FIG WORKING WEEK 2023
28 May - 1 June 2023 Orlando Florida USA
Protecting Our World, Conquering New Frontiers

Commission 10

Current Standardization Efforts to Achieve BIM and GIS Interoperability

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- ISO/TC59/SC13–ISO/TC211 WG: GIS-BIM (JWG14)
- buildingSMART Germany
- DVW Germany

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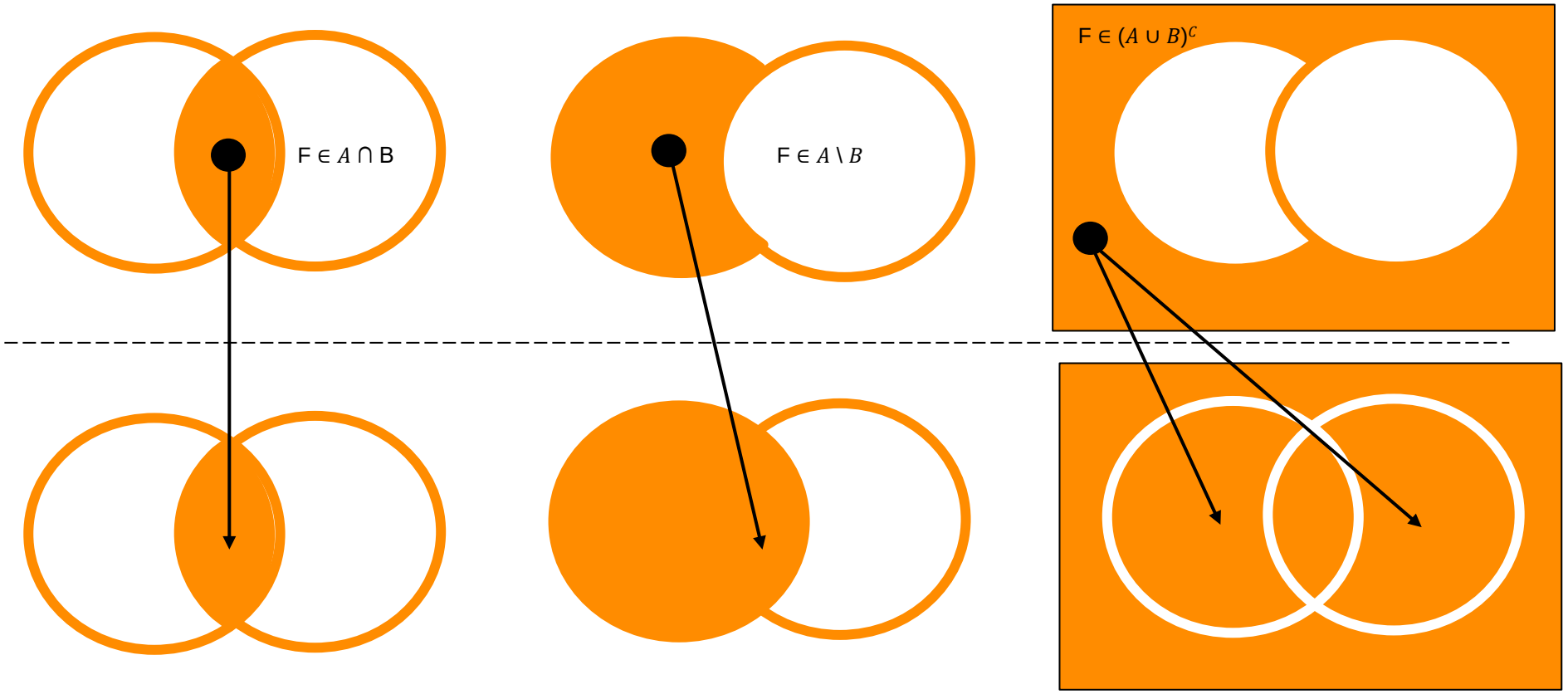
Use Cases

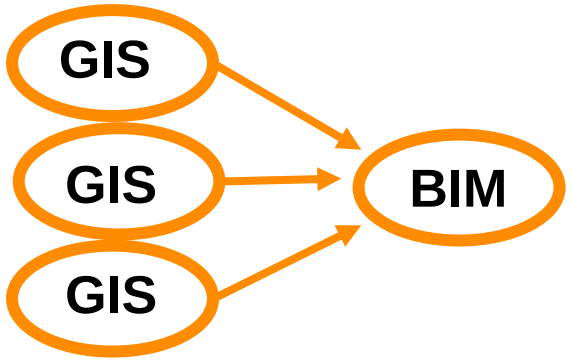
Very different types of use cases for BIM/GIS integration

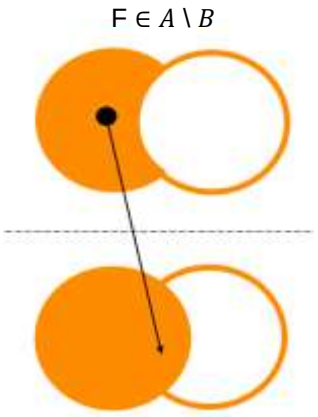


Example	Indoor-Navigation	BIM-Vicinity-Model - local part of the cadaster, terrain or city model	Building permit, environmental audit

From: Beck, Stefan, et al: Analyzing Contextual Linking of Heterogeneous Information Models from the Domains BIM and UIM, IJGI, 2021, https://doi.org/10.3390/ijgi10120807

