ISO/TC 59 SC13 and ISO/TC - JWG 14
Interoperability between GIS (Geospatial) and BIM

Presentation for the “Standards in Action seminar” in connection with the 48th Plenary of ISO/TC 211, Maribor, Slovenia
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Understanding & Managing the Natural & Built Environment

**Geospatial Modelling**
(ISO / TC 211: 191(1-11), 19136, 19109, 19150)


**Built Asset Modelling**
(ISO / TC 59 / SC 13: 16739, 29481, 19650, 12006)

Planning, Designing, Construction & Operation of Built Assets

Digital Engineering & Asset Management

Details

Return data

Provides context
In-between GIS and BIM
Why interoperability between GIS and BIM?

• Different technologies developed independent of each other.
• Both technologies have matured (fulfill their obligations?)
• Users see that both technologies:
  – Have advantages
  – But also disadvantages

Interoperability required
Interoperability between GIS (Geospatial) and BIM

**Scope**

Technical report developed by ISO/TC 211 and ISO/TC 59/SC 13 on the interoperability between GIS (Geospatial) and BIM. The objective of this Technical Report is to:

1. Describe requirements for interoperability between the two domains, to ensure mapping and/or semantic mediation of information flow including data exchange.

1. Describes measures to lower the barriers and increase interoperability between GIS and BIM, and specify standardization need in the field of GIS-BIM interoperability.
The scope of this technical report is to investigate barriers and propose measures to improve interoperability between Geospatial standards developed by ISO/TC 211 and BIM standards developed by ISO/TC 59 SC 13. This is undertaken in close cooperation with buildingSMART and OGC, in particular the Integrated Digital Built Environment Working Group. The investigation includes:

- Mapping and semantic mediation rules between geospatial information (General Feature Model) and building information (IFC).
- Mapping between geometry and topology models in ISO 19107 and ISO 16739
- Transformation between Geospatial and BIM coordinate systems.
- Instance level linking between Geospatial features and IFC entities.
- Vocabularies and means of interaction between experts in Geospatial and BIM domains.
Data quality / accuracy in GIS/BIM

• GIS-picture:
  – The real world is always correct. The GIS dataset shall present an abstraction of the real world in a sufficient way. This implies accuracy, for example positional accuracy.

• BIM-picture:
  – The phase of projecting: Accuracy is not relevant
  – Building phase:
    • The projected data is the blueprint, that actually states where the building should be in the real world
    • Accuracy is the accuracy of the position of the building related to the projected position

  – Building as a real world object:
    • Question: Is the building as built close enough to the projected building.
      – YES.  GIS data will be updated with BIM data.
      – No:  The building is not accepted (has to be moved).
The standardisation picture

**Geospatial**
- ISO/TC211 (ISO19100-familien)
- ISO19103 Concept Model Language
- ISO19107 Spatial Schema
- ISO19109 Rules for Appl Schema
- ISO19136 Geogr Markup Lan
- ISO/IEC 19505-2:2012 UML

**BIM**
- ISO/TC59/SC13
  - ISO16739 (IFC)
  - ISO12006-3 (IFD)
  - ISO29481 (IDM)
  - ISO 10303-xy (STEP)

Standards to take into consideration
Framework for Enterprise Interoperability

FEI: Framework for Enterprise Interoperability

ISO 11354-1 Advanced automation technologies and their applications – Requirements for establishing manufacturing enterprise process interoperability – Part 1: Framework for enterprise interoperability
Data Interoperability concern - Conceptual

ISO/TC 211 and OGC - Model driven architecture

- Metamodels
  - UML, ISO 19109 General Feature Model

- Conceptual schemas - abstract schemas
  - ISO 19107 Spatial Schema, ISO 19108 Temporal Schema, ISO 19111 Referencing by coordinates, etc.

- Conceptual schemas - application schemas
  - INSPIRE, OGC CityGML, LandInfra/InfraGML, etc.

- Implementation schemas
  - Schemas for GML, OWL, GeoPackage etc, derived from application schemas

ISO/TC 59 and buildingSmart
EXPRESS and IFC

5. Core schemas
6. Shared schemas
7. Domain schemas
8. Resource schemas

Figure 1 — Data schema architecture with conceptual layers
Suggested new structure as a basis for mapping?

- Schema languages
- Metamodels
- Conceptual schemas
- Application schemas
- Implementation schemas
Data Interoperability concern - Technological

Georeferencing

Creating a geoMVD (Model View Definition) for georeferencing??

EUREF 89 NTM zones for BIM in Norway
Data Interoperability concern - Conceptual

Geometry

- **Constructive Solid Geometry (CSG)**

- **Bounding Representation**

Challenge – parametric spatial objects.
The challenge of products

GIS – product is a dataset
BIM – product is something you can buy in a store (window, door, etc)
Service interoperability concerns

There are no services in BIM as we are used to in GIS, like
• Download services
• View service
• Discovery service (or catalogue service).

Metadata in GIS and BIM are different
• In GIS metadata is data about dataset
• In BIM there is metadata in a dataset.

Interoperability between the two domains requires knowledge of what data that existes and how to access them.
Further work

Planned submission of technical report - October 2019.

Then it is up to ISO/TC 59 SC 13 and ISO/TC 211 to agree on further actions.