THE UNIVERSITY of EDINBURGH

cyberbuild

COGITO – Digital Twinning Construction Projects

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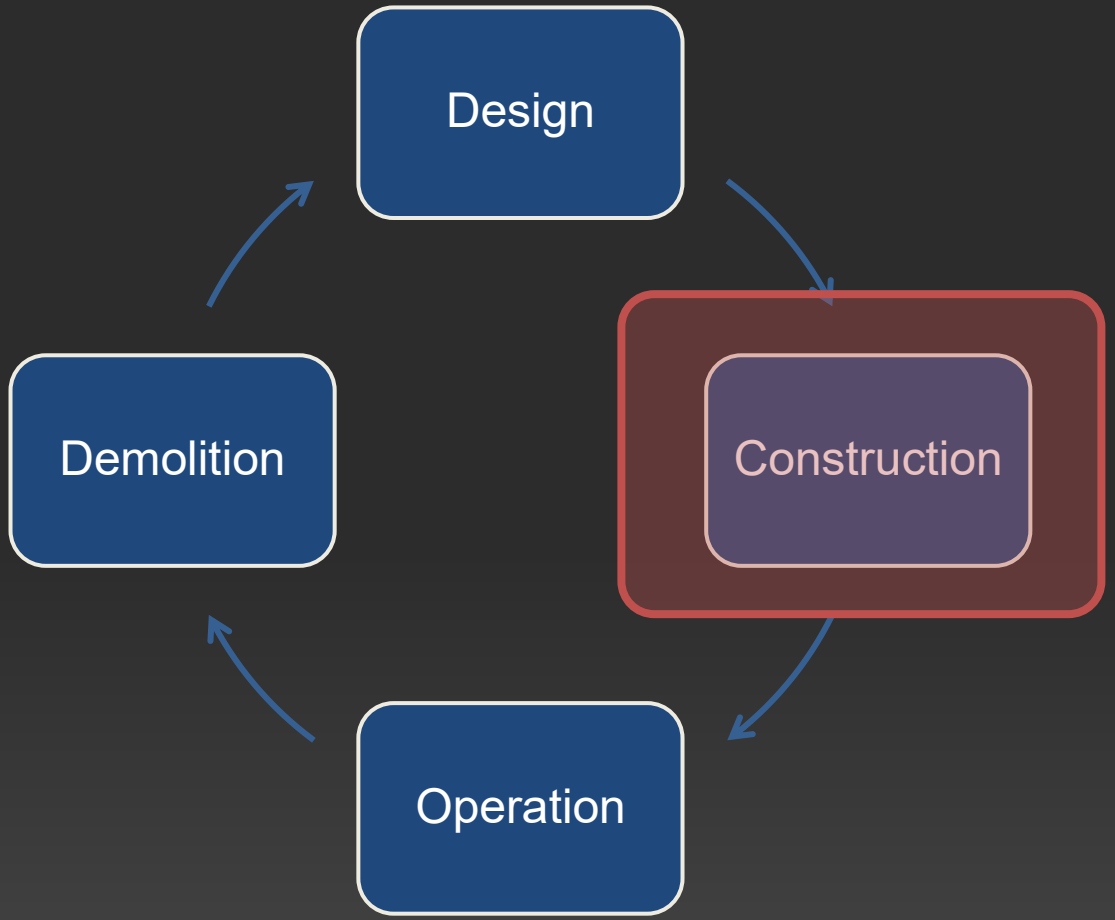
COGITO

Construction vs Operation



Construction Problem?

- Construction industry is important:
  - 9% of EU GDP (£1.6t)
  - 8% of EU employment (18m jobs)

- BUT:
  - Poor productivity growth (~1% annual gains)
  - Rework costs ~5% of overall contract value
  - Time overruns ~7% of total work hours
  - Highly-fragmented with numerous SMEs
  - Limited levels of digitalisation (despite potential benefits)

COGITO: Construction 4.0

- **Digital 4.0 methodology** encompassing:

Dynamic safety planning and monitoring

Digitalised visual and geometric quality control.

