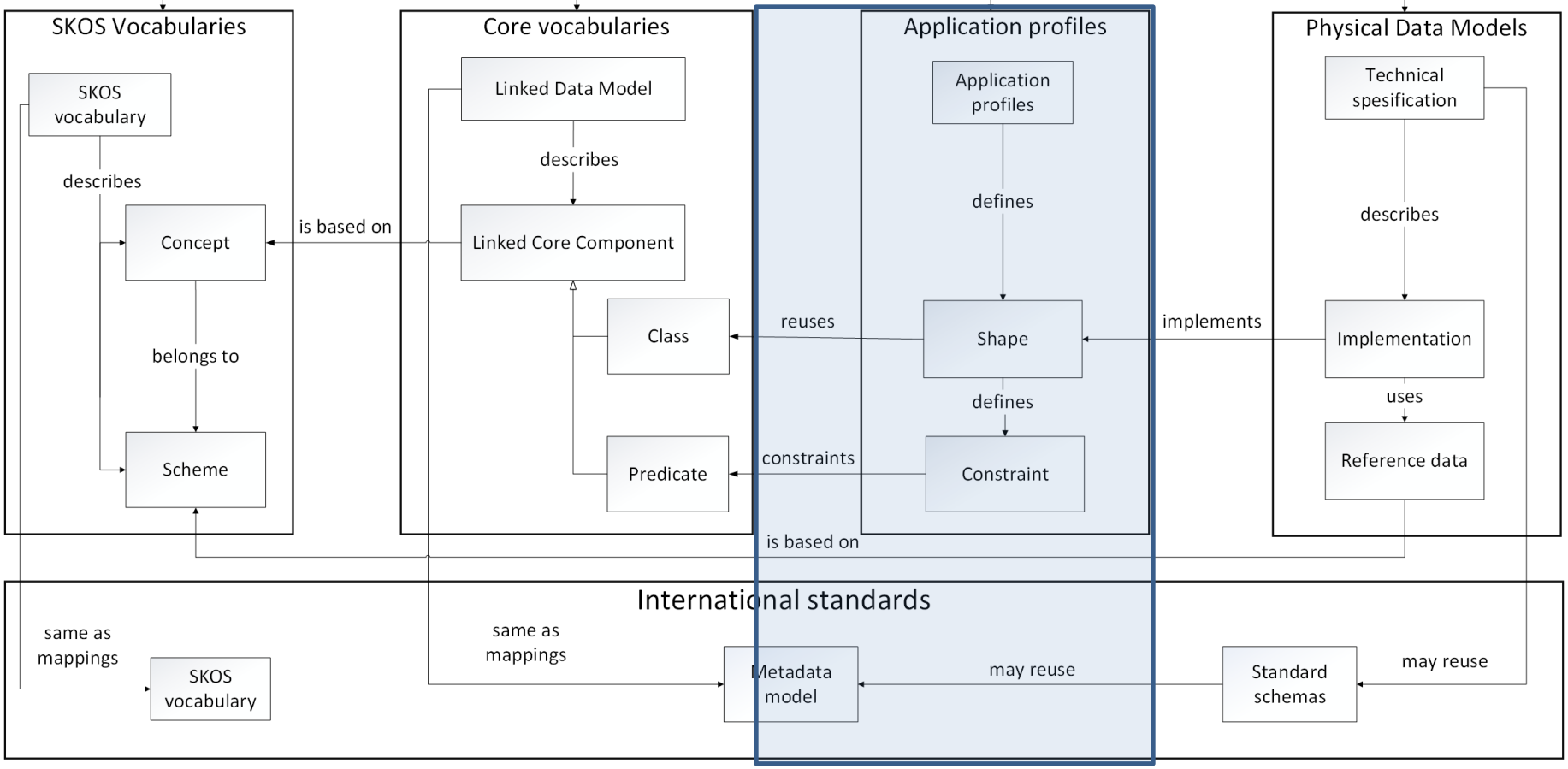
Domain specific vocabularies are administered by different agencies and published in the standard SKOS model in the Finnish Thesaurus and Ontology Service