Examples





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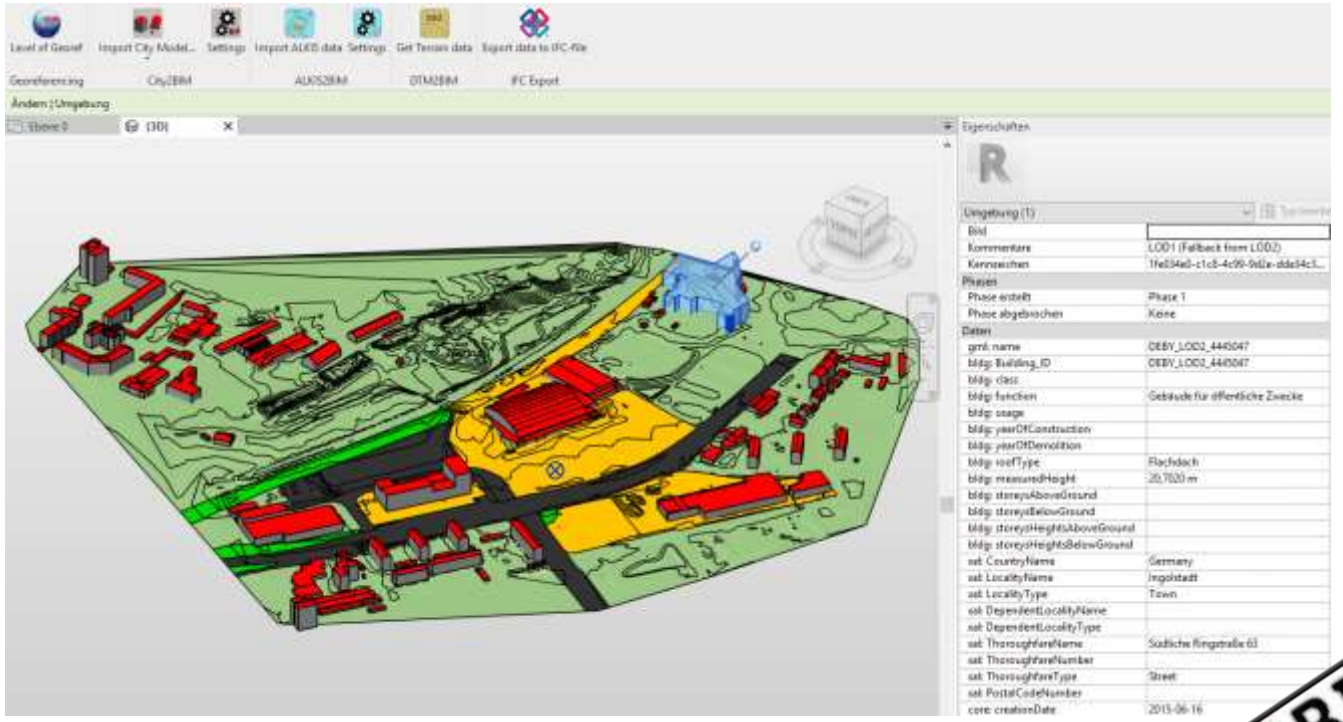
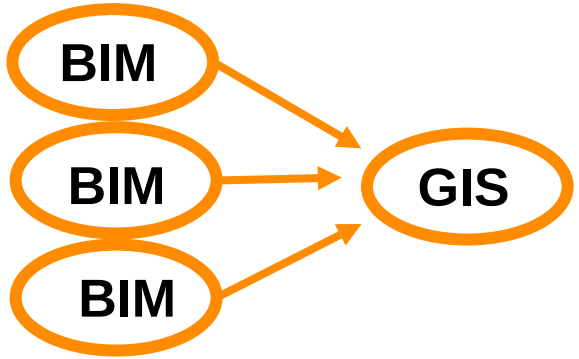
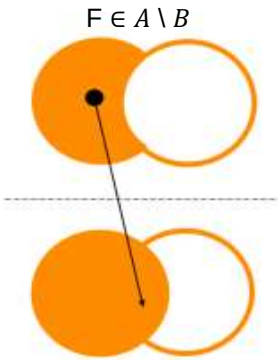


1. Georeferencing
2. Digital Terrain Model
3. 3D City Model
4. Cadaster and Land use planning
5. (CAD2BIM)
6. Customized IFC-Export