Reality capture tools

Satellite images

3D scanning & photogrammetry

Unmanned Aerial Vehicles

Devices and Sensors

Weather predictions

3D geometry

Activities scheduling

Budget and Costs

As-planned data

Data Pre-processing

Construction Phase Digital Twin Platform

Linked data

Construction Supporting services

Health & Safety

Quality Control

Adaptive Workflow Management

GUI & support Apps

Secure workflow planning and monitoring

Integrated data/info visualisation (off-site and on-site)

COGITO: Construction 4.0

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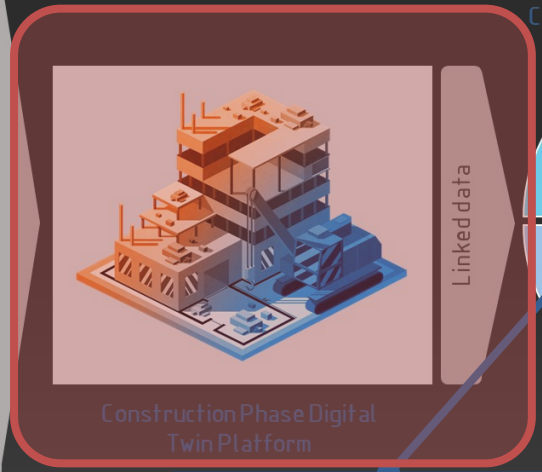


Construction Supporting services

Secure workflow planning and monitoring

Integrated data/info visualisation (off-site and on-site)

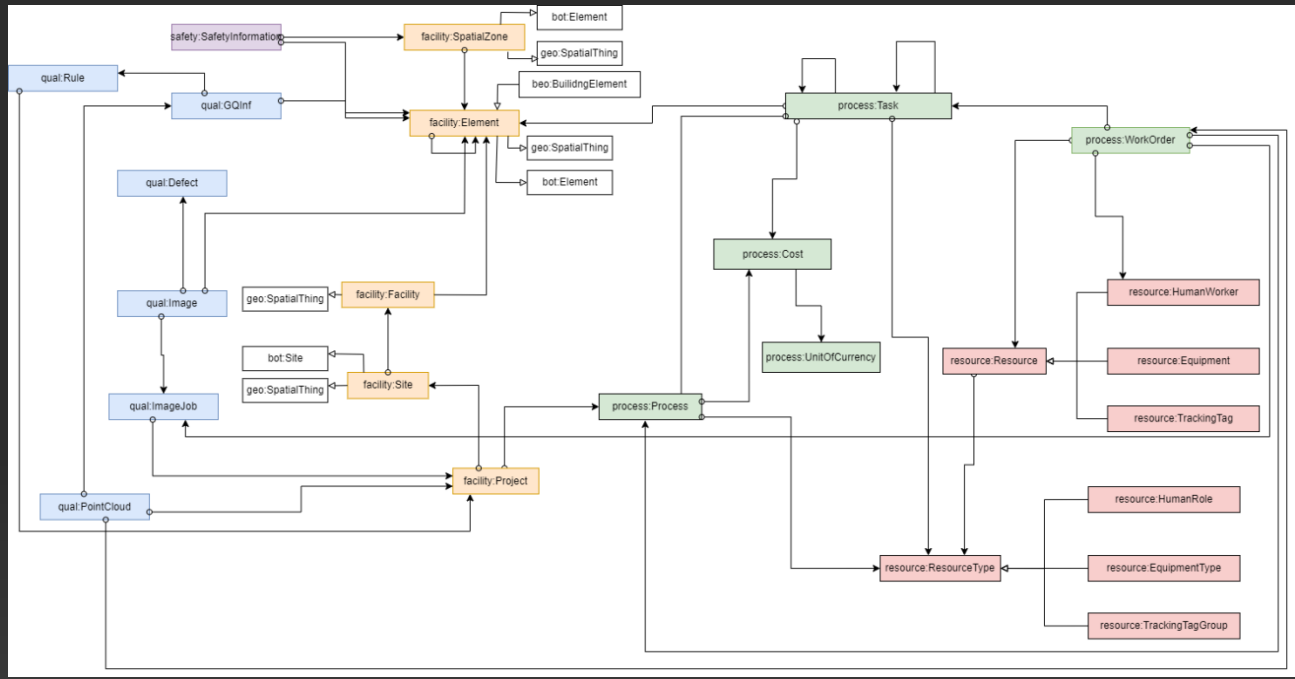
Ontology Network

- Relevant information domains:

Product	+	Building / Infrastr. Asset
Process	+	Schedule / Workflow
		Resources
Reality capture	+	Visual
		Internet of Things
Applications (Use Cases)	+	Workflow Management
		Health & Safety
		Quality Control

