On-site follow-up Supporting Data Model Methodology & Inspirations

Jonas Schlenger TUM, Chair for Computational Modeling and Simulation

Sustainable Places 2022, 7th of September

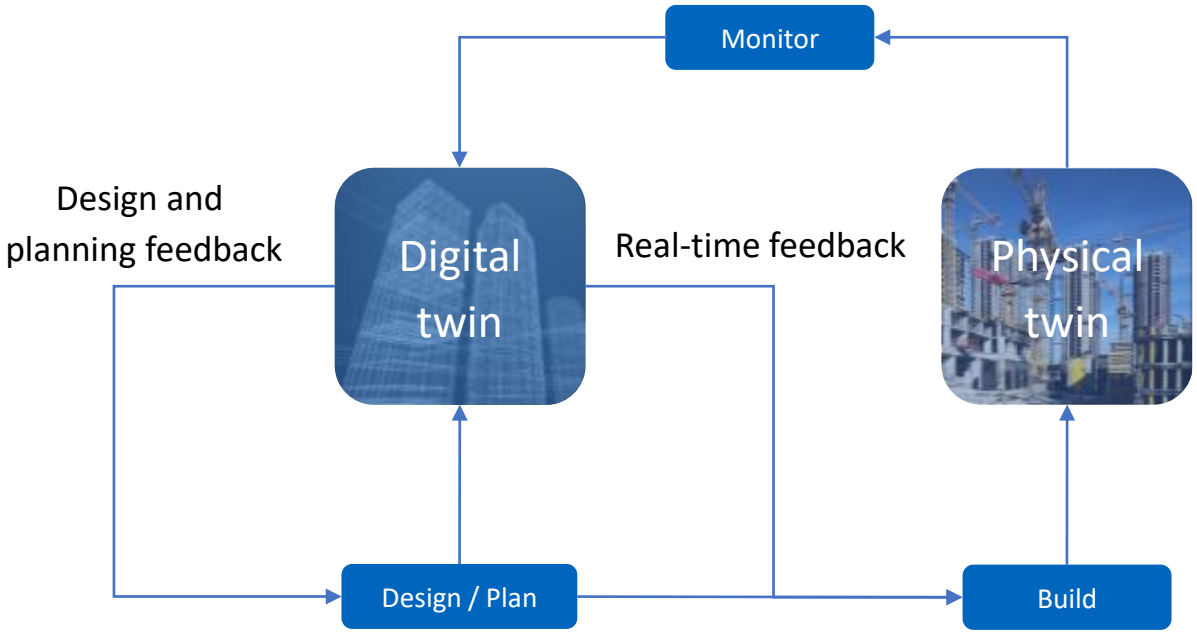
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 958398.

Overview

- BIM2TWIN and Digital Twin Construction
- BIM2TWIN Ontologies
- Project Status and Outlook

Digital Twin Construction

- Digital twin of the construction phase
- Gain situational awareness through real-time status information
- Process-oriented approach
- Full-cycle model of planning and control