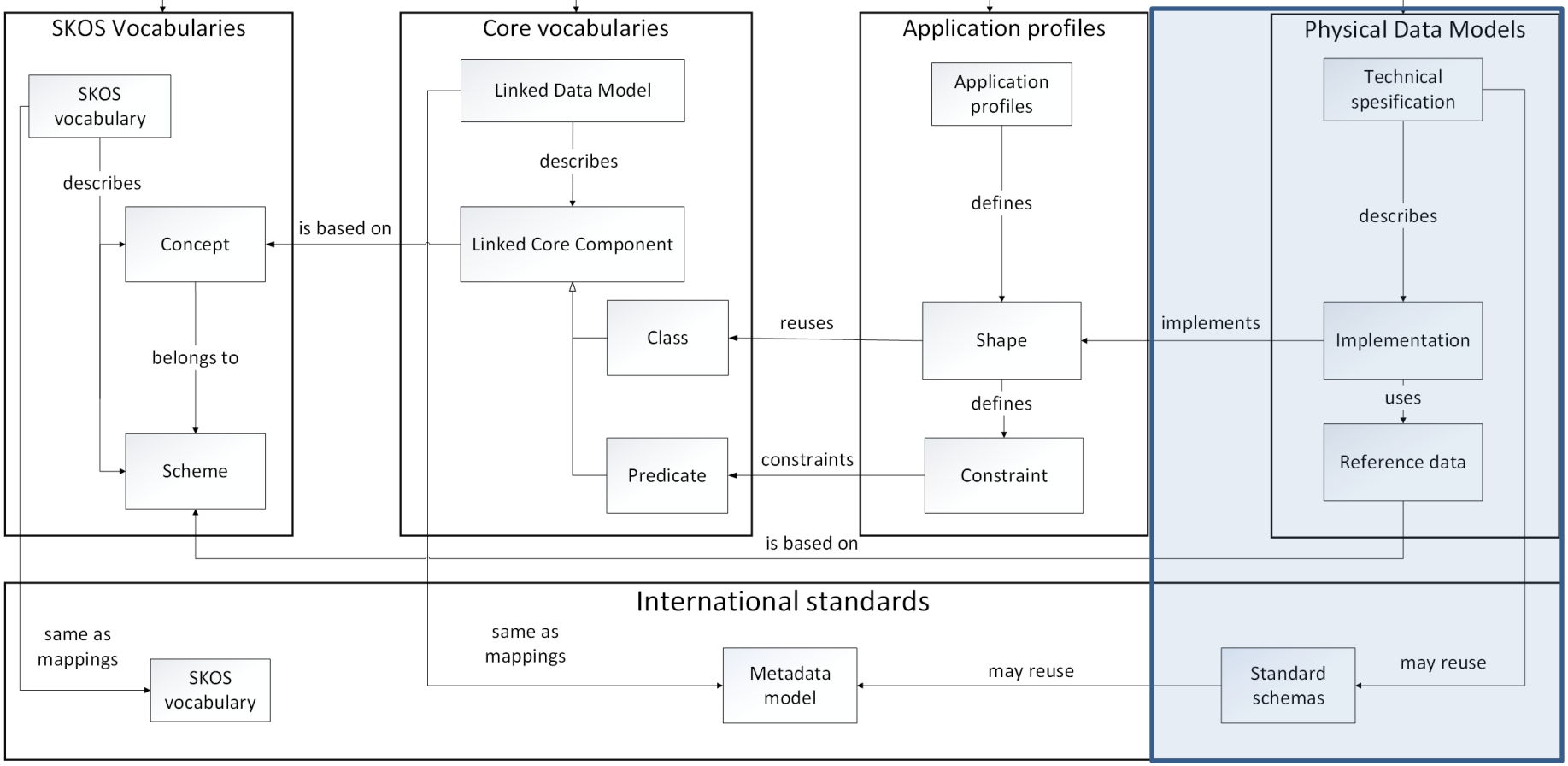
Core vocabularies are published as Linked Data that defines re-usable classes and properties based on shared concepts and links to standards and best practices.



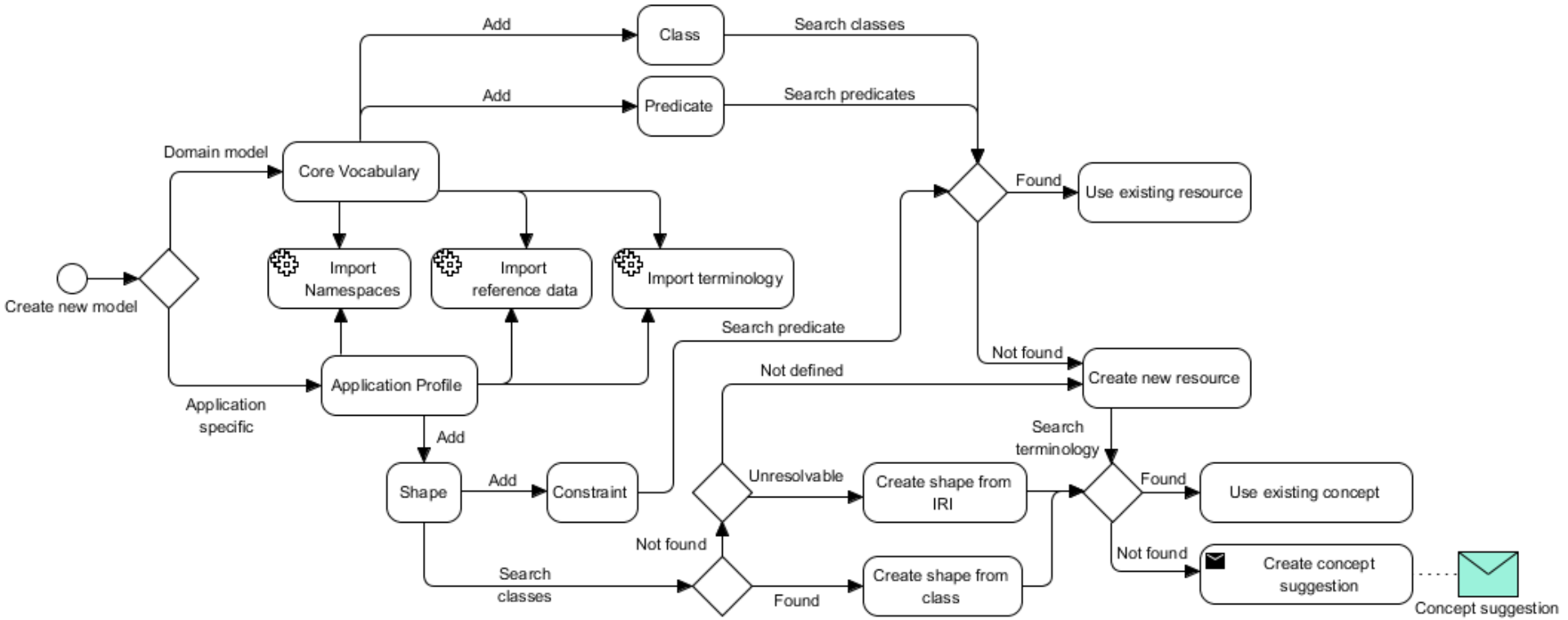
Domain specific data models and interfaces are documented as Application profiles that re-use the classes and properties from the Core Vocabularies



