The European Commission’s science and knowledge service

Joint Research Centre

Pilot project on energy extending INSPIRE buildings 2D

Michael Lutz
Giacomo Martirano (external consultant)

Marne-La-Vallee (FR), 20 June 2017
Workshop on INSPIRE extension
Outline

• Context
• INSPIRE core schemas extension
• Re3gistry implementation
• Data transformation
• Data validation
• Data publication
• Data use
• Next steps
Context (EULF/ELISE energy pilot overview)

- The EU is giving more and more emphasis to its energy policy, whose strategy and actions are included in the Energy Union Package and the 2030 Framework for Climate and Energy.
- Buildings in which people live and work are responsible for an important portion of the energy consumption in Europe.
- Several policies and initiatives aim at improving the energy performance of buildings and to collect data of sufficient quality on the effect of energy efficiency policies on building stock across Europe.
Context (scaling-up methodologies)
Context (use case overview)

- **Name**: INSPIRE Harmonization of existing Energy Performance Certificate datasets and creation of a web application for accessing them.
- **Goal**: To establish an accessible and interoperable common knowledge base for EPC datasets to support local government and private sector involved in energy efficiency policies.
- **Description**: To harmonize according to INSPIRE existing EPC datasets and to create a user friendly web application to make them accessible and re-usable.
Context (use case workflow)

STEP 1
EPC dataset

STEP 2
Open cadastral vector dataset

STEP 3
To define a methodology to georeference the EPC dataset using cadastral data

STEP 4
Georeferenced EPC dataset

STEP 5
To create the target data model extending the INSPIRE core data model for Buildings

STEP 6
To transform the georeferenced EPC dataset into the INSPIRE extended target data model

STEP 7
To publish the transformed dataset by means of INSPIRE Network Services (WMS + WFS)

STEP 8
To use the harmonised dataset into a GIS client desktop application

STEP 9
To assess the possibility to apply the methodology (or enhance it) to other EPC datasets, managed by other organizations in other countries/regions
INSPIRE core schemas extension

• Content and structure of INSPIRE application schemas for theme Buildings
INSPIRE core schemas extension

- Dependencies between application schemas of theme Buildings
INSPIRE core schemas extension

- Modular approach for modelling Buildings theme
INSPIRE core schemas extension

- Issues in the draft INSPIRE extended schemas
INSPIRE core schemas extension

- INSPIRE core data models
- INSPIRE extended data models
- Energy Pilot extended data models
- CityGML Energy ADE
The INSPIRE DS extension approach

INSPIRE Generic Conceptual Model

Title: D2.5: Generic Conceptual Model, Version 3.4
Status: Version for Annex II/III data specifications v3.0
Creator: Drafting Team "Data Specifications"
Date: 2014-04-08
Subject: Generic Conceptual Model of the INSPIRE data specifications
Publisher: Drafting Team "Data Specifications"
Type: Text
Description: Generic Conceptual Model of the INSPIRE data specifications
Contributor: Members of the INSPIRE Drafting Team "Data Specifications", INSPIRE Spatial Data Interest Communities & Legally Mandated Organisations, INSPIRE Consolidation Teams and other Drafting Teams
Format: Portable document format (pdf)
Source: Drafting Team "Data Specifications"
Rights: Public
Identifier: D2.5_v3.4
Language: En
Relation: n/a
Coverage: Project duration

Example for an extension to an INSPIRE application schema

Annex F
(informative)

F.1 Introduction
The agreement on harmonised data specifications addresses the need of users, in particular pan-European users, to combine multiple spatial data sets without repetitive manual intervention and in such a way that the result is coherent. This requires an effort to transform the existing spatial data to the new harmonised data specifications. In the long-term, it is the hope that less and less effort will be required for such transformations and that data providers start to re-use the harmonised data specifications as the basis for their spatial data sets in case they are restructured. Since national spatial data sets will in almost all cases contain information not covered by the INSPIRE data specifications, national SDIs or community SDIs will typically have to extend the INSPIRE data specification for their own purpose.

The Generic Conceptual Model has been designed to support such extensions. This annex provides an example for a simple extension.

