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Volunteering for the future – Geospatial excellence for a better living

Information exchange using the open IFC format from a surveyor's perspective.

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Agenda

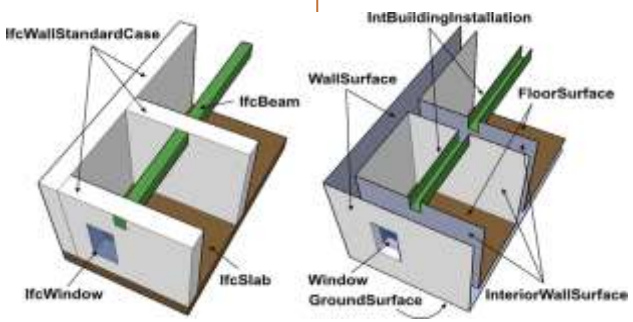
1. Introduction
2. Surveyor in BIM – new tasks and new solutions
3. IFC from surveyor point of view
4. Summary

Introduction

BIM (Building Information Modeling) –

information management during object life cycle - 3D model and metadata - some abbreviations:

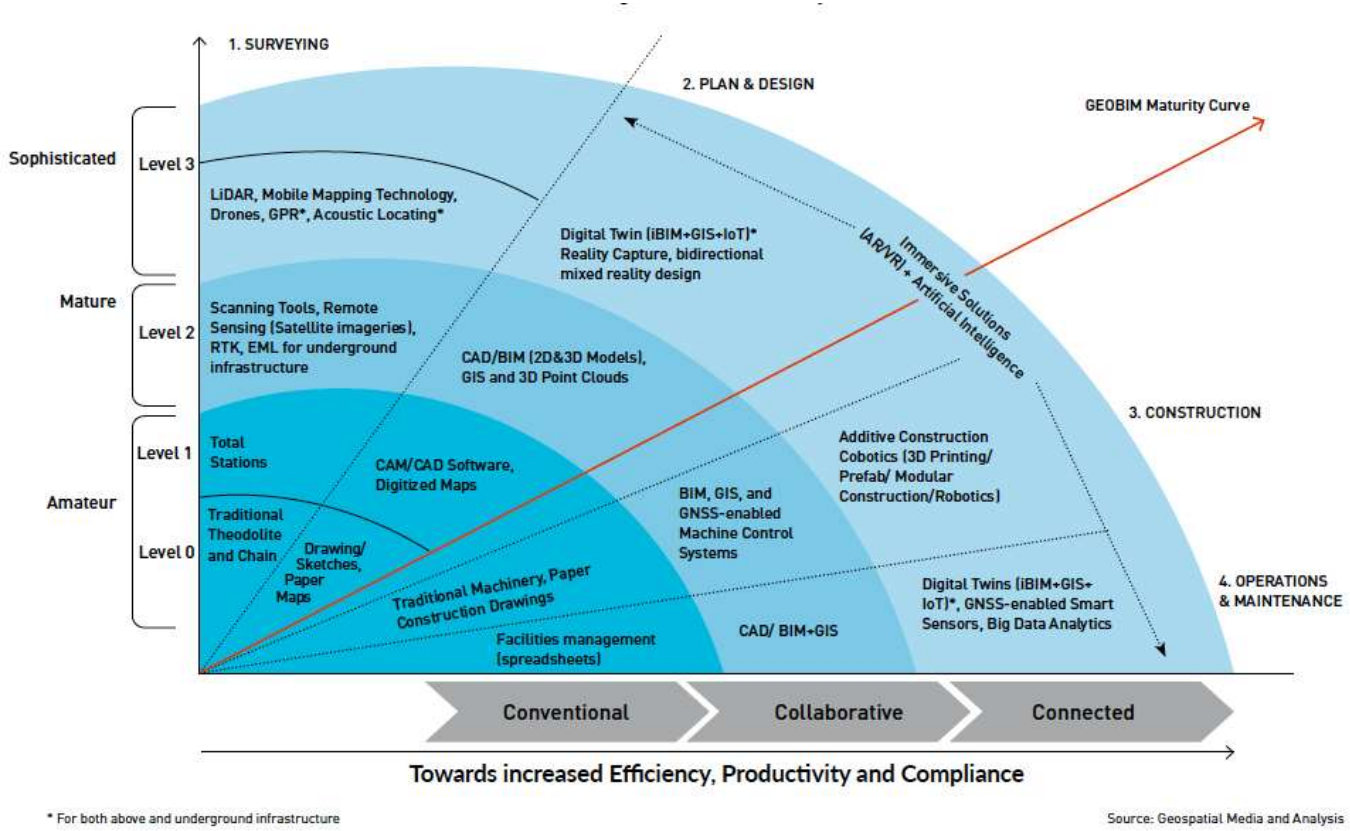
- MVD – Model View Definition
- EIR – Exchange Information Requirements
- IFC – Industry Foundation Classes
- CDE – Common Data Environment
- … and a lot of other