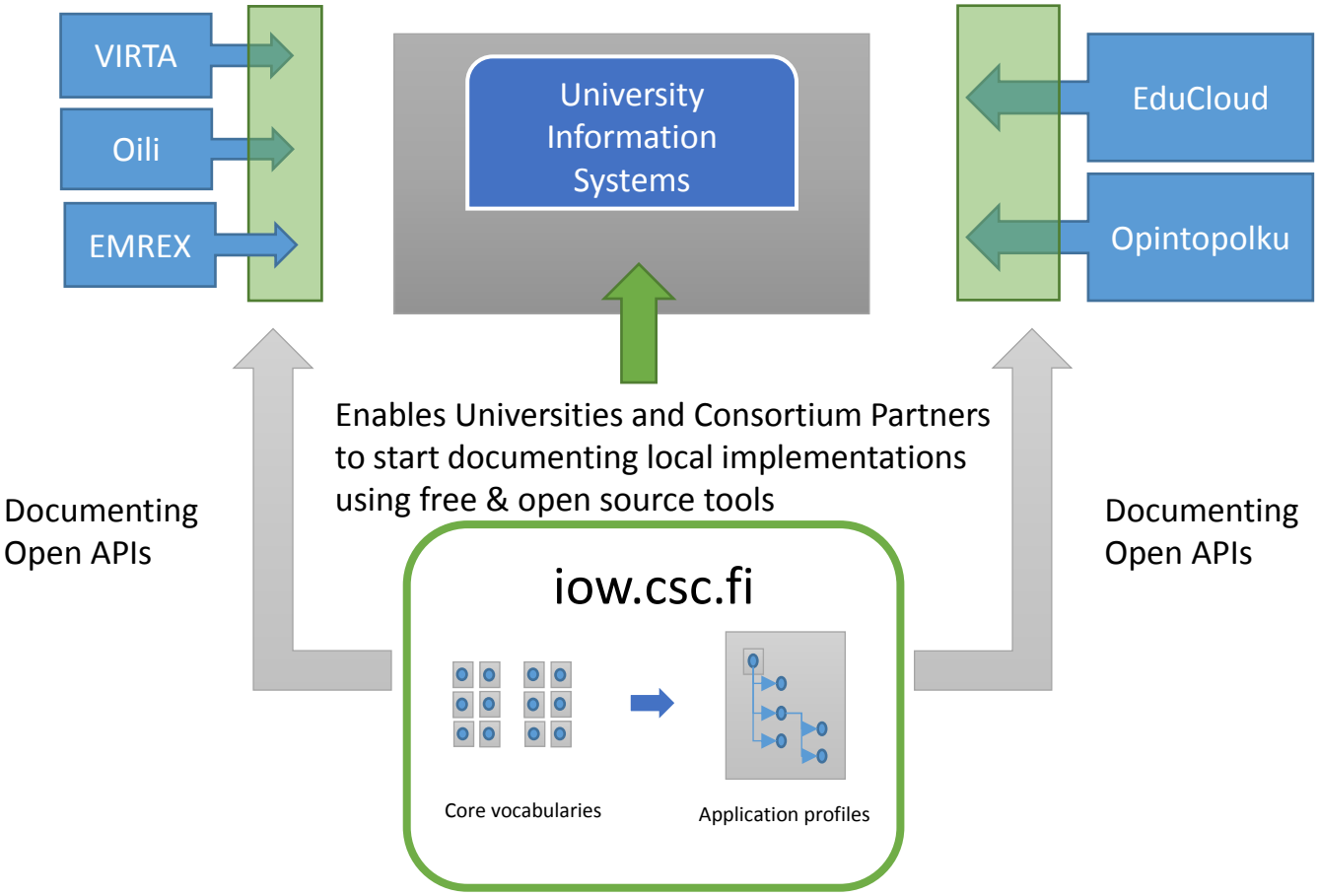
Data models are implemented with languages that best suit the given architecture by implementing the application profile.