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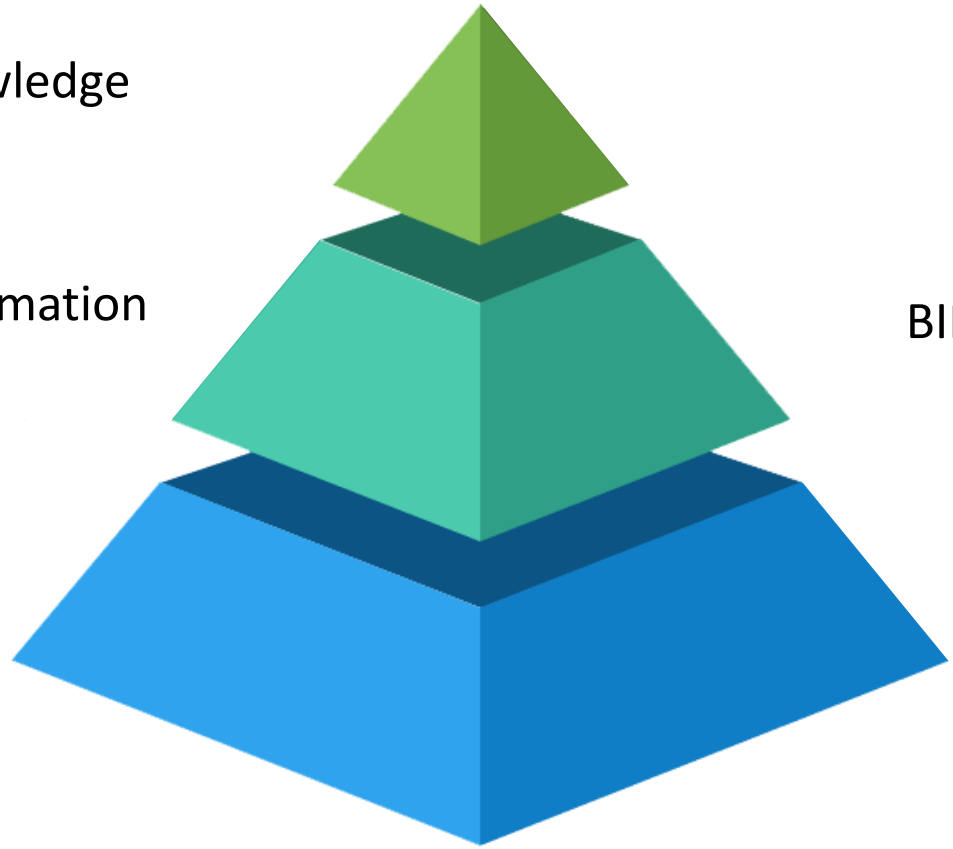
BIM2TWIN (B2T) Ontologies

Knowledge

Information

Data



BIM2TWIN KPI

- Key performance indicators
- Mainly to for display on dashboard

BIM2TWIN Core
BIM2TWIN Core Extension

- Main monitoring information
- Project status and intent (as-planned and as-performed)

BIM2TWIN Data

- Lookup graph for raw data
- Devices and their data captures

4 ”separate“ ontologies to improve reusability

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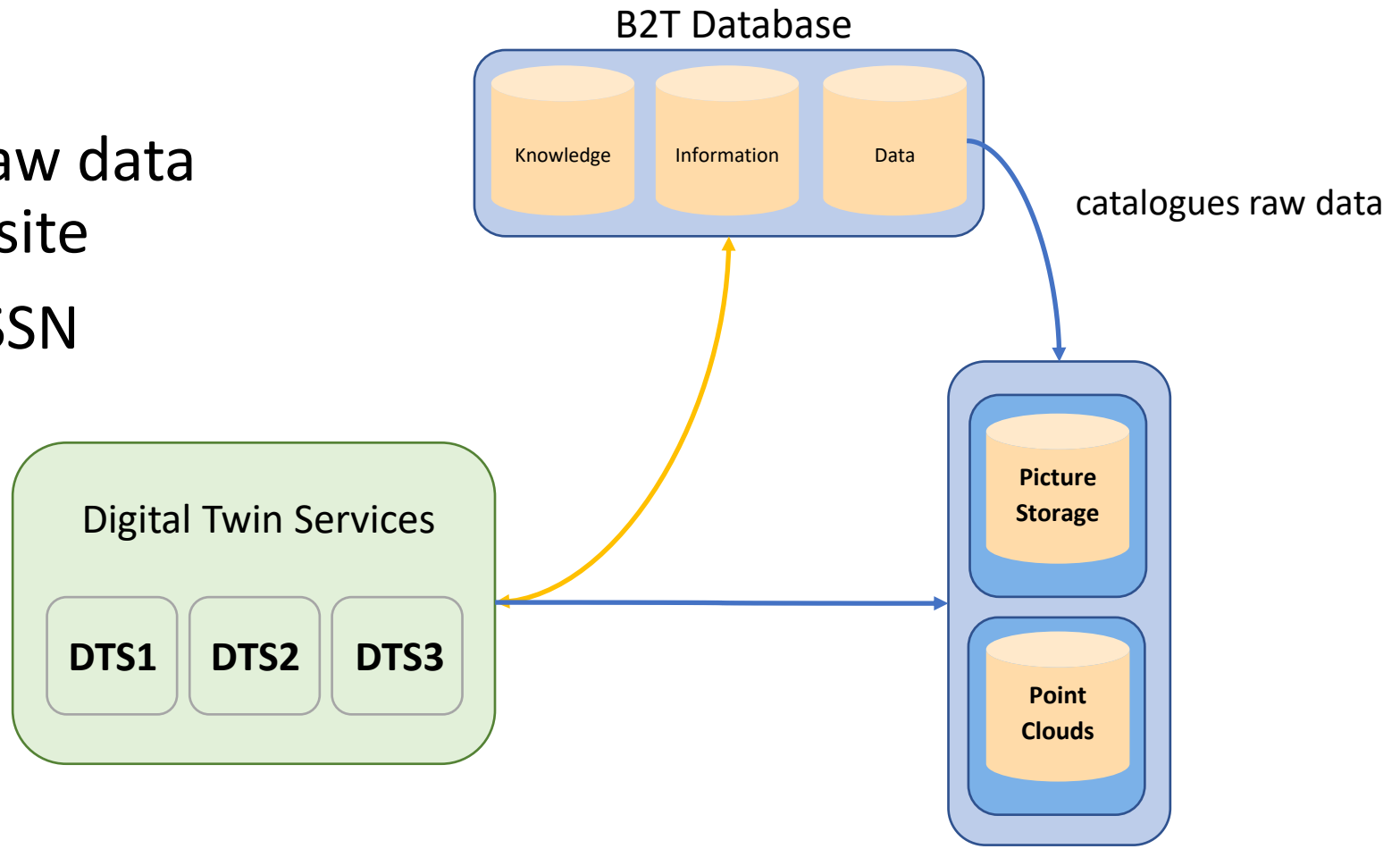
BIM TWIN