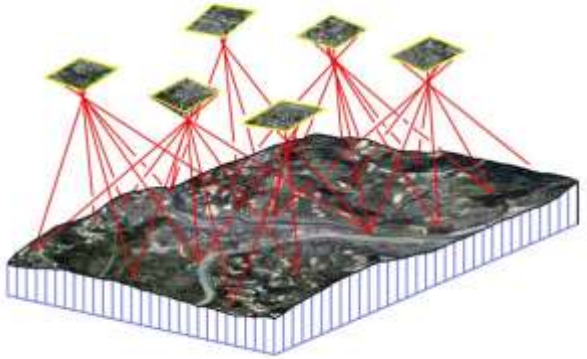


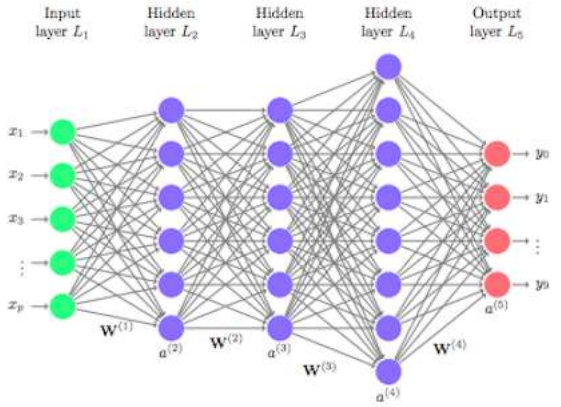
BIM vs Geospatial domain

- Different standards
- Different applications (main)
- Different approaches to:
  - Geolocation/Georeference
  - Geometry
  - Data Management
  - Semantic