Simplified process for describing Core vocabularies and Application profiles



Piloting Interoperability Framework



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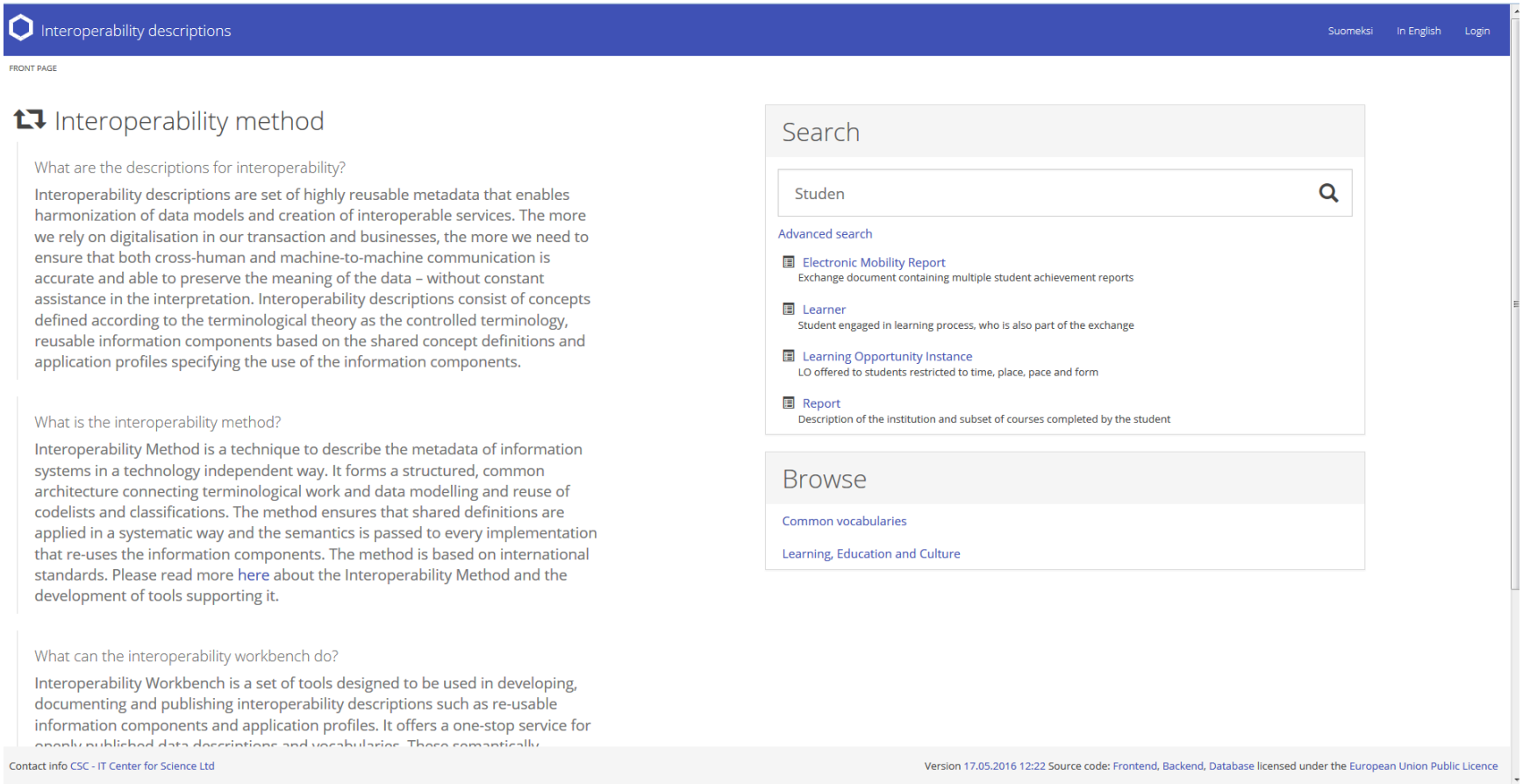
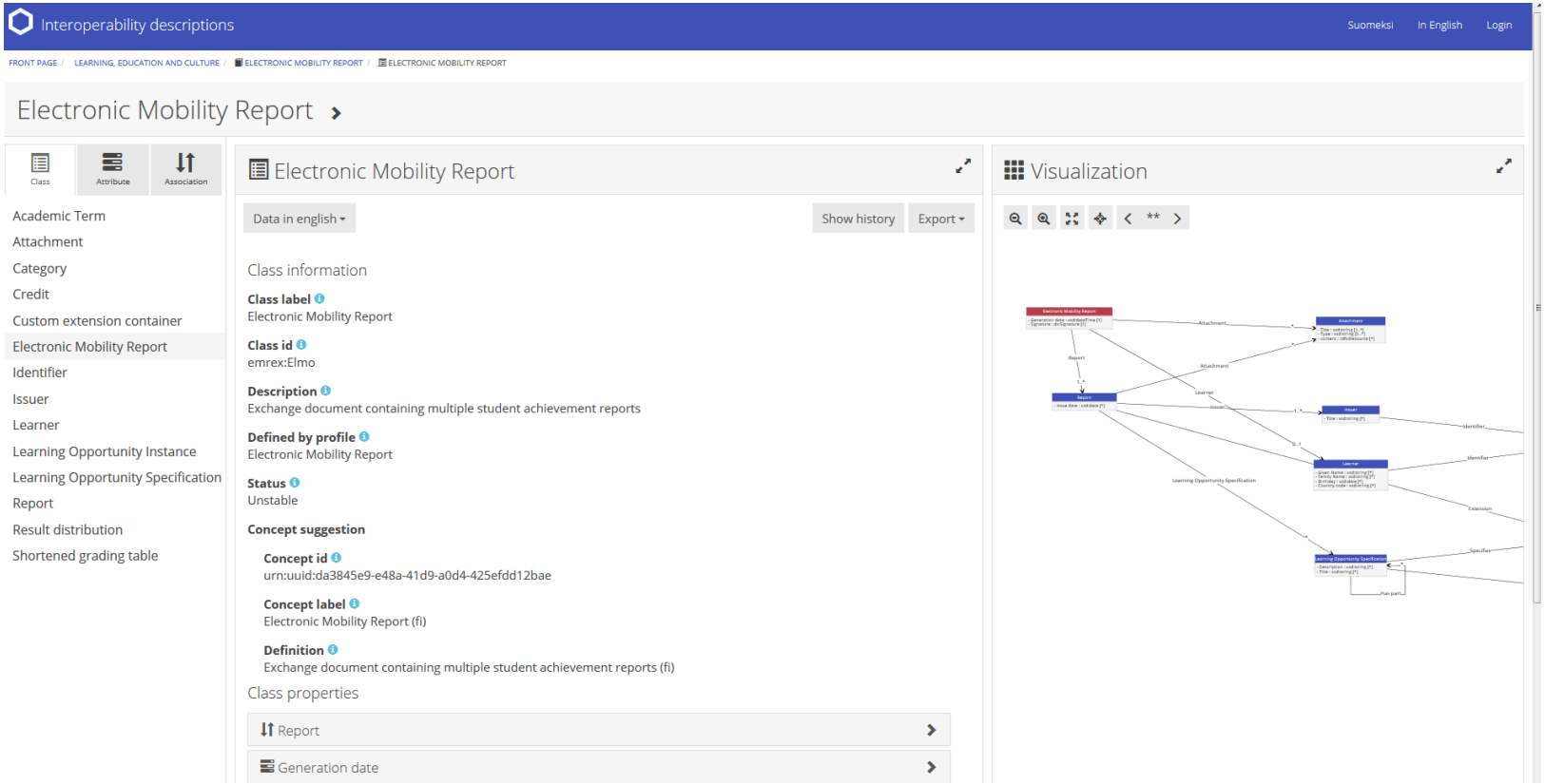
Interoperability workbench