BIM2TWIN Data

- Catalogue to explore raw data from the construction site
- Largely reusing SOSA/SSN



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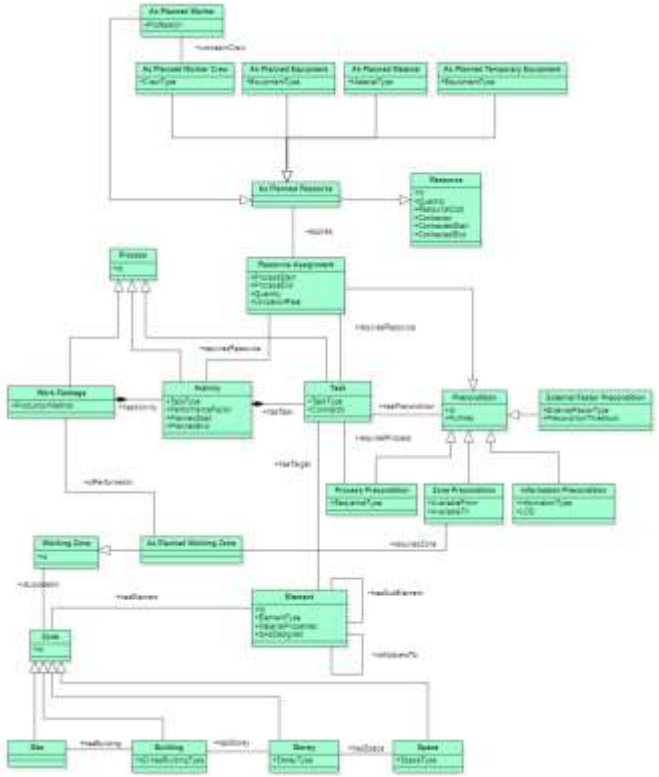
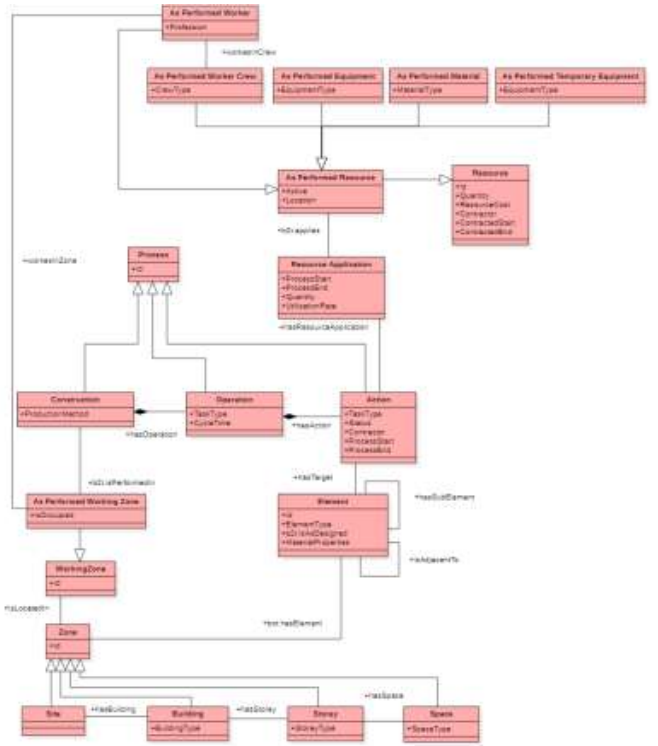
BIM2TWIN Core