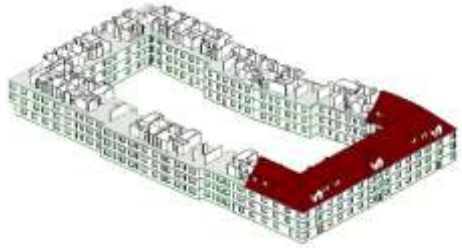
Examples



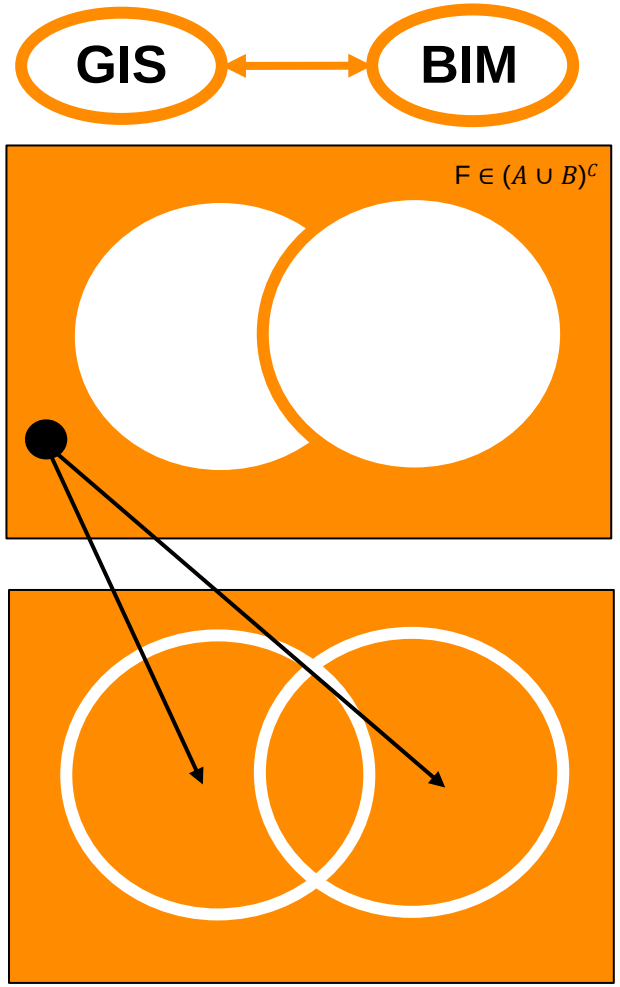


- Georeferencing
- Extraction of polygons
- Processes
- Semantic

Gefördert durch:
Bundesministerium für Wirtschaft und Energie
aufgrund eines Beschlusses des Deutschen Bundestages



Examples



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ISO Technical Report 23262

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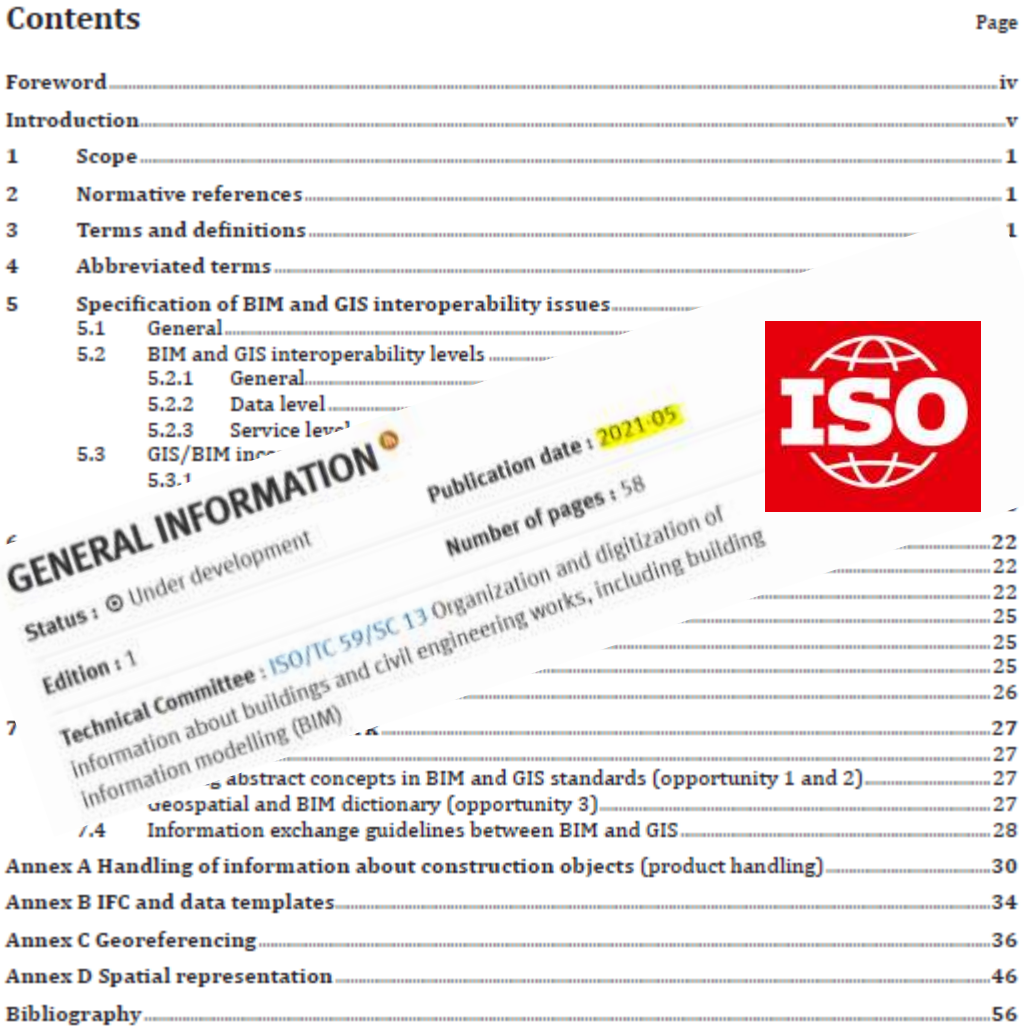
Background/Motivation JOINT ISO/TC59/SC13–ISO/TC211 WG: GIS-BIM (JWG14)

- 2018-2021 information exchange, collaborative text writing
- In place and web meetings with national delegates
- **Result: ISO Technical Report ISO/TR 23262 in May 2021**!