- Collaborative online tool for creating Core Vocabularies and Application Profiles:



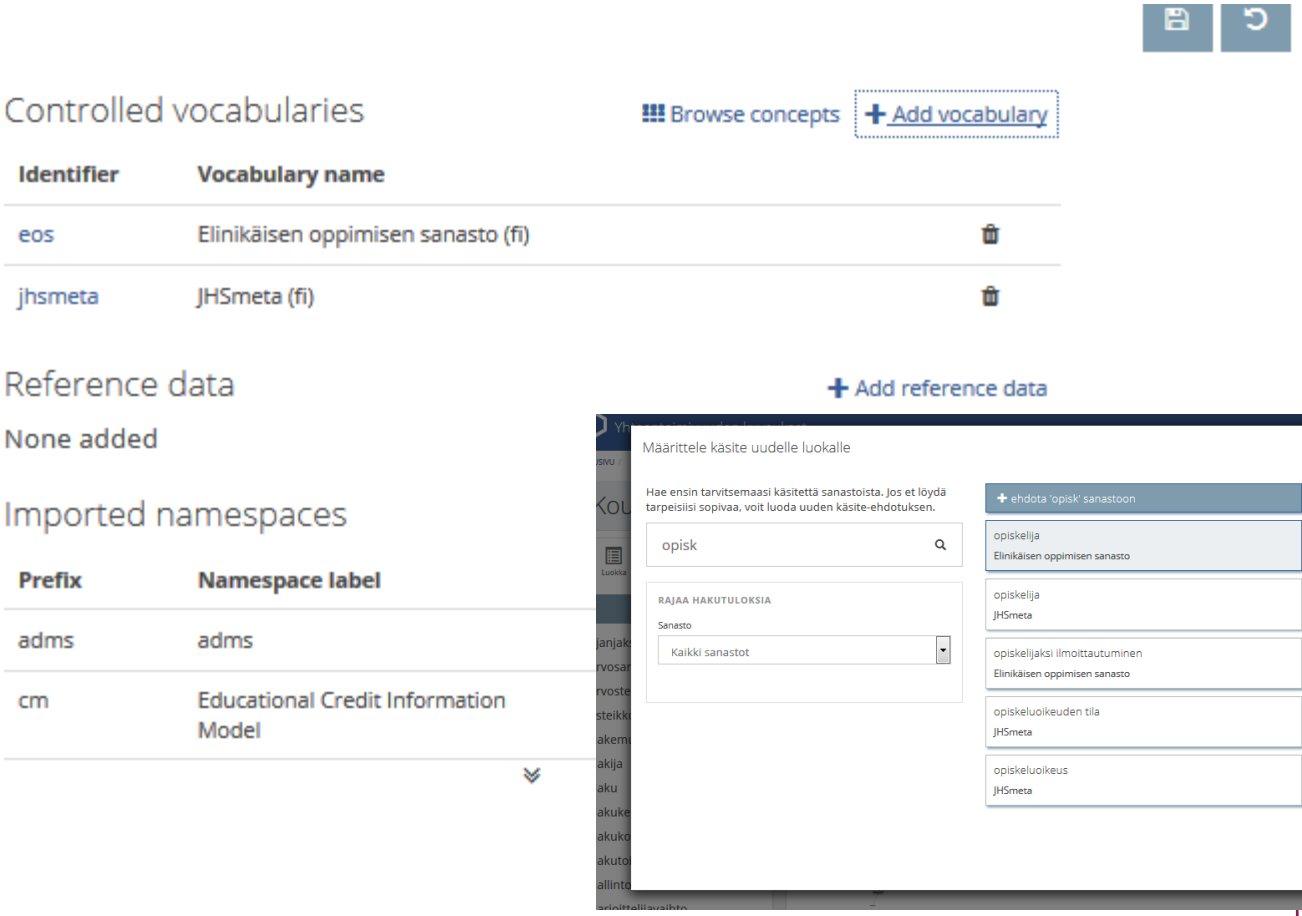
Interoperability workbnech

- Tool for defining resolvable and machine readable data models
- Document the use of data models, standards and best practices