- Separation between project status and intent (two containers with differing sets of classes)
- Direct relation between the two for direct comparison
- Building structure as common information (reusing BOT)

Project Intent



Project Status



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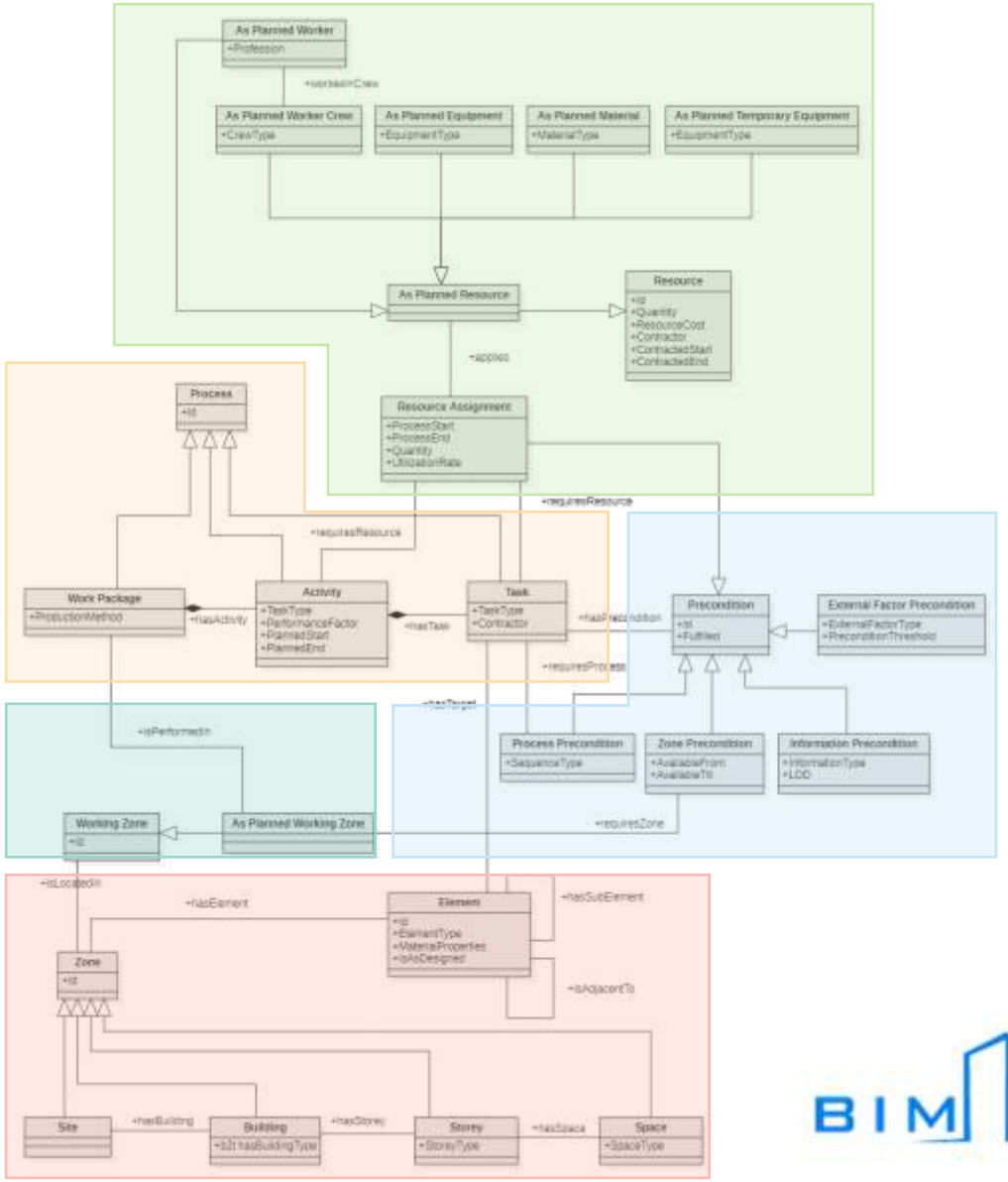
BIM2TWIN Core