GeoBIM Maturity Levels







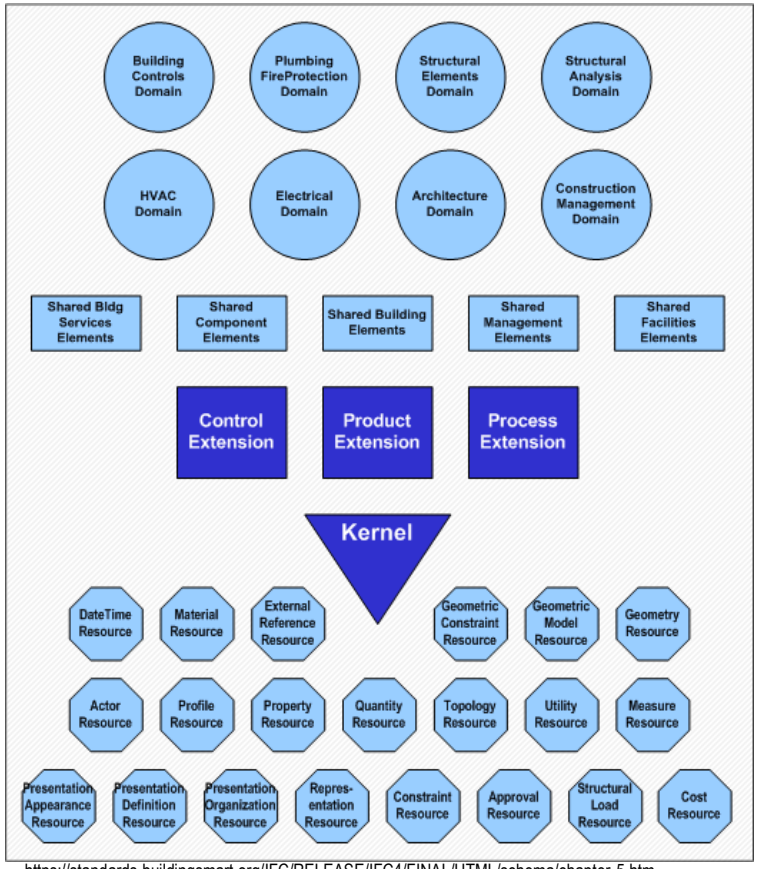
Surveyor in BIM – new tasks and new solutions

Phase	Describtion – new task	Tools and resources to do task
0 - Strategy	Proposing the spatial data "background" necessary for the design work (e.g. for the purpose of creating the EIR). Selection of reference systems, reference points for the entire project. Description of information requirements for spatial data (e.g. requirement for surveyor's MVD).	Project location and analysis of legal requirements for project location in global space - knowledge of coordinate systems used for the location. Software for definition of information requirements.
1 - Preparation	Provision of data and products (e.g. DTM) with a defined resolution. The quality of the data should provide the situational position of the place planned for the investment together with the information about the land development or the elements of the land utilities. The difference to the classical method of implementation results from the resolution of the data (e.g. the density of distribution of points and their accuracy). Most often, the surveyor provided studies in the vector form (Map for Design Purposes), in the BIM technology these are the Digital Terrain Models or Digital Surface Models..	Open spatial data, resources of state institutions, and if the resolution/quality of the data is insufficient - measurements using: • Unmanned Aerial Vehicle (optical sensor or laser scanner) and as a result: point cloud, orthophoto map with defined terrain pixel • Total Station • GPS satellite receiver • Equipment for measurement of land utility elements (underground infrastructure) e.g. EML or GPR
2 – Concept	Use of data from the Preparation phase. The surveyor may be asked to clarify inaccuracies in the existing data, clarify some spatial information, or perform spatial analyses (more often the task of a geoinformatician). Georeferencing of files and verification of correctness of the global spatial record.	As in the Preparation stage. Tools for georeferencing verification and spatial information modelling/documentation creation.
3 – Design	The surveyor checks and confirms whether the project can be staked out (based on the data received). Execution of further tasks related to detailing of spatial data, spatial information. Cooperation in creation of the model, its components, for placing in the global space, e.g. provision of necessary layers for calculation of earthworks. Validation of project files for correct georeferencing.	As in the Preparation stage.