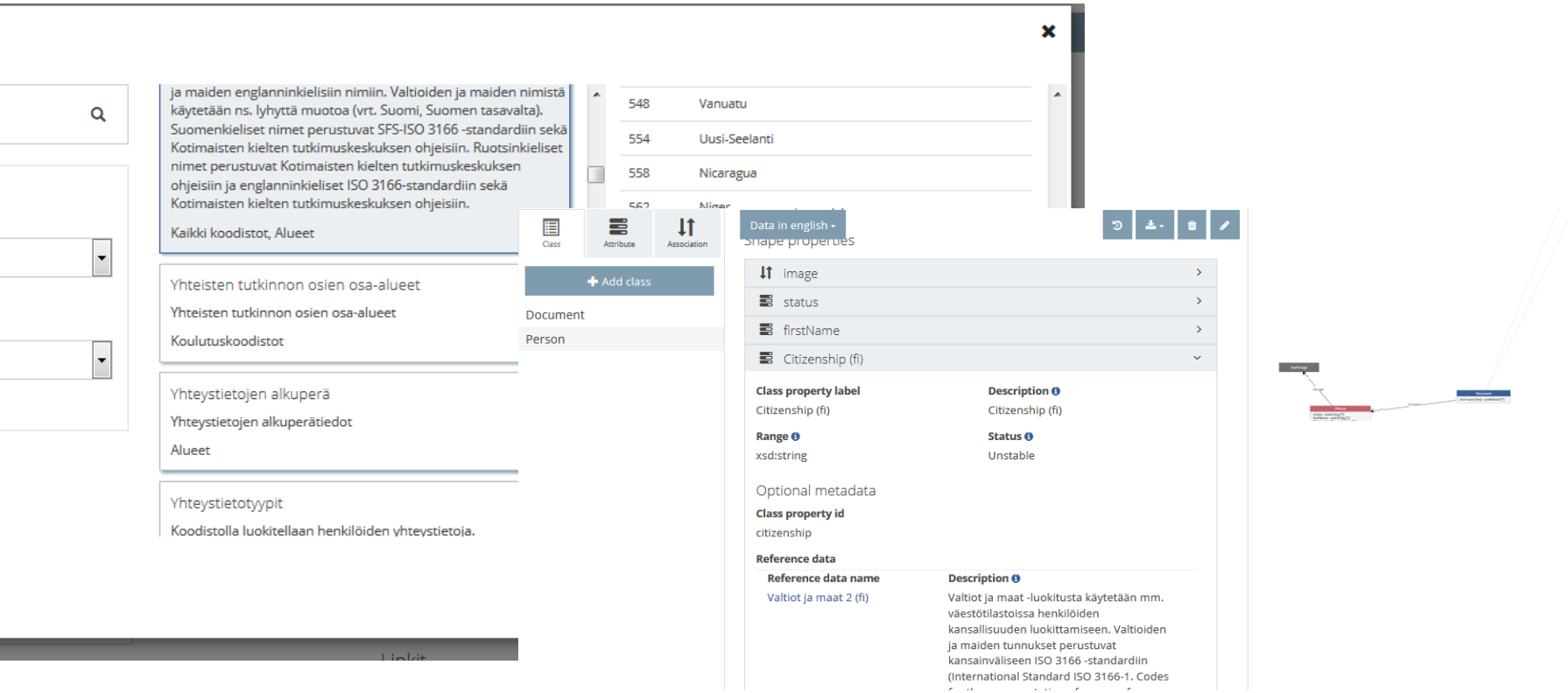
Integration to controlled vocabularies

- Link controlled vocabularies to created model
- Create classes and properties based on existing concepts