Sections

- Construction Processes
- Preconditions
- Resources
- Location
- Building Structure



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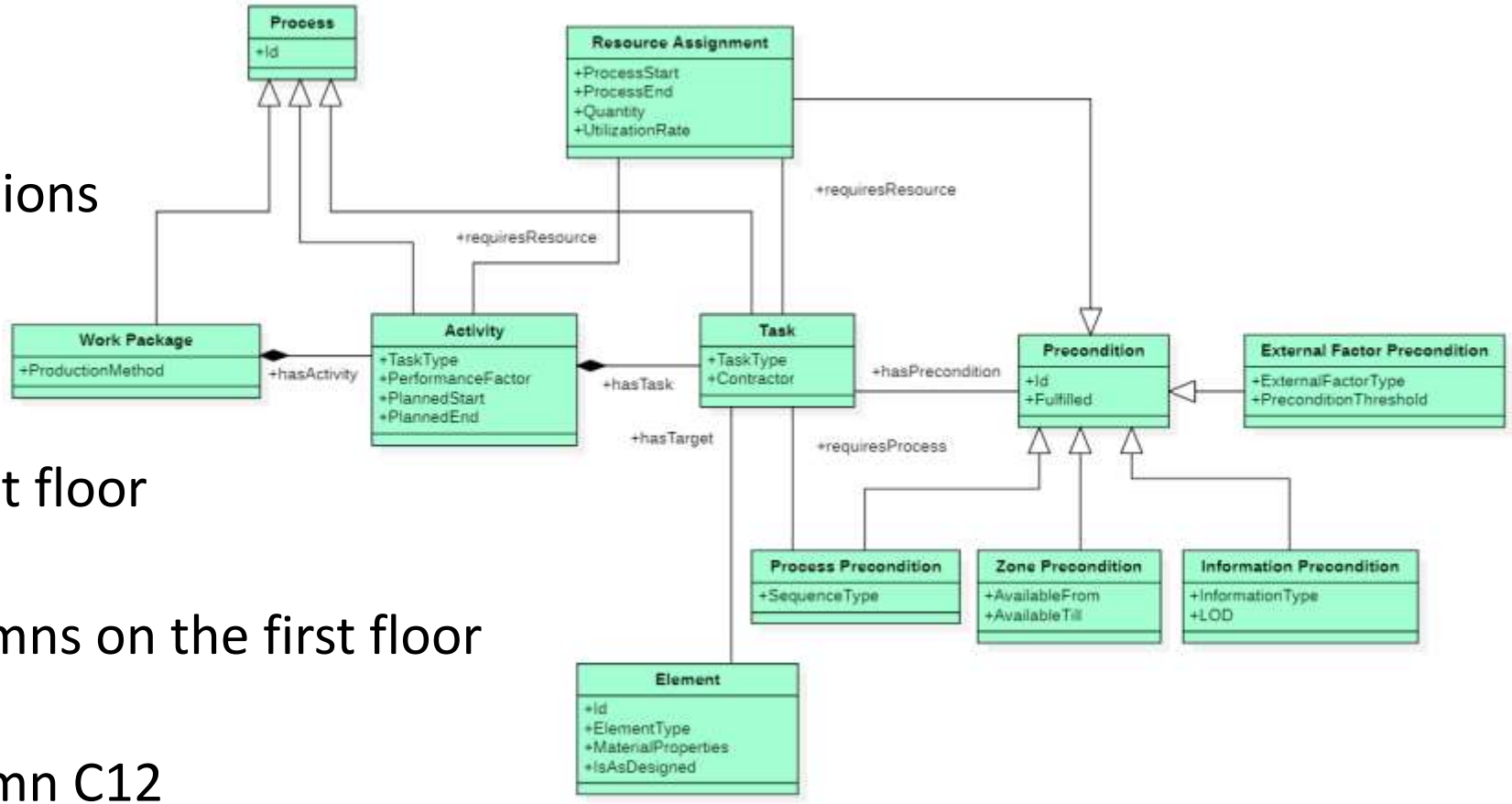
BIM2TWIN Core