Surveyor in BIM – new tasks and new solutions

Phase	Describtion – new tasks	Tools and resources to do tasks
4 – Construction	Design and placement in the field of the geodetic bench marks connected with the global coordinate system and the model coordinate. Activities: staking, supervision of the works and geometric correctness of the placement of individual components, deformation monitoring. Providing current information on the stage of implementation of the phase in order to: compare the schedule or cost estimates, minimize errors or improve safety on the construction site. Ongoing inventory of elements that are covered in subsequent phases of the investment.	• Total Station or GPS - for staking work - depending on the object staking accuracy required • Laser scanning - for status/progress recording • UAV with laser scanner or optical sensor - for status/progress recording • Mobile scanners - to record the current status of the work/progress • Satellite imagery - to record the current status of the works/progress • GPR/EML - measurement of below surface objects
5 – Handover	Inventory and create an as-built model that can be used to manage resources during the operational phase. Comparison of the current state with the designed one in order to locate possible discrepancies from the design. In case of objects exposed to deformations/displacements, stabilisation of permanent control points or sensors monitoring the technical condition of the object. Creation of appropriate as-built reports.	• UAV with laser scanner or optical sensor • Laser scanners (TLS and mobile) • Total Station and/or GPS • GB-SAR
6 – Operation and Maintanence	Depending on the type of facility, condition monitoring of the facility through periodic measurements. Creation of models of the current state for the purpose of technical condition monitoring of the object. Measurement of geometrical conditions of objects (depending on the type of object). Recording data for verification purposes e.g. for Asset Management/Facility Management systems.	As in phase 5. In addition, possibility to monitor infrastructure using satellite imagery (optical and radar)
7 – Modernisation	Create a current state model and repeat steps 2 to 6.	As in the Preparation stage.

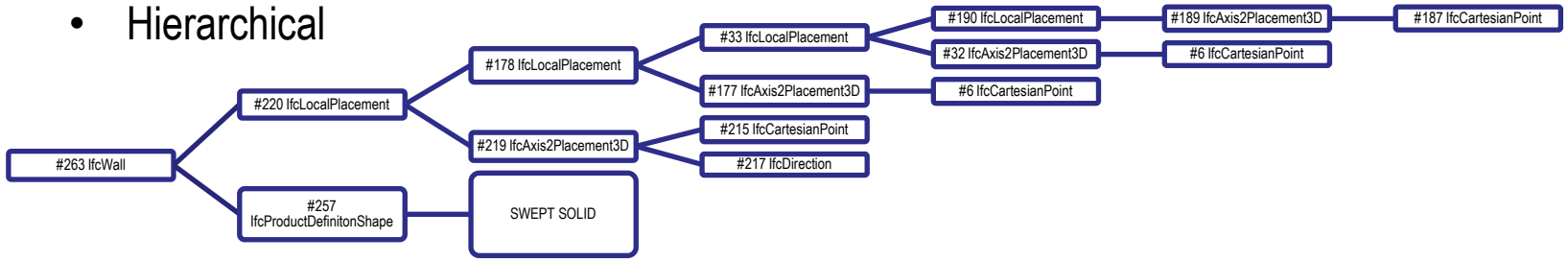
IFC – Industry Foundation Classes



https://standards.buildingsmart.org/IFC/RELEASE/IFC4/FINAL/HTML/schema/chapter-5.htm