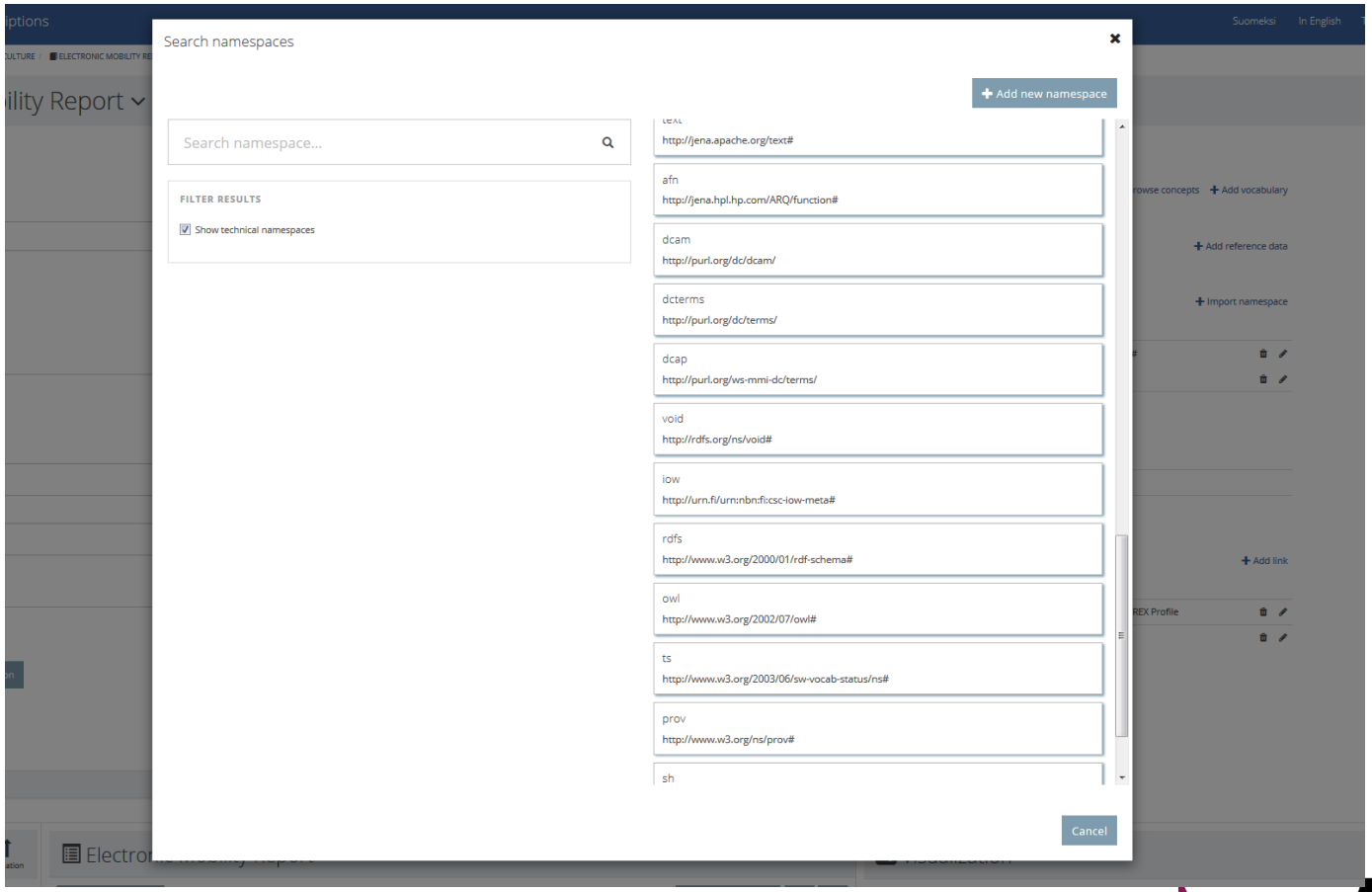
Integration to classification schemes

- Link to existing reference data from code service
- Restrict allowed values by using existing reference data