Processes and Preconditions

- 3 process levels
- Focus on process preconditions (rather than a fixed order)



Work Package

e.g.: build columns on the first floor

Activity

e.g.: place formwork for columns on the first floor

Task

e.g.: place formwork for column C12

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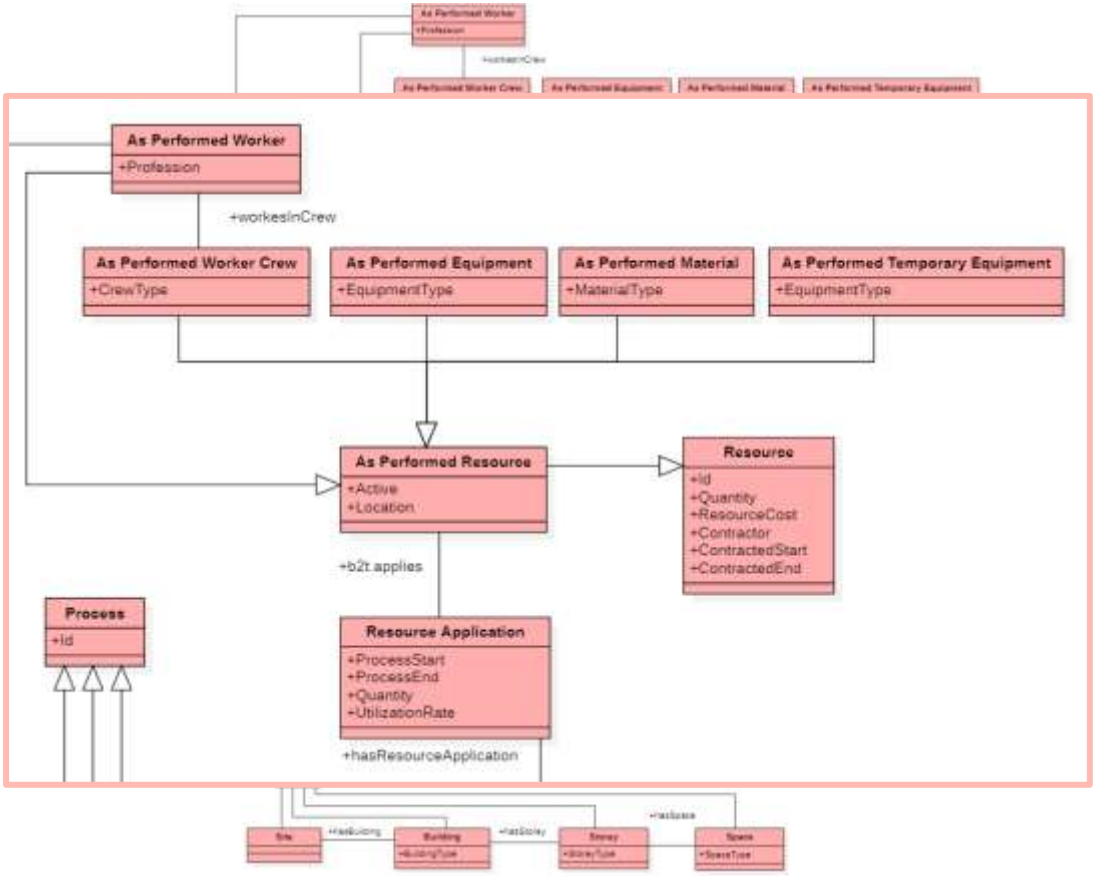
Differences between Project Intent and Status