- **Suggestions for NWIP related to BIM/GIS-Interoperability (ISO Standards)**

Structure of the technical report ISO TR 23262:2021



Contents

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GENERAL INFORMATION

Status : Under development

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Number of pages : 58

Edition : 1

Technical Committee : ISO/TC 59/SC 13 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)

ISO

„Compendium“ on BIM and GIS Standards

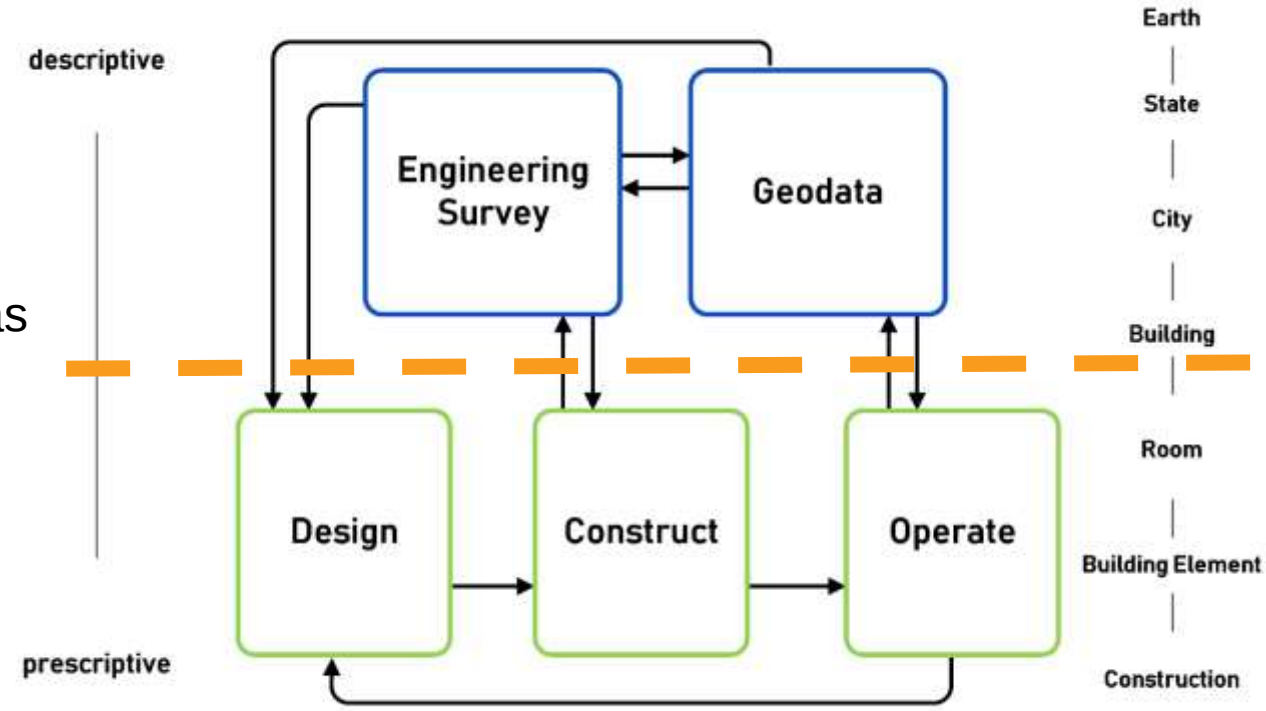
Barriers and Oportunities

Suggestions for further standardization work

Annex with additional information

Scope of the ISO/TR

- *investigates barriers and proposes measures to improve interoperability between geospatial and BIM domain, namely to align GIS standards developed by ISO TC211 and BIM Standards developed by ISO/TC59/SC13*
- traditionally AECOO and geospatial have been seen as **different domains**.
- **BIM** community is currently focusing on the standardization of terms, processes and business models.
- The **geospatial** community has a very sophisticated set of standards for digital modeling and communication - focusing more on functional standards.
- As a result, standards **cannot simply be mapped 1:1 between the two domains**. Instead, there has to be a detailed examination of the respective standards.

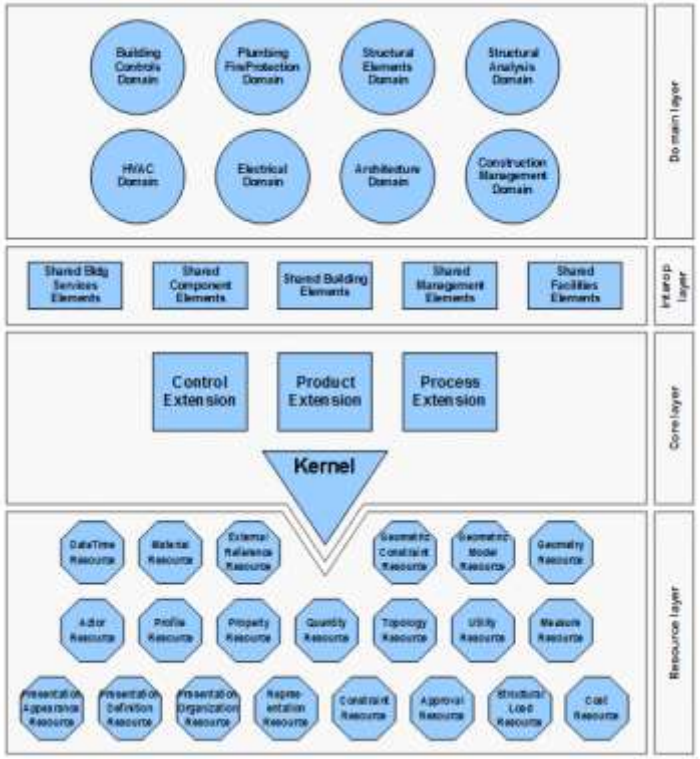


- Please note: Most concepts are developed by pre-standardization, namely **OGC** and **buildingSMART**