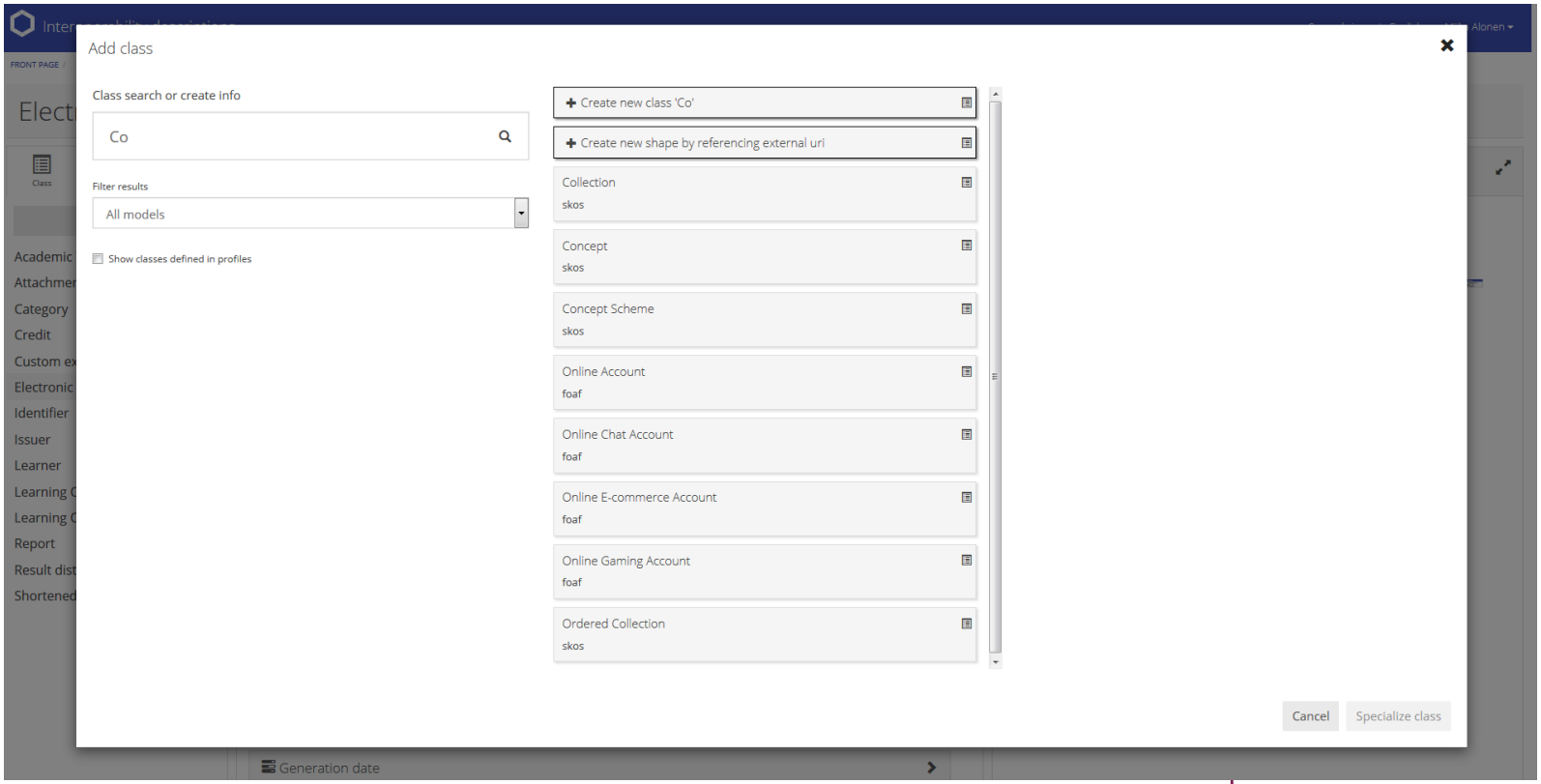
Interoperability workbench

- Import existing models from local models and external namespaces



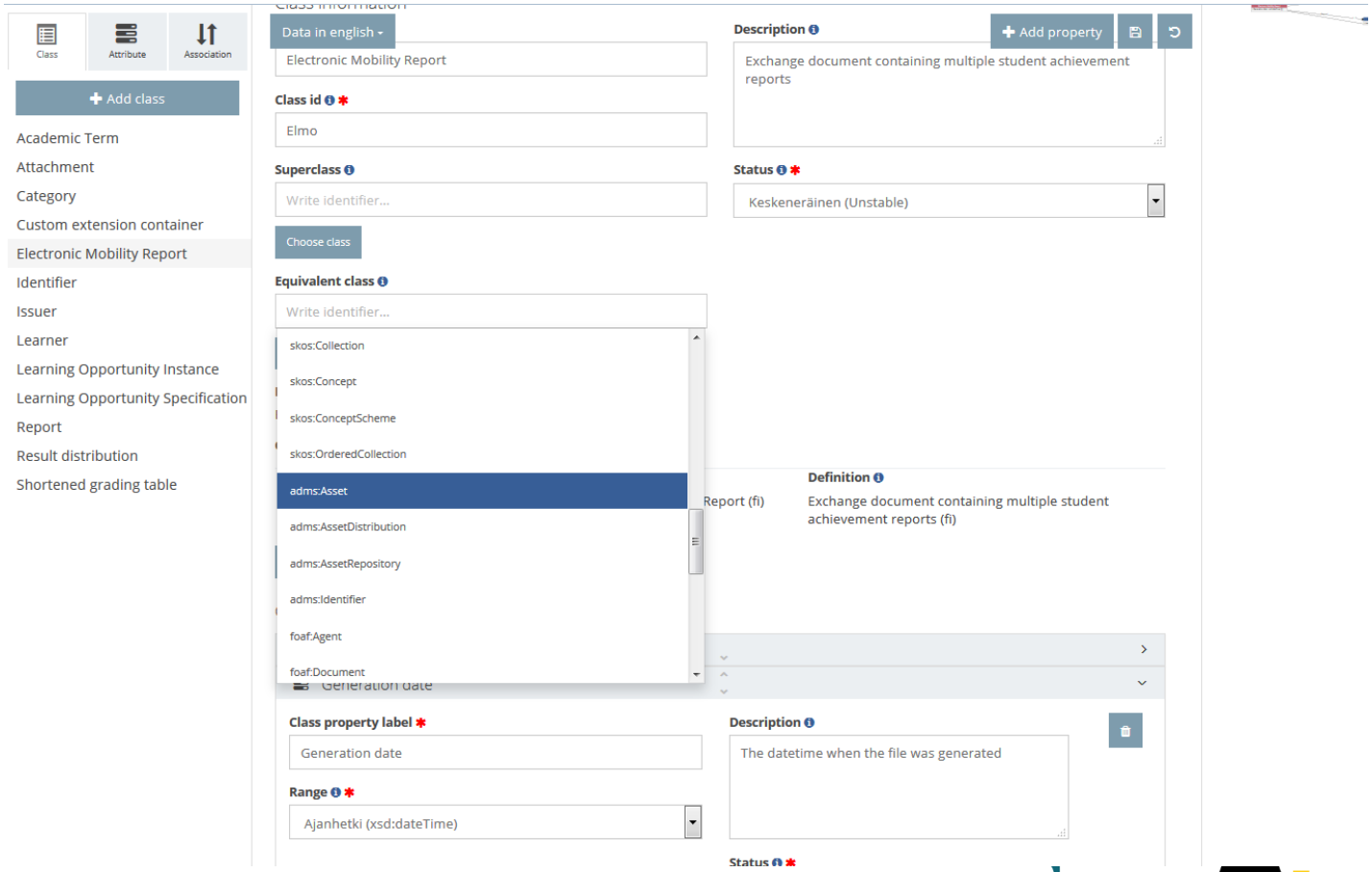
Interoperability workbench

- Include and search metadata from imported standards
- Create new domain models as highly reusable metadata



Interoperability workbench

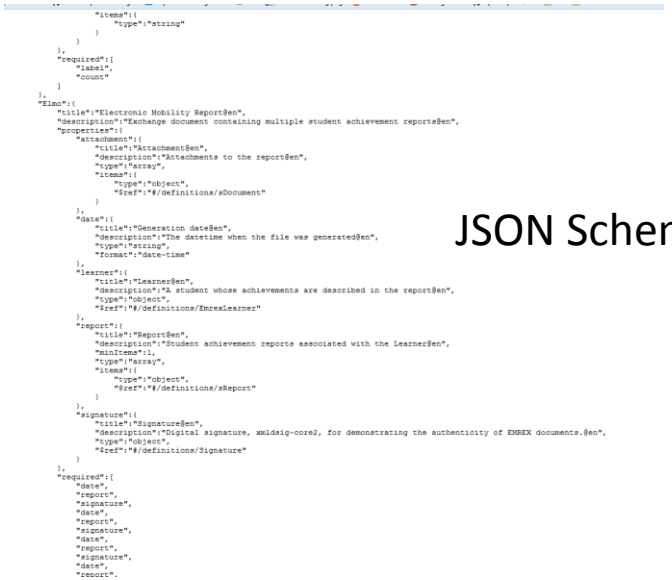
- Map new classes and class usage to relevant standards



Interoperability workbench

- Export schemas in multiple formats
- Enforces Naming practices

RDF



JSON Schema

XML Schema

tbd …

Thanks!

- Questions

- Interoperability workbench
- http://iow.csc.fi