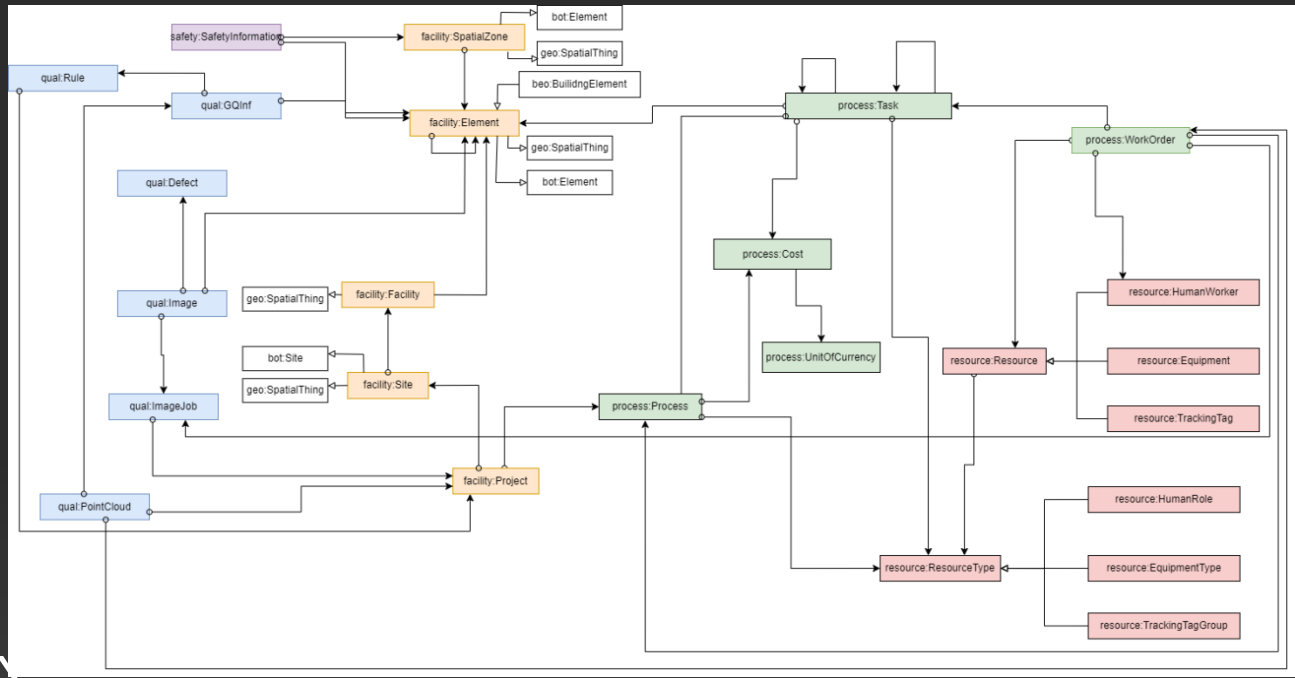
Ontology Network (as of Aug 22)

- 5 Ontology Modules:
  - Product (yellow)
  - Process
    - Workflow (green)
    - Resources (pink)
  - Applications
    - Quality (blue)
    - Safety (purple)



Ontology Network (as of Aug 22)

- 5 Ontology Modules:
  - Reuses:
    - W3C Time
    - W3C BOT
    - W3C WoT TD
    - WGS84
    - BEO
    - ETSI SAREF
    - ETSI SAREF4CITY



Ontology Network (as of Aug 22)

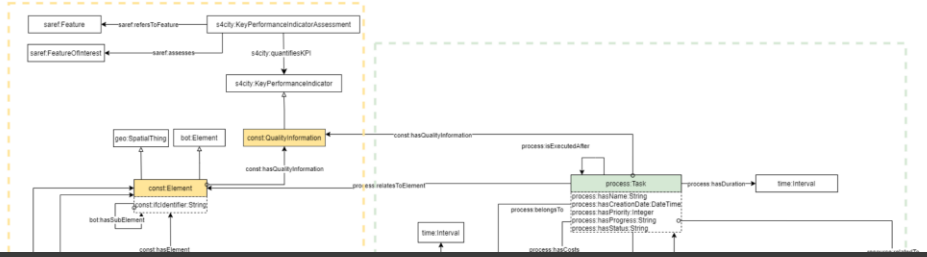
Ontologies | Ontology testing

COGITO

Here you can find the list of ontologies developed for COGITO project

If you want to contribute developing ontologies please follow the guidelines we provide

