Geonovum

Study INSPIRE Extensions

Michel Grothe, Jandirk Bulens, Thorsten Reitz
Introduction

- It is a study
  - to find patterns & provide guidelines, no static document, but an accessible, dynamic website
  - material accessible for a broad (INSPIRE) audience
  - Still requires advanced knowledge on basic Object-Oriented modelling

- Covers the full chain
  - From data preparation to publishing
    - Organisational and technical
  - Data collection not included

- Joined effort NL & EU
  - Including user input all member states

- Follow up is needed
In short..

- Why?
- What?
- How?
- Who?
- When?
Why?

- How can we use INSPIRE to support specific policy and business processes effectively?
  - **Observation:** Extensions provide the opportunity to build new, efficient business processes on top on INSPIRE.
  - **Example:** New spatial planning act in the Netherlands coming into force in 2018

- What are the steps to create an interoperable INSPIRE Extension?
  - **Observation:** High uncertainty about the methodology towards an interoperable INSPIRE Extension
  - **Example:** How to transform existing data into harmonized services while maintaining the richness and the value of the data to its present and foreseen use the data
What?

- We provide guidance that helps pick organisational and technical patterns to extend INSPIRE models, depending on the specific wishes to extend.
How?

- In this project a study is carried out to
  - make an inventory on best practices in extending INSPIRE models
  - find patterns that can be useful to be followed by data providers member states.
Who?

- Geonovum
- WeTransform
- Expert group
- Advisory board
- INSPRIE Stakeholders:
  - LMO/SDIC
  - MIGs
  - Thematic clusters
- DG ENV
- JRC
- EEA
Inside the project

- Geonovum initiated this project
  - Overall coordination
- Wetransform is contracted by Geonovum
  - carry out the body of the work.
- Support is supplied by DG ENV, EEA and JRC
  - taking care of organising the domain with an expert group, and facilitating the communication with the expert group and internally.
- The expert group
  - INSPIRE experts specifically in the field of modelling and implementing INSPIRE models from the data specifications
Outside the project

- An advisory committee
  - will ensure the overall project quality

- The stakeholders
  - represented by Spatial Data Interest Communities (SDICs) and Legally Mandated Organisation (LMOs).
  - The pool of experts for maintenance and implementation
  - two INSPIRE Maintenance and Implementation Group (MIG-T and MIG-P)

- The target group
  - The broad (INSPIRE) audience
  - Still requires advanced knowledge on basic Object-Oriented modelling
Composition?

Project group
Jandirk bulens
Michel Grothe
Paul Janssen
Linda van derBrink
Thorsten Reitz

Expert group
Morten Borrebaeck
Debbie Wilson
Stefania Morrone
Katharina Schleidt
Sylvian Grellet
Paul Janssen
Linda van den Brink

Advisory board
Michael Lutz
Robert Tomas
Joeri Robbrecht
Robin Smith
Christian Ansorge
Michel Grothe
Task and deliverables

- D1: Inventory of existing Model Extensions
- D2: Expert Kick-off Meeting
- D3: Extension Methodology and MDA Summary
- D4: Full Pattern Catalogue, Existing Examples, Toolchains
- D5: Tutorial Project
- D6: Expert Review Meeting
- D7: Final Report
- D8: Workshop at INSPIRE Conference
When?

- Kick-off
- Survey
- Expert meeting 1
- Drafting the report
- Online website
- Expert meeting 2
- Final report
- INSPIRE Conference workshop

Timeline:
- March
- April
- May
- June
- July
- September

Note: The timeline is visually represented with arrows indicating the progression of activities.
Results

INSPIRE Data Specification Extensions

Get the most out of INSPIRE by extending data specifications!

Site Purpose and Overview

We collect and document best practices for extending INSPIRE models. This documentation shows how organisations can align their processes with the INSPIRE reference infrastructure. Below, you’ll find an extension methodology that describes the process, people and tools needed to make an INSPIRE extension project successful, and provides common extension approaches in the form of a pattern catalogue.