F.2 General rules
The INSPIRE data specifications have been developed through a process involving the European stakeholders. While the future maintenance of the specifications has not yet been fixed, it is reasonable to assume that this will be the case in the future, too. The INSPIRE

Extending an INSPIRE data specification would imply at a minimum that:
- the extension does not change anything in the INSPIRE data specification but normatively references it with all its requirements
- the extension does not add a requirement that breaks any requirement of the INSPIRE data specification

However, the extension may, for example, do any of the following:
- add new application schemas importing INSPIRE or other schemas as needed
- add new types and new constraints in your own application schemas
- extend INSPIRE code lists as long as the INSPIRE data specification does not identify the code list as a centrally managed, non-extensible code list
- add additional portrayal rules

In addition to these general rules that are mainly implied by the rules of UML, further harmonisation will be achieved, if the extensions conform to all requirements of this document and the document "Guidelines for the encoding of spatial data", too.
INSPIRE core schemas extension

INSPIRE Data Specification Extensions

The Purpose of Patterns

In software engineering, a software design pattern is a general reusable solution to a commonly occurring problem. It is a description or template for how to solve a problem that can be used in many different situations. Design patterns are formalized best practices that the designers or programmers can use to solve common problems when building a system.

Software design patterns fall into multiple categories such as structural and behavioural patterns. Structural pattern show relationships between classes that are static. In our extension design context, we define several new categories of design patterns. Based on the information given for each pattern, you will be able to make informed choice about how to design your model extension, and how to make it INSPIRE compatible.

Types of Patterns for INSPIRE Extensions

Model extension design as described in the extension methodology is a hierarchical top-down process, where you first design a wide scope, and then drill down to make individual aspects concrete. We start at the level of the entire model, the proceed with adding classes, and then define these classes in detail by adding properties. For each of these phases, there are different patterns you can apply:

1. Patterns for Model compliance: These patterns define restrictions you can apply to ensure compliance of your model to INSPIRE and to other frameworks where you want to comply to.
2. Patterns for adding classes and properties: These patterns describe how one or multiple classes are linked to classes in the INSPIRE data specification you’d like to extend. If in another language they describe which language features you use to implement them, and what consequences there are on a conceptual and implementation level.
3. Patterns for modifying properties: Property modification patterns describe how you can extend individual properties, e.g. by adding new constraints or by extending code lists. They also include consequences there are on a conceptual and implementation level.
INSPIRE core schemas extension

NEW FEATURE TYPES

DRAFT INSPIRE EXTENDED

INSPIRE CORE
Building unit

A BuildingUnit is a subdivision of Building with its own lockable access from the outside or from a common area (i.e. not from another BuildingUnit), which is atomic, functionally independent, and may be separately sold, rented out, inherited, etc.
INSPIRE core schemas extension

- Modified feature types of INSPIRE BuildingsExtended2D draft schema
INSPIRE core schemas extension

- New feature types of Use Case extended data model
INSPIRE core schemas extension

• Data types of the extended data model
INSPIRE core schemas extension

- New data types
INSPIRE core schemas extension

- Code lists of the INSPIRE BuildingBase core schema
INSPIRE core schemas extension

• New (sixteen) code lists
### INSPIRE core schemas extension

In green background are shown the attributes of the use case extended data model taken as-is from CityGML Energy ADE modules.

<table>
<thead>
<tr>
<th>FeatureType</th>
<th>Attribute</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>costructionStyle</td>
<td>CostructionStyleValue</td>
</tr>
<tr>
<td>Building</td>
<td>buildingType</td>
<td>BuildingTypeValue</td>
</tr>
<tr>
<td>Certificate</td>
<td>climaticZone</td>
<td>ClimaticZoneValue</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>yearOfInstallation</td>
<td>Date</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energyCarrierType</td>
<td>EnergyCarrierTypeValue</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energyAmountProduced</td>
<td>Measure</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energyConversationSystemCode</td>
<td>CharacterString</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>registrationNumber</td>
<td>CharacterString</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energyCarrierNotes</td>
<td>CharacterString</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>otherConversionSystemTypeNotes</td>
<td>CharacterString</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>nominalPower</td>
<td>Measure</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energySourceType</td>
<td>EnergySourceTypeValue</td>
</tr>
<tr>
<td>EnergyConversionSystem</td>
<td>energyConversionSystemType</td>
<td>EnergyConversionSystemTypeValue</td>
</tr>
<tr>
<td>EnergySystem</td>
<td>energySystemCategory</td>
<td>EnergySystemCategoryValue</td>
</tr>
<tr>
<td>EnergySystem</td>
<td>hasEnergyConversionSystem</td>
<td>EnergyConversionSystem</td>
</tr>
<tr>
<td>EnergySystem</td>
<td>nominalEfficiency</td>
<td>Measure</td>
</tr>
<tr>
<td>EnergySystem</td>
<td>systemNominalPower</td>
<td>Measure</td>
</tr>
</tbody>
</table>
Re3gistry implementation