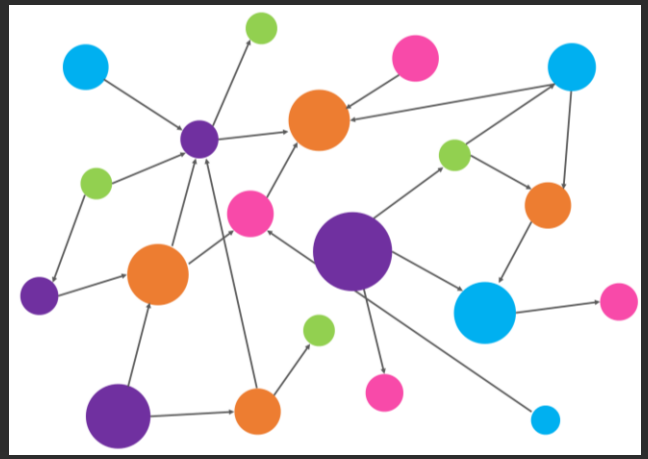
Ontology	Description	Requirements	Repository	Issue tracker	Releases
COGITO Process ontology	This ontology aims to model the construction process in the COGITO ontology	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Facility ontology	This ontology aims to model the construction data exchanges in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Resources ontology	This ontology aims to model the resources in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Quality ontology	This ontology aims to model the construction quality domain in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases



https://cogito.iot.linkeddata.es/

DT Platform – Overview

- DTP Technological Implementation



Triplestore
DB
(Semantically Linked Data; RDF)

Relational
DB
(Project Data)

Key-Value
DB
(IFC Data)

Timeseries
DB
(IoT Data)