The site has three core elements: The initial survey and inventory of existing INSPIRE Model Extensions, the extension pattern catalogue and an end-to-end tutorial project:

1. Introduction
2. Results of the Survey
3. Model Extensions Inventory
4. The INSPIRE Model-Driven Approach
5. The Extension Methodology
6. The Pattern Catalogue
7. An End-to-End Tutorial Project
8. Conclusions and Outlook

Current Project Activities

1. Kickoff Workshop (Amersfoort) – 9th of March 2016 ✔
2. Model Extensions Inventory Delivery ✔
3. Advisory Board Meeting (Ispra) – 21st of April ✔
4. Extension Methodology Draft ✔
5. Full Pattern Catalogue ✔
6. Tutorial Project and Running Example Documentation ✔
7. Advisory Board Review Meeting (Ispra) – 29th to 30th of June 2016 ✔
8. Final Report ✔
9. Workshop at INSPIRE Conference (Barcelona) – 26th of September, 09:00 to 12:30
http://inspire-extensions.wetransform.to/

- Introduction
- Results of the Survey
- Inventory of Model Extensions
- The INSPIRE Model-Driven Methodology
- The Extension Methodology
- The Pattern Catalogue
- An End-to-End Tutorial Project
- Conclusions and Outlook
The survey

- 117 people responded to the survey between April and June
  - You can still submit entries!
- Good overall response rate (3%)
  - High focus group response rate in the INSPIRE Maintenance and Implementation Groups (between 10 and 20%.
- Low rate of incomplete responses (3%)
- 37 existing data models related to the INSPIRE data specifications are documented.
What was done?

**Question 2.3:** Compared to the INSPIRE Data Specifications, what have you done to create your data model?

*36 responses*

- Created new data types
- Added new Properties
- Profiled a model by taking away elements
- Added or extended codelists
- Added formal constraints
- Others
How about maintenance?

**Question 2.12:** Will you continue to develop the data model?

*34 responses*

- Yes, long-term resources available: 14
- Yes, short-term resources available: 14
- No: 6
Question 2.18: Which challenges did you encounter when implementing the data model?

35 responses
Inventory models (up to 18/5/2016)

Browse Models by Date

- Geological Database of Catalonia (1:250000) (added 18.05.2016)
- ZSIN - the Integrated System of Information about Real Estates (added 18.05.2016)
- Geographic Reference Information - Hydrography (added 10.05.2016)
- SOSI Vegnett (Road Network) and Linear Referencing (added 10.05.2016)
- BuildingsExtended2D (added 10.05.2016)
- Nutrification (MDI-DE) (added 10.05.2016)
- Redes de Transporte (Spanish Transport Networks) (added 10.05.2016)
- Querbauwerke (added 10.05.2016)
- INSPIRE for Dutch Provinces (added 10.05.2016)
- LISA (Land Cover) (added 10.05.2016)
- IMKL2015 (Information model cable and pipelines) (added 23.04.2016)
- EAGLE Data Model (added 22.04.2016)
- GeoSmartCity Buildings 2D-Energy (added 22.04.2016)
- GeoSmartCity Extended Utility Networks (added 20.04.2016)
- ELF Data Model (added 19.04.2016)
- SOSI Planned Land Use (added 19.04.2016)
- Example Model 2 (added 14.04.2016)
- Example Model (added 09.04.2016)
Model Driven Appraoch

- Consistent and well-structured approach
- Ability to model cross-theme relationships
- Effective re-use and detection of inconsistencies and errors
- Easy generation of encodings and other artifacts such as feature catalogues and mapping tables
From Use Case to Data Specification

1. Organise a thematic working group
2. Collect Use Cases
3. Identify user requirements and Spatial Object types
4. Determine required level of interoperability
5. Perform as-is analysis and gap analysis
6. Design a draft model
7. Test the model and consult stakeholders
8. Iterate over the model and feedback cycle
9. After release, maintain the model
Process of extending models

- **Organise**: Build your working group
- **Analyse**: Identify and analyse requirements
- **Compare**: Compare the requirements with existing models and INSPIRE Data Specs
- **Design**: Create or modify your model extension
- **Validate**: Test and validate
- **Consult**: Invite all stakeholders and the public
- **Operate**: Deploy and operate the model extension in view and download services
The process

1. Organise
2. Analyse
3. Compare
4. Design
5. Validate
6. Operate

Start
Retrospective
Release
Iterate
Pattern catalogue

- Patterns for Model compliance
  - INSPIRE Generic Conceptual Model
  - CityGML Application Domain Extensio

- Patterns for adding classes and properties
  - Aggregation
  - Inheritance
  - Association
  - Composition
  - Multiple Inheritance

- Patterns for modifying properties
  - Adding Constraints
  - Codelist Extension
For each pattern

