

COGITO

María Poveda Villalón



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958310

ORGANIZED BY:



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S H2020 PROGRAMME UNDER GRANT AGREEMENT NO. 820805.

COGITO in a nutshell

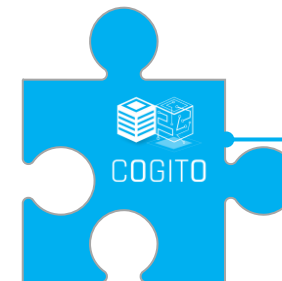
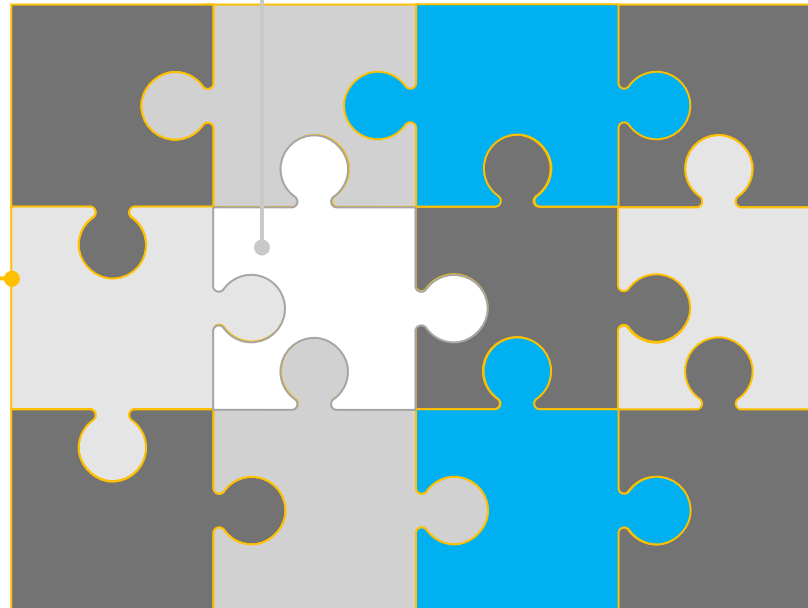
Problem

- The construction phase has so far been overlooked by the Digital Twin community;
- Lack of commonly agreed standards and low interoperability among collected data reveal a major drawback to the enterprises' digital transformation.

Need

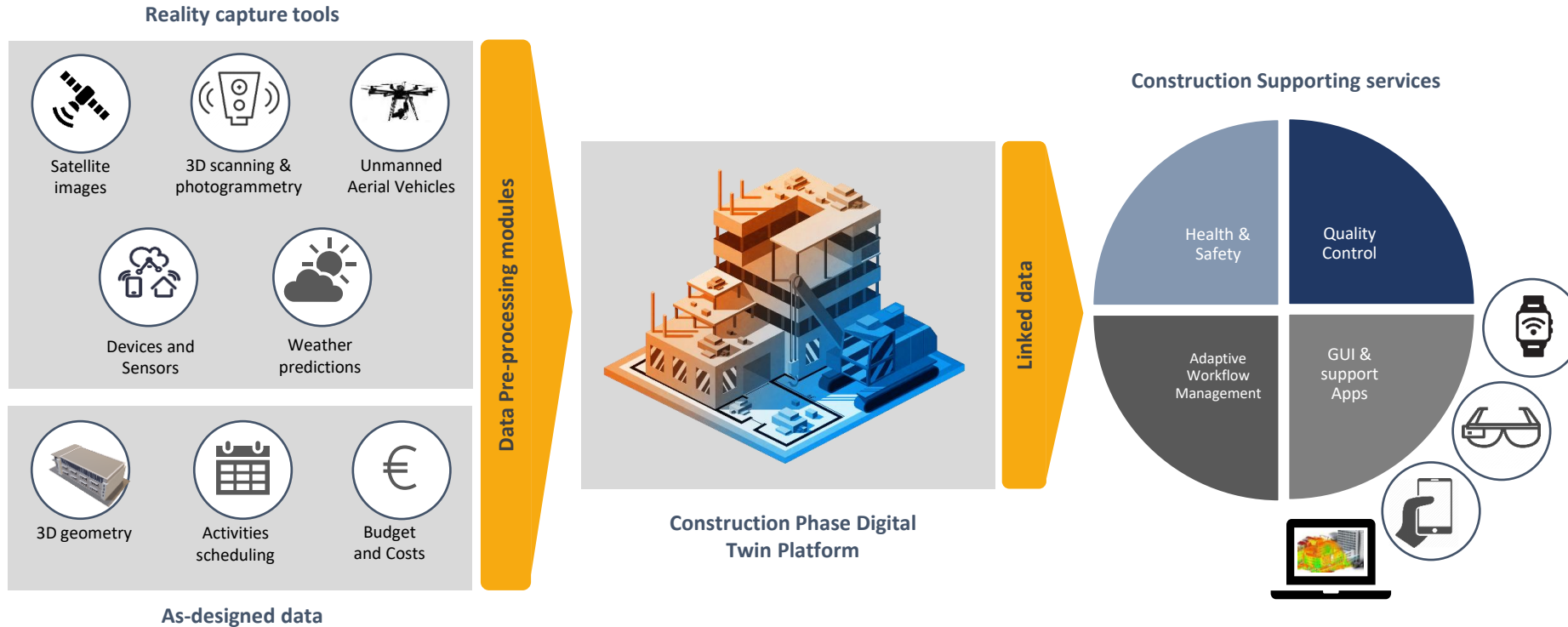
- Going beyond "static" Building Information Modelling (BIM) is required by leveraging technologies like IoT, Cloud Computing and Artificial Intelligence;
- Construction projects require collaboration between many parties -> transparent platforms for digital data handling are needed;
- Automated progress and resource tracking, automated quality assessment, safety measures planning, and hazardous areas detection -> need for a CONstruction-phase diGital Twin mODEl (COGITO).
- Development and delivery of (1) a transparent digital data management platform and (2) digital Construction 4.0 toolbox that contributes to productivity improvement and increased safety.