Identified Barriers (MDA)

Barrier	GIS	BIM
Conceptual Schema languages	UML	EXPRESS and EXPRESS-G
Metamodels	ISO 19101 (reference model), ISO 19103 (UML profiles), ISO 19109 (general feature model, GFM)	ISO 10303-201 to ISO 10303-242, IFC Kernel Schema, ISO 23387 (data templates)
Abstract Concept Schema	ISO 19107 (spatial schema), ISO 19111 (coordinate referencing), ISO 19148 (linear referencing), ISO19115-1 (metadata), etc.	ISO12006-3 (dictionaries), IFC Resources for Geometry, Topology, Date, Time
Conceptual Application Schema	LandInfra, OGC CityGML, EU INSPIRE,etc.	IFC Shared Schema, IFC Domain Schema, MVD
Implementation Schema	ISO 19136 (GML), ISO19150-2 (Rules for OWL), OGC CityGML schema, etc.	IFC EXPRESS, IFC xml schema, IFC Owl

Identified Barriers (MDA)



buildingSMART
International home of openBIM

Easy to compare:

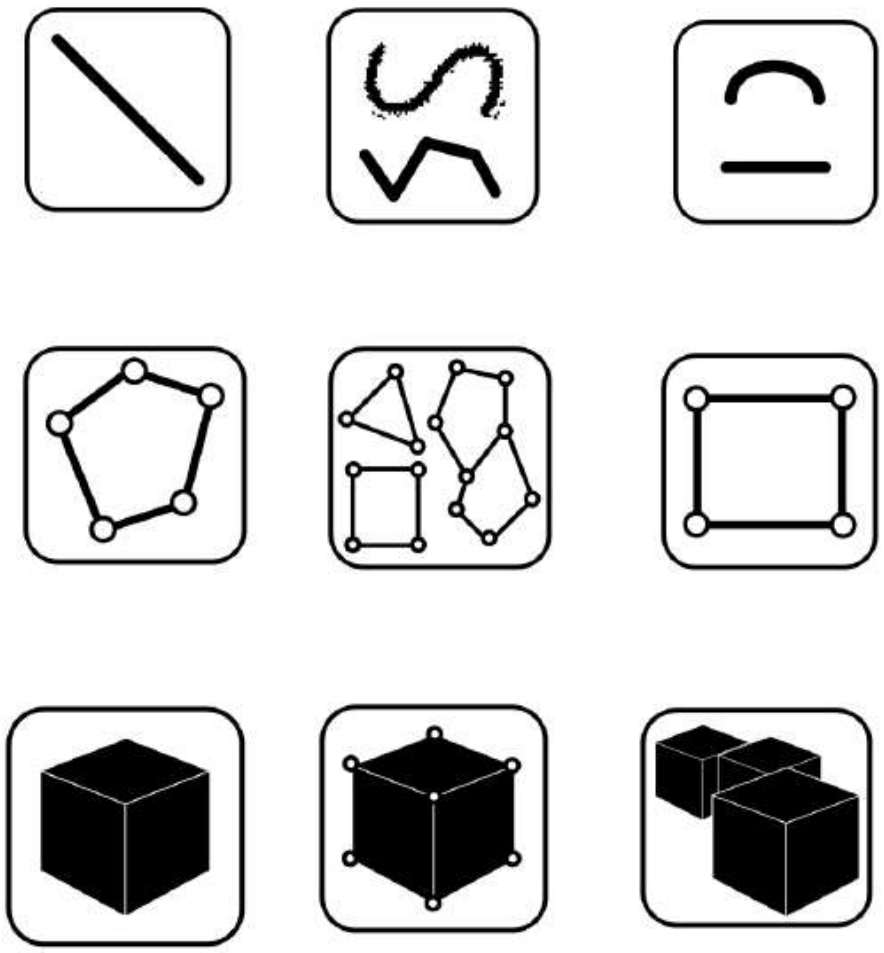
- IfcObject vs. GIS-feature,
- Concepts of the IFC Resource Layer / specific GIS concepts
- …

However, some concepts are **very different**:

- Objectified relationships in IFC
- Prototyping in IFC
- Spatial Structure in IFC
- …

Identified Barriers (others)

- Differences in underlying **software design approach**
- Differences in **geometric/topological dimension** of data
- Generation of watertight **B-Reps** / high numerical demands in BIM
- Diversity in **spatial representation**, e.g. IFC (ANNEX D)
- **Semantic incompatibility** regarding the concept of ”service” and the concept of ”product”
- Differences in the usage and specification of **coordinate systems**
- Different extensions of the underlying architectures for addressing **semantic interoperability issues**
- Differences in usage and specification of object geometry and topology (features)
- Differences in usage and understanding of metadata
- …