- Structure
- When to use, when not to use
- XML schema example
- XML instance example
- Implementation considerations
- Examples in the Model inventory
Structure
XML schema example

```xml
<?xml version="1.0" ?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:cp="http://inspire.ec.europa.eu/schemas/cp/4.0"
    xmlns:gml="http://www.opengis.net/gml/3.2"
    xmlns:ex="http://www.wetransform.to/ie-examples/aggregation/1.0"
    elementFormDefault="qualified"
    targetNamespace="http://www.wetransform.to/ie-examples/aggregation/1.0"
    version="1.0">
  <xs:import namespace="http://www.opengis.net/gml/3.2" schemaLocation="http://schemas.opengis.net/gml/3.2.1/gml.xsd"/>
  <xs:element name="Owner" type="ex:OwnerType" substitutionGroup="gml:AbstractFeature" />
  <xs:complexType name="OwnerType">
    <xs:complexContent>
      <xs:extension base="gml:AbstractFeatureType">
        <xs:sequence>
          <xs:element name="givenName" type="xs:string" minOccurs="1" maxOccurs="1"/>
          <xs:element name="familyName" type="xs:string" minOccurs="1" maxOccurs="1"/>
          <xs:element name="address" type="xs:string" minOccurs="1" maxOccurs="1"/>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:schema>
```
XML instance example

```
http://www.wetransform.to/ie-examples/aggregation/1.0 ./aggregation.xsd
numberMatched="3" numberReturned="3" timeSamp="2016-05-31T10:55:38.697+02:00">

<wfs:member>
  <ex:JoinedParcel gml:id="_3">
    <cp:beginLifespanVersion xsi:nil="true" nilReason="unpopulated" />
    <cp:geometry><!---- ... --></cp:geometry>
    <cp:inspireId>
      <base:Identifier>
        <base:localId>3</base:localId>
      </base:Identifier>
    </cp:inspireId>
    <cp:label>My Joined Parcel</cp:label>
    <cp:nationalCadastralReference>urn:wetransform.to:ie-examples:inheritance:3</cp:nationalCadastralReference>
    <ex:joinedParcel xlink:href="#parcel_1"></ex:joinedParcel>
    <ex:owner xlink:href="#owner_1"></ex:owner>
    <ex:owner xlink:href="#owner_2"></ex:owner>
  </ex:JoinedParcel>
</wfs:member>

<wfs:member>
  <cp:CadastralParcel gml:id="parcel_1">
    <cp:beginLifespanVersion xsi:nil="true" nilReason="unpopulated" />
    <cp:geometry><!---- ... --></cp:geometry>
  </cp:CadastralParcel>
```
End-To-End Tutorial

- **Data Modelling:**
  - Enterprise Architect 12.0

- **Schema Transformation:**
  - ShapeChange 2.1.0 (Open Source)

- **Data Transformation:**
  - hale studio 2.9.4 (Open Source)

- **Service Publishing:**
  - deegree 3.3.18 (Open Source)
Analysis

- Story
  - It's late on a rainy Friday afternoon. I am in the middle of reviewing an article when my boss Alex calls. He sounds agitated and tells me that there is a problem, so he needs me to help him. Ten minutes later, we sit together at the bar of the pub across the road. Alex tells me about the meeting he has had in the last two days in the capitol city, with many other directors of public authorities.
  - ....

In this tutorial, we build a custom variant of the existing CDDA INSPIRE extension. If you need to deliver CDDA data, please use the official extension, and not a custom variant we might build using this tutorial.
Follow up ideas

- Continue to develop the site into an official registry for extensions
- Add a simple self-registration form for more extensions instead of the survey
- Improve the statistics, model links, and pattern identification using concrete models, by using automated analysis
- Make sure we get access to the actual model for as many extensions as possible
- Include extensions in the interactive data specifications find your scope tool
- Add sandboxes for interactive work with data models to tutorial project
- Add interactive model exploration tools to each model extension entry for which we have a formal model (XSD, UML)
- Add a section on UML modelling requirements and best practices, such as UML model presentation and the integration of all relevant ISO 191xx requirements
Feedback from the workshop

- More implementation examples with wider scope
- Add a trouble shooting section
- Guidance for steps in managing the process i.e. add checklists
- Add complementary workflows and adding more tools on the side (ex. merging data files)
- More specifics on INSPIRE compatibility, risks and benefits

- Guidance in finding a balance in compliance, interoperability and current use own datasets
For now we plan to continue this work, so please continue to submit contributions!

Barchman Wuytierslaan 10, 3818 LH Amersfoort, NL
Postbus 508, 3800 AM Amersfoort, NL
+ 31 (0) 334 604 100
info@geonovum.nl
www.geonovum.nl
@geonovum.nl