Support to ELISE

European Location Interoperability Solutions for E-Government

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CityGML to INSPIRE Building data model to enable harmonization of energy performance of buildings across Europe

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OUTLINE

• Introduction

• Source dataset CityGML LOD1 and LOD2

• Mapping CityGML to INSPIRE BU 3D
  o CityGML LOD1 vs INSPIRE BU 3D CORE
  o CityGML LOD2 vs INSPIRE BU 3D CORE
  o CityGML LOD2 vs INSPIRE BU 3D EXTENDED

• Conclusions
Introduction

• ELISE Energy Pilot

• Use case “Comparative analysis of different methodologies and datasets for Energy Performance Labelling of buildings”

• Test areas in Zwolle (NL) and Essen (DE) with 3D building test datasets

• Energy heating demand simulations with SimStadt software developed by HFT Stuttgart, currently using CityGML LOD1/LOD2 input data, but looking at INSPIRE interoperability
The 4 CityGML Level of Detail

(a) LOD1 building
(b) LOD2 building
(c) LOD3 building
(d) LOD4 building
ESSEN
test area
ZWOLLE

test area
Source dataset: CityGML LOD1 (500 buildings)
Source dataset: CityGML LOD2
Source dataset: CityGML LOD2
Mapping CityGML to INSPIRE BU 3D

- **Main feature types**
  - Building
  - Building Part
  - Building Unit
  - Installation
  - Other Construction

- **Semantics**
  - Base
  - Extended Base
  - 2D
  - 2D Extended
  - 3D
  - 3D Extended

- **Geometry**
  - LOD1
  - LOD2

**Alternative deliveries:**
1 = simple semantics + 2D geometry
2 = simple semantics + 3D geometry
3 = extended semantics + 2D geometry
4 = extended semantics + 3D geometry + additional 3D feature types

*Includes Building Base*
Mapping CityGML to **INSPIRE BU 3D**

Attributes colored in green are those coming from Core profiles.

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<tr>
<th>City GML (Building)</th>
<th>TWG BU model (Building)</th>
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Mapping CityGML LOD1 to INSPIRE BU Core 3D

**Main feature types**
- Building
- Building Part
- Building Unit
- Installation
- Other Construction

**Semantics**
- Base
  - Added attributes
  - 2D
    - Same geometry
  - 3D
    - Same geometry

**Geometry**
- 2D
- 3D
- Extended Base
  - Includes Building Base

*Alternative deliveries:*
1 = simple semantics + 2D geometry
2 = simple semantics + 3D geometry
3 = extended semantics + 2D geometry
4 = extended semantics + 3D geometry + additional 3D feature types
GenericApplicationPropertyOfCityObject, storeysBelowGround and address are not mapped
Mapping CityGML LOD2 to INSPIRE BU Core 3D

Alternative delivery:
1 = simple semantics + 2D geometry
2 = simple semantics + 3D geometry
3 = extended semantics + 2D geometry
4 = extended semantics + 3D geometry + additional 3D feature types

*Includes Building Base
GenericApplicationPropertyOfCityObject, address, roofType and storeysBelowGround are not mapped.
Mapping CityGML LOD2 to INSPIRE BU Extended 3D

Alternative deliveries:
1 = simple semantics + 2D geometry
2 = simple semantics + 3D geometry
3 = extended semantics + 2D geometry
4 = extended semantics + 3D geometry + additional 3D feature types

*Includes Building Base
Double inheritance (generalisation) not encoded in the xsd.
The generalizations between the two feature types Building and BuildingPart and the feature type BuildingInfo have been substituted with associations.
Buildings Extended Base schema:
Name of association "address" has been changed to "linkToAddress"
Mapping CityGML LOD2 to INSPIRE BU Extended 3D
CityGML LOD2

INSPIRE BU 3D EXTENDED
Conclusions

• 3 different mapping between CityGML LOD1/LOD2 and INSPIRE BU 3D have been implemented:
  o CityGML LOD1 vs INSPIRE BU 3D CORE
  o CityGML LOD2 vs INSPIRE BU 3D CORE
  o CityGML LOD2 vs INSPIRE BU 3D EXTENDED

• Errors in INSPIRE draft extended schemas have been fixed:
  o BuildingExtendedBase
  o BuildingExtended3D
Conclusions

• Mapping CityGML LOD2 datasets to INSPIRE BU 3D Core or Extended depends on the use case.
• Reverse mapping from INSPIRE BU 3D to CityGML (easily doable) can improve interoperability of energy simulation software using CityGML input data.
• Harmonization of energy simulation output (easily doable by means of a further extension of INSPIRE BU Extended Base) can improve interoperability of energy performance of buildings data.
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The ELISE Energy Pilot in the INSPIRE Knowledge Base:
Run by the ISA Unit at DIGIT (European Commission) with 131€M budget, the ISA² programme provides public administrations, businesses and citizens with specifications and standards, software and services to reduce administrative burdens.