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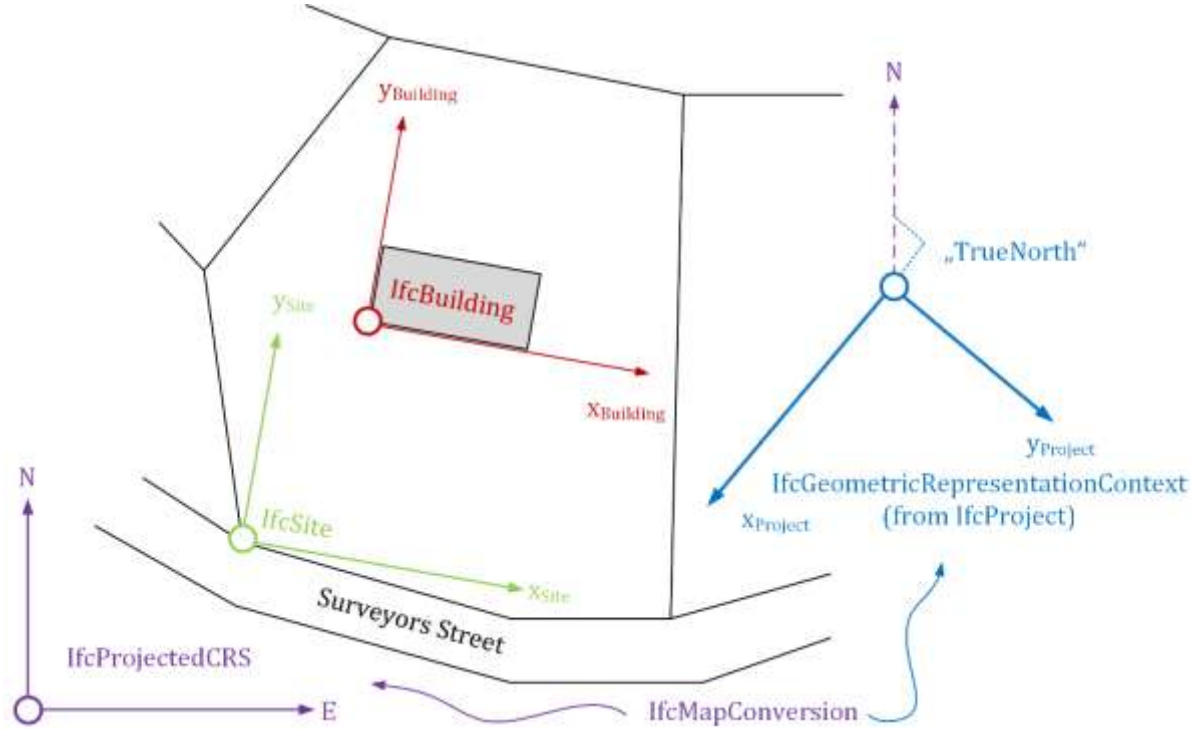

10 **20** **30** **40** **50**

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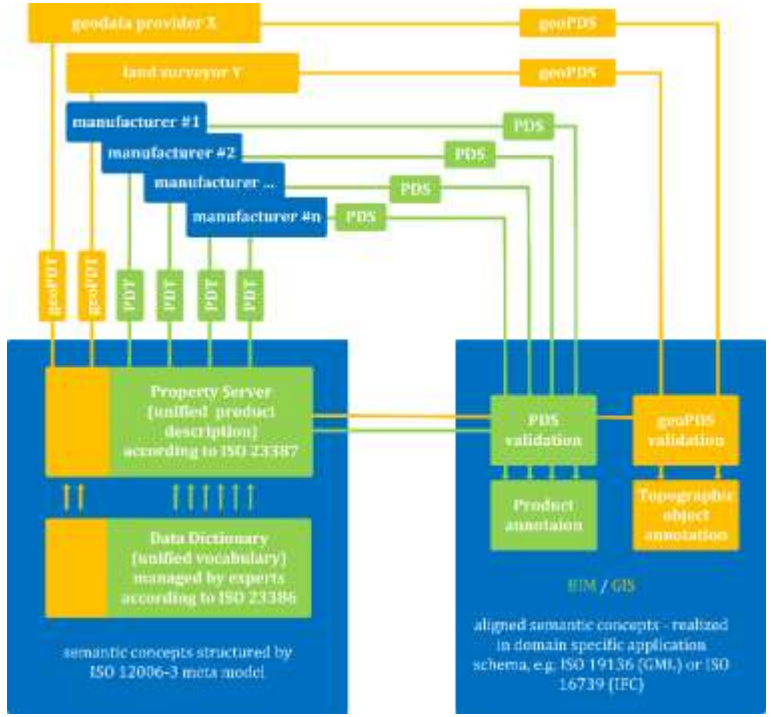


Ongoing work

Geospatial and BIM dictionary

A BIM/GIS dictionary would prevent future (cross-domain translation) work and improve the understanding of terms between professional engineers.

This work item will cover terms specifically related to these domains. This work item will **not provide recommendations** to resolve conflicts in terminology.