Our ISA solutions for you

- Document exchange
- Semantics
- Security
- Cross border collaboration services
- e-Participation
- Collections of software, standards and specifications
- Interoperable IT architecture & services

Re3gistry

A tool to manage and share reference codes.

You would like to exchange data cross-border and cross-sector using reference codes. These codes are used in data exchange between applications, making sure that the parties involved understand univocally the key concepts to which the data refer. They can be used to define sets of permissible values for a data field, or to provide a reference or context for the data being exchanged. Examples are enumerations, controlled vocabularies, taxonomies, thesauri or, simply, ‘lists of things’.

You would like to manage and share reference codes.

Re3gistry provides a central access point that allows labels and descriptions for reference codes to be easily looked up by humans, or retrieved by machines. It supports
Re3gistry implementation

EULF Energy Pilot code list register

**ID:**
http://inspire-sandbox.jrc.ec.europa.eu/codelist

**Label:**
EULF Energy Pilot code list register

**Content Summary:**
This code list register contains code lists and their values, as defined in the EULF Energy Pilot use cases. NOTE: None of the code lists referred to in this register are contained in any of the code lists referred to in the INSPIRE code list register.

**Owner:**
European Union

**Register manager:**
European Commission, Joint Research Centre

**Control body:**
European Commission, Joint Research Centre

**Submitter:**
European Commission, Joint Research Centre (EULF Energy Pilot)

**Contact point:**
EULF Energy Pilot Registry Team

**Licence:**
Europa Legal Notice

**Other formats:**
- [XML](http://inspire-sandbox.jrc.ec.europa.eu/codelist)
- [XML ISO 19135](http://inspire-sandbox.jrc.ec.europa.eu/codelist)
- [RDF/XML](http://inspire-sandbox.jrc.ec.europa.eu/codelist)
- [JSON](http://inspire-sandbox.jrc.ec.europa.eu/codelist)
- [Atom](http://inspire-sandbox.jrc.ec.europa.eu/codelist)
- [CSV](http://inspire-sandbox.jrc.ec.europa.eu/codelist)

**Code Lists**

<table>
<thead>
<tr>
<th>Label</th>
<th>Themes</th>
<th>Application schema</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>BuildingType</td>
<td><a href="http://inspire.ec.europa.eu/theme/bu">http://inspire.ec.europa.eu/theme/bu</a></td>
<td>EULF Energy Pilot UC1</td>
<td>Valid</td>
</tr>
<tr>
<td>CertificateType</td>
<td><a href="http://inspire.ec.europa.eu/theme/bu">http://inspire.ec.europa.eu/theme/bu</a></td>
<td>EULF Energy Pilot UC1</td>
<td>Valid</td>
</tr>
</tbody>
</table>
Data transformation
Data transformation
Data validation
Data validation
Data publication

WFS with deegree memory feature store
Data publication
Data use
Data use
Data use
Data use
Next steps

• Improve Persistent Identifier management in the target schema
• Apply HALE alignment to all dataset
• Deploy WFS on a publicly accessible server
• Enrich code list register content with more detailed description of code list values and translation in English
• Support partner to operationalize the pilot workflow into its organization
• Develop a web application facilitating the access to and use of harmonized data
• Re-use pilot workflow in other Regions/Countries
Stay in touch


Twitter: @EU_ScienceHub
@EULocation

LinkedIn: european-commission-joint-research-centre

http://inspire.ec.europa.eu/


Email: eulf-info@jrc.ec.europa.eu