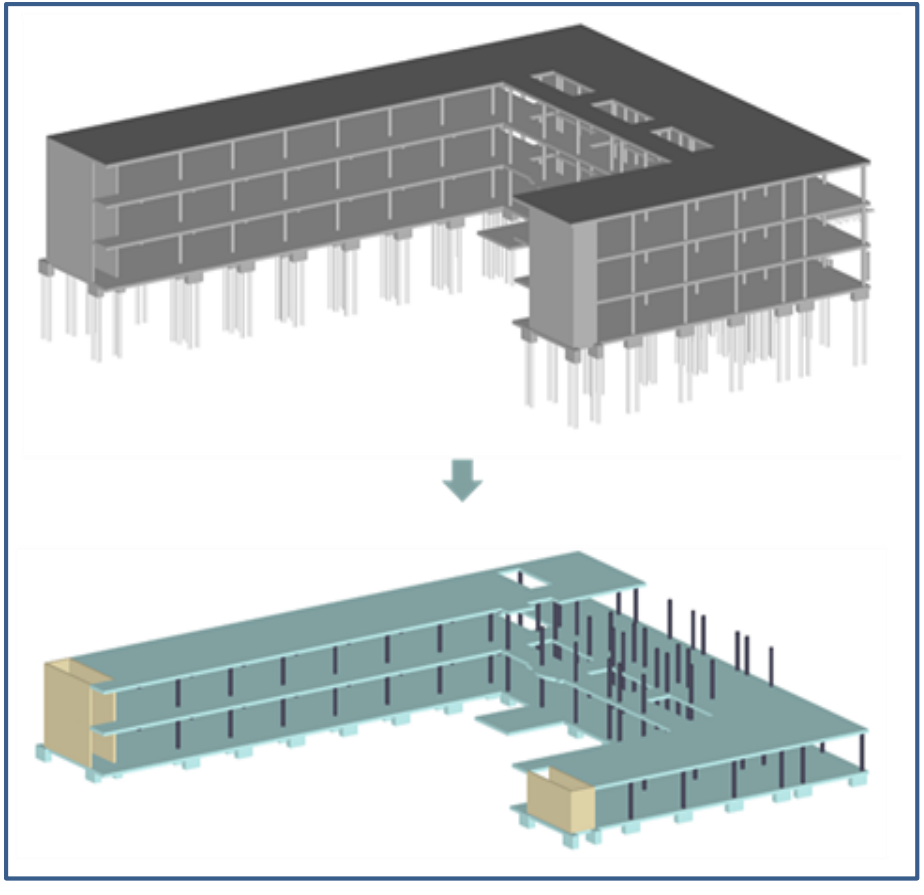
BIM Data Post-processing Services

Extraction, Transformation & Loading Services

Data Management Services

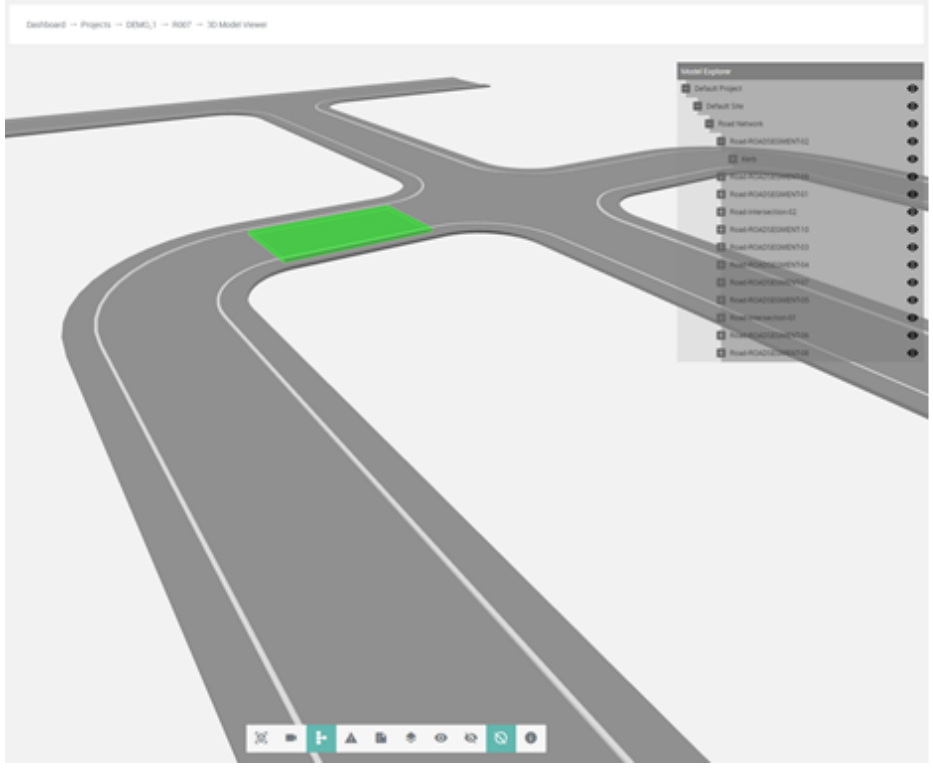
DT Platform – Knowledge Graph

Visual representation of the knowledge graph generated by the DT Platform

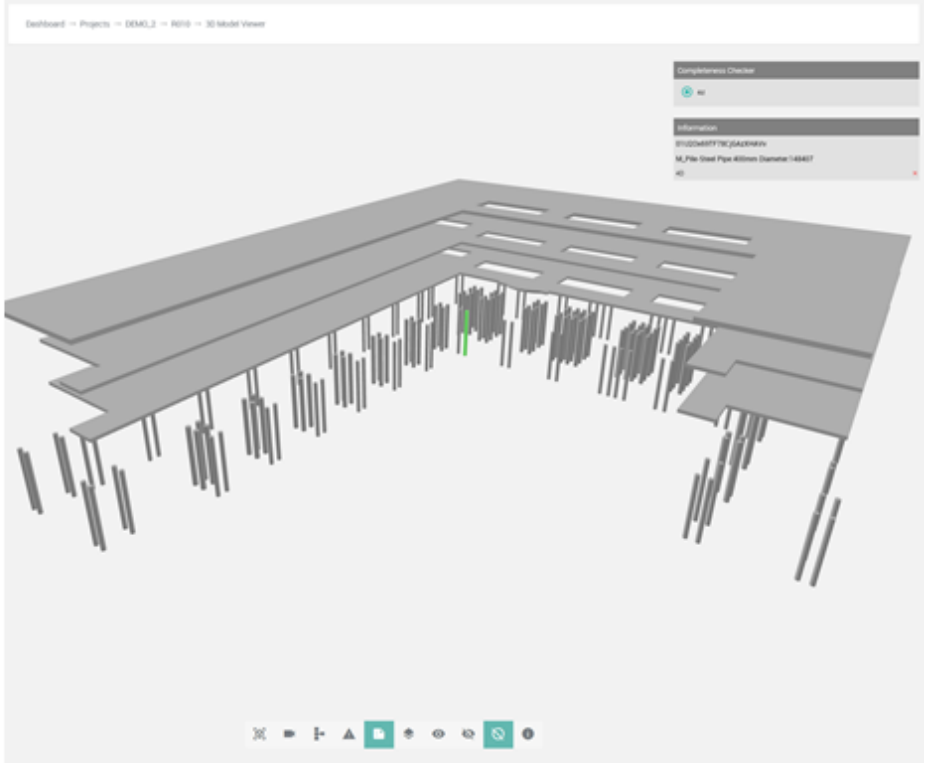


BIM model generated by DTP's "4Dsnap" BIM query module during runtime

DT Platform – Data Post-Processing



B-rep generation of a road network using an IFC4x3 file



MVD completeness checking visual report of a 4D BIM model

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Thank you

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