- Different set of class attributes, e.g.:
  - Location (of resources)
  - Active (workers and equipment)
- No precondition
- Defect and inspection-related classes
- Status concepts for elements and processes



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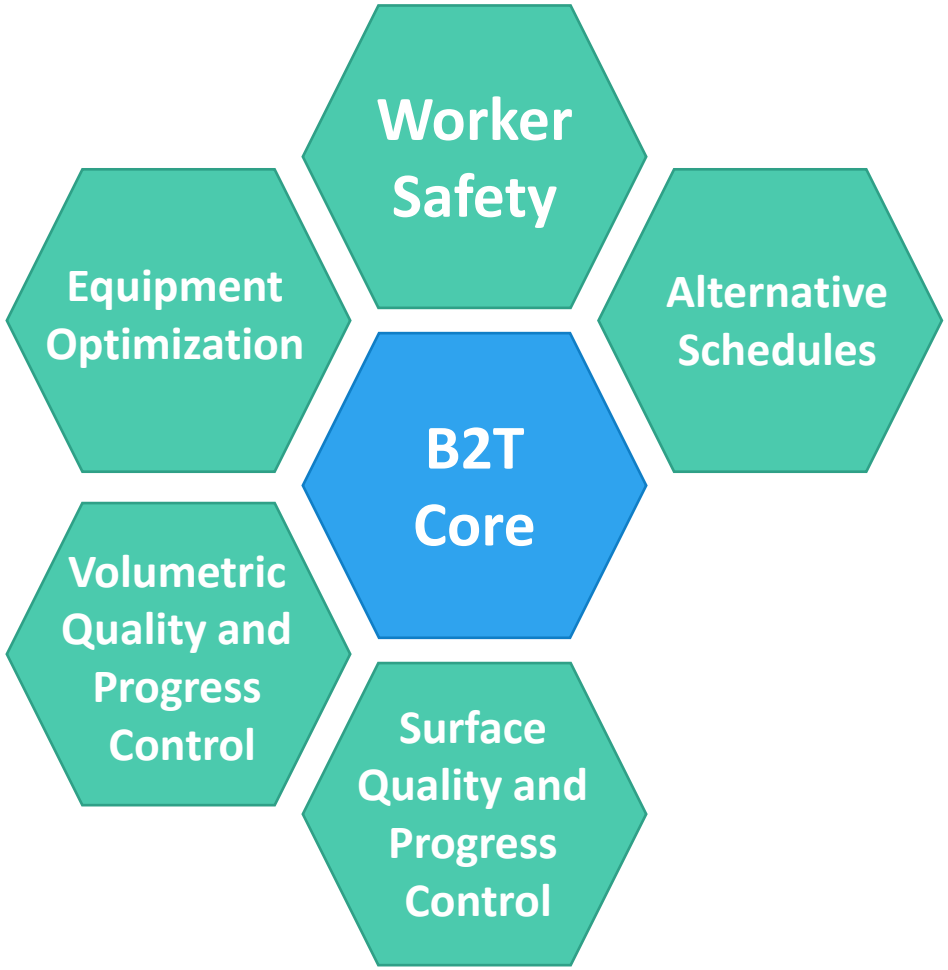
BIM2TWIN Core Extensions