IFC – Industry Foundation Classes (ISO 16739-2018) – common AEC language

- Hierarchical

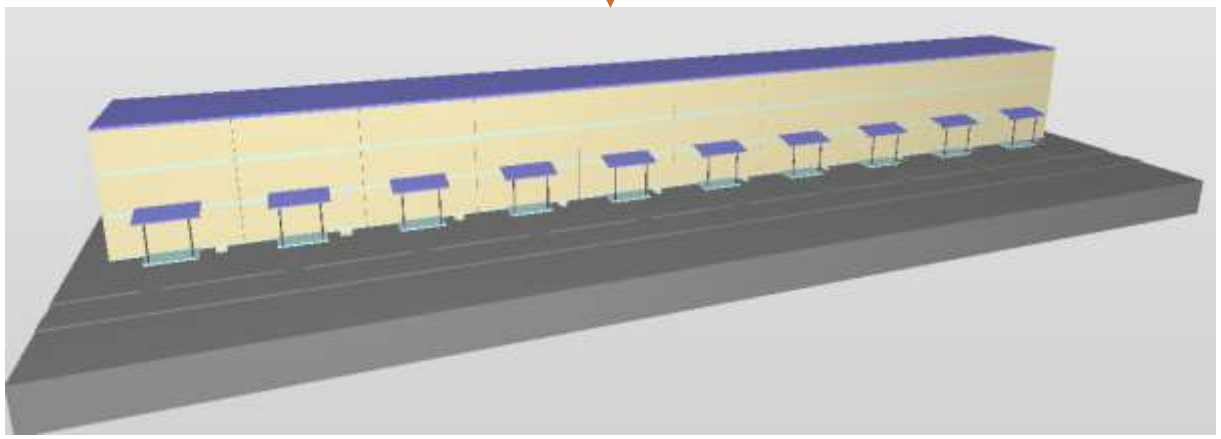


- Classes

- Problems:
  - Georeference
  - Generic classes
  - Geometry
  - *„Not perfect”*

Case study
#1 MVD for surveyors

MVD



Near future: Information Delivery Specification

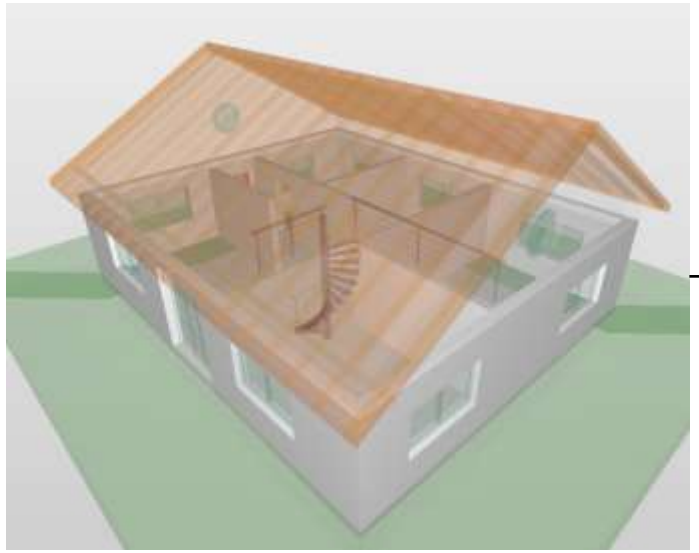
Case study
#2 Generating stake out data from IFC files

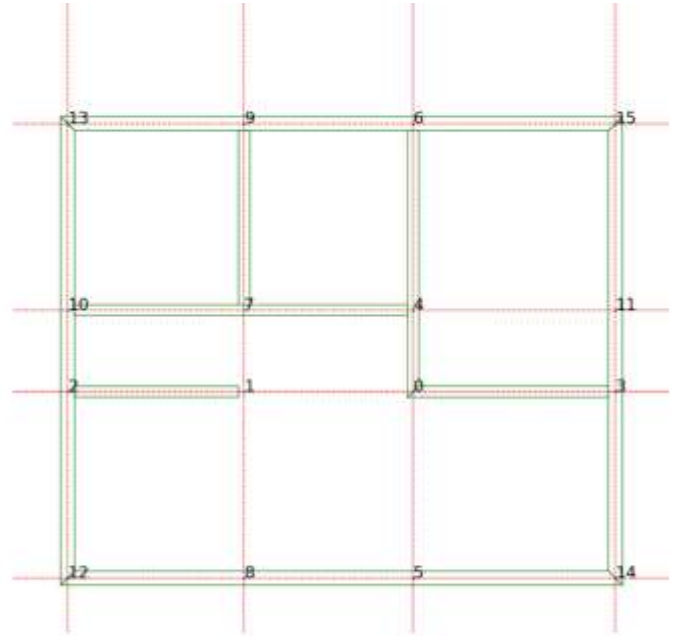
- Problems for surveyor: georeferencing, semantic representation and geometry

#1 Add/validate georeference

#2 Extact stake out data

#3 Save data





Summary

- BIM is future (is now)
- Great opportunities and new responsibilites
  - New tools
  - New tasks
- Need of new management solutions (data management) like MVD
- Knowledge about IFC and BIM

Thank you for your attention!

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