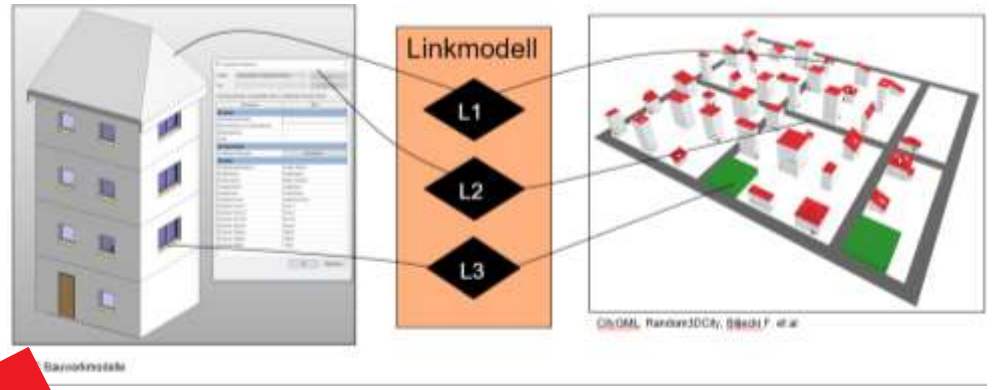
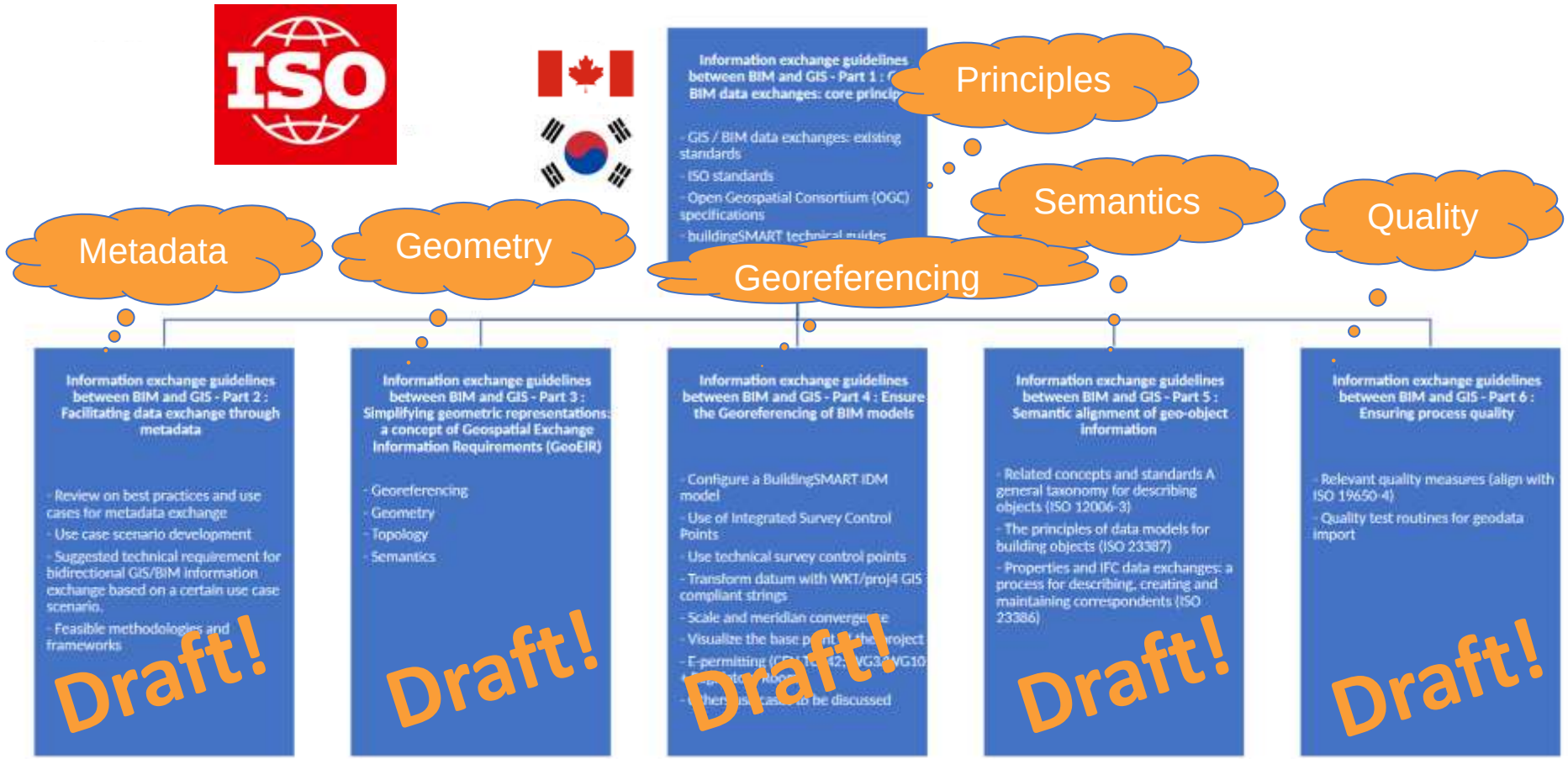


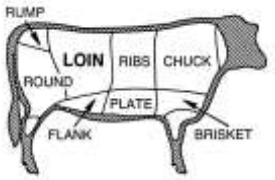
Abbildung Linkmodell (Mitte): Kernkonzept eines Multimodellcontainers (MMC), nach Fuchs (2014)

Linking abstract concepts in BIM and GIS standards

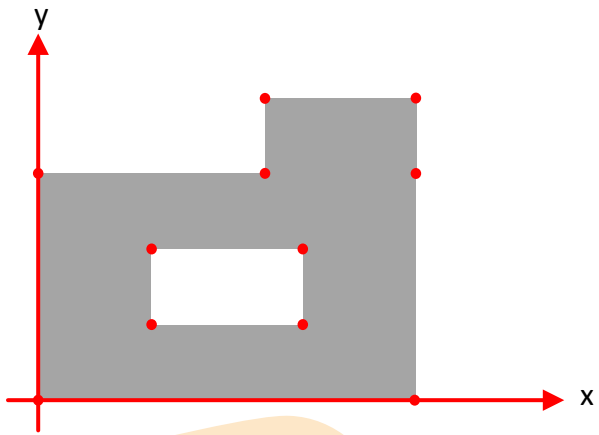
Aim: Transformation rules or an ontology should allow schema crosswalks. Ontology linksets can define links and transformations between equivalent concepts.