- Builds upon B2T Core
- Domain specific extension of ontology
- Separation to improve reusability of the ontologies



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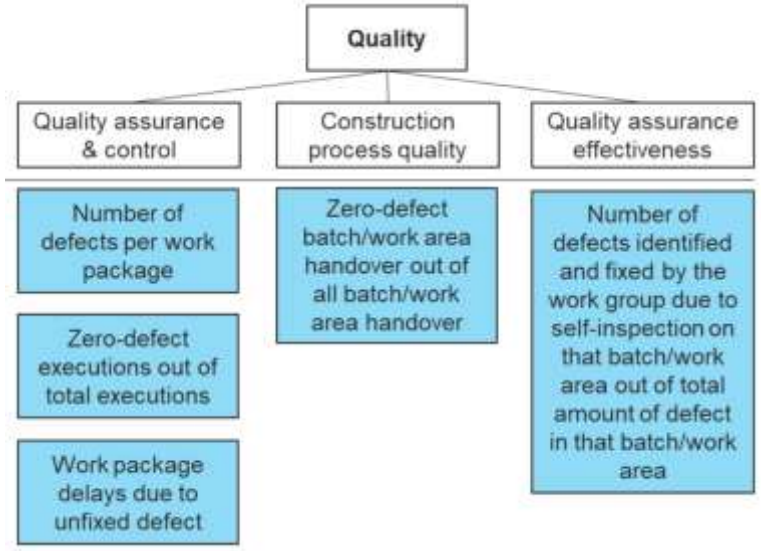
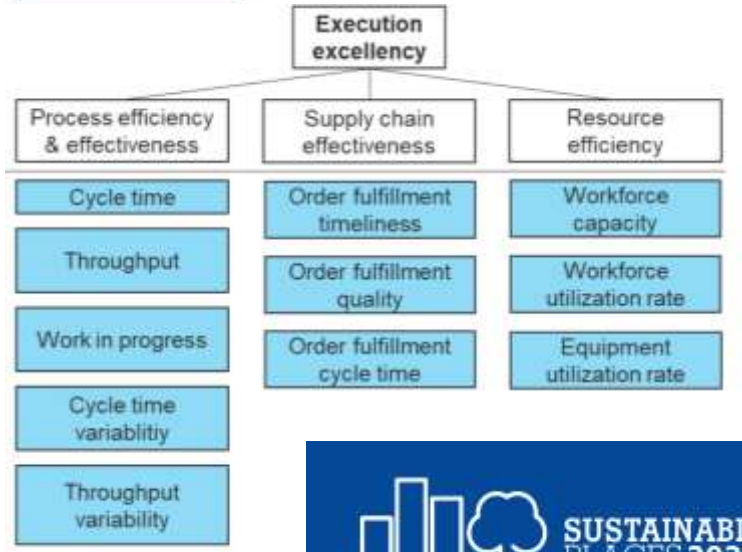
BIM2TWIN KPI

- Different types of KPIs
  - Quality
  - Safety
  - Execution excellence
- KPI units (reusing QUDT)
- Time intervals





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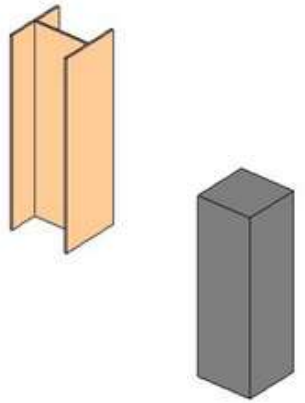
Geometry Representations

- Detailed geometry of building elements:
  - PLY file
- Rough geometry / Bounding box:
  - Geosparql, asWKT
- Geometry for online visualization:
  - glTF



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Project Status and Outlook

- BIM2TWIN running since end of 2020
  - Requirement analysis
  - Use case definition

→ Data modelling

Pilot sites in preparation

Spain - Acciona

- Hospital building
- Cast-in place concreting

Finland - Fira

- Apartment buildings
- Pre-cast concrete

France - Spada

- Retail building
- Cast-in place

→ Test and refine ontologies → Publish ontologies

→ Further alignment with existing ontologies

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