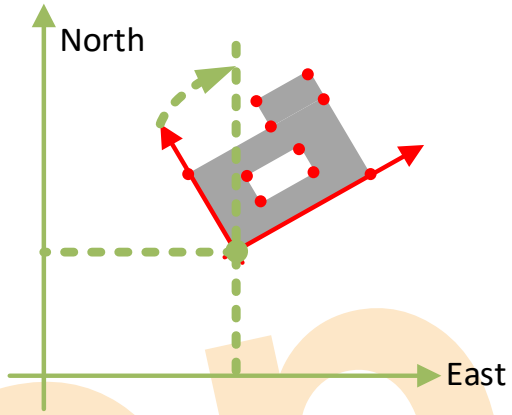

ISO
Information exchange guidelines between BIM and GIS - Part 1 : BIM data exchanges: core princip
- GIS / BIM data exchanges: existing standards
- ISO standards
- Open Geospatial Consortium (OGC) specifications
- buildingSMART technical guides
Principles
Semantics
Quality
Metadata
Geometry
Georeferencing
Information exchange guidelines between BIM and GIS - Part 2 : Facilitating data exchange through metadata
- Review on best practices and use cases for metadata exchange
- Use case scenario development
- Suggested technical requirement for bidirectional GIS/BIM information exchange based on a certain use case scenario.
- Feasible methodologies and frameworks
Draft!
Information exchange guidelines between BIM and GIS - Part 3 : Simplifying geometric representations: a concept of Geospatial Exchange Information Requirements (GeoEIR)
- Georeferencing
- Geometry
- Topology
- Semantics
Draft!
Information exchange guidelines between BIM and GIS - Part 4 : Ensure the Georeferencing of BIM models
- Configure a BuildingSMART IDM model
- Use of Integrated Survey Control Points
- Use technical survey control points
- Transform datum with WKT/proj4 GIS compliant strings
- Scale and meridian convergence
- Visualize the base p
- E-permitting
Draft!
Information exchange guidelines between BIM and GIS - Part 5 : Semantic alignment of geo-object information
- Related concepts and standards A general taxonomy for describing objects (ISO 12006-3)
- The principles of data models for building objects (ISO 23387)
- Properties and IFC data exchanges: a process for describing, creating and maintaining correspondents (ISO 23386)
Draft!
Information exchange guidelines between BIM and GIS - Part 6 : Ensuring process quality
- Relevant quality measures (align with ISO 19650-4)
- Quality test routines for geodata import
Draft!

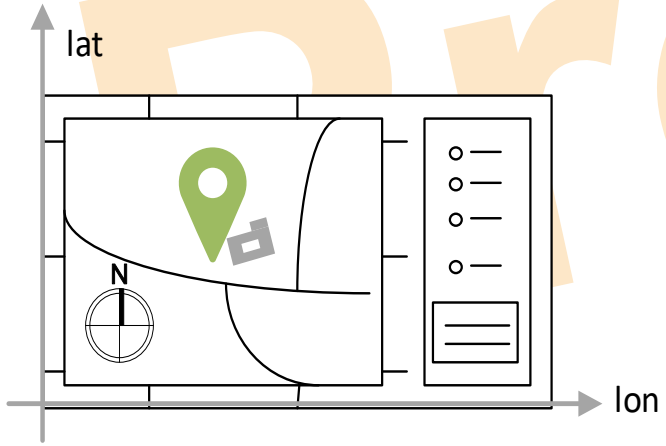
Proposal for **Level of Information Need** / absolute location

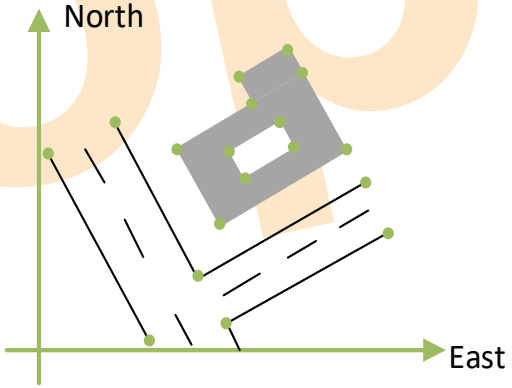


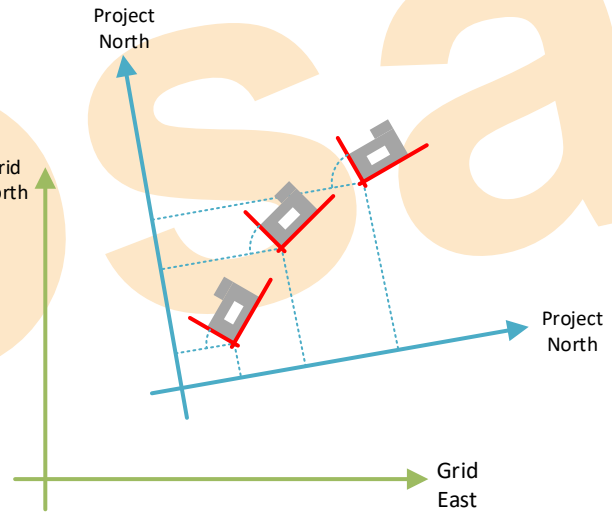
Proposal concerning positioning in ISO 7817- part 2 (via CEN/TC 442 “Building Information Modelling (BIM)”, WG 2 “Data Exchange”, PG 1)











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