Solution



Project Overview & Objectives

COGITO - materialise the digitalisation benefits for the construction industry by harmonising Digital Twins with the Building Information Model and building a digital Construction 4.0 tool-box to unleash the untapped potential in productivity improvement and increased safety.



Objective 1: Delivery of a Construction Digital Twin platform

Objective 4: Demonstration on actual construction sites to quantify the benefits of the COGITO tools

Objective 2: Delivery of digital tools for Quality Control and Workflow Management

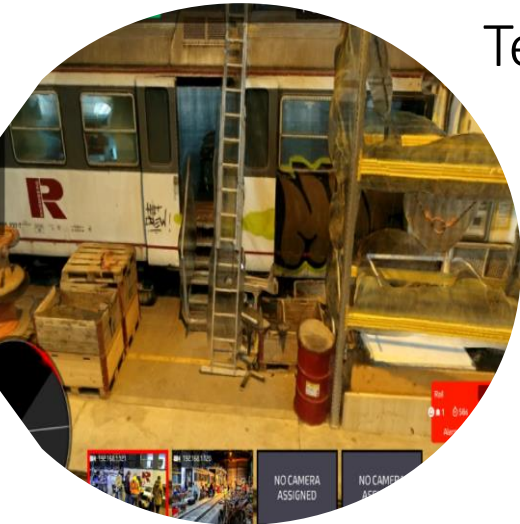
Objective 5: Research, design and promotion for standardization data exchange formats

Objective 3: Delivery of digital tools for Health & Safety management

Objective 6: Promotion of the COGITO solution's adoption through intense dissemination and knowledge transfer of the project outcomes

Pre-validation on a testlab for early testing of algorithms and components on real environments.

Validation on two actual construction sites for full experimentation with the COGITO tools and quantification of the benefits.



Testlab - Austria

T8.2

Partner: Rhomberg Sersa Rail Group

Site: BBW Depot in Wels

Description: 10 parallel tracks and two maintenance halls with more than 500 m rail track length. The area covers tracks, switches, road crossings and a network of survey reference points

Pilot site I - Denmark

T8.4

Partner: Rhomberg Sersa Rail Group

Site: Copenhagen Metro Network Extension

Description: Approved by the Danish Parliament in February 2015. The extension will be 4.5 km long and includes five underground stations. RSRG focuses on rail infrastructure.



Pilot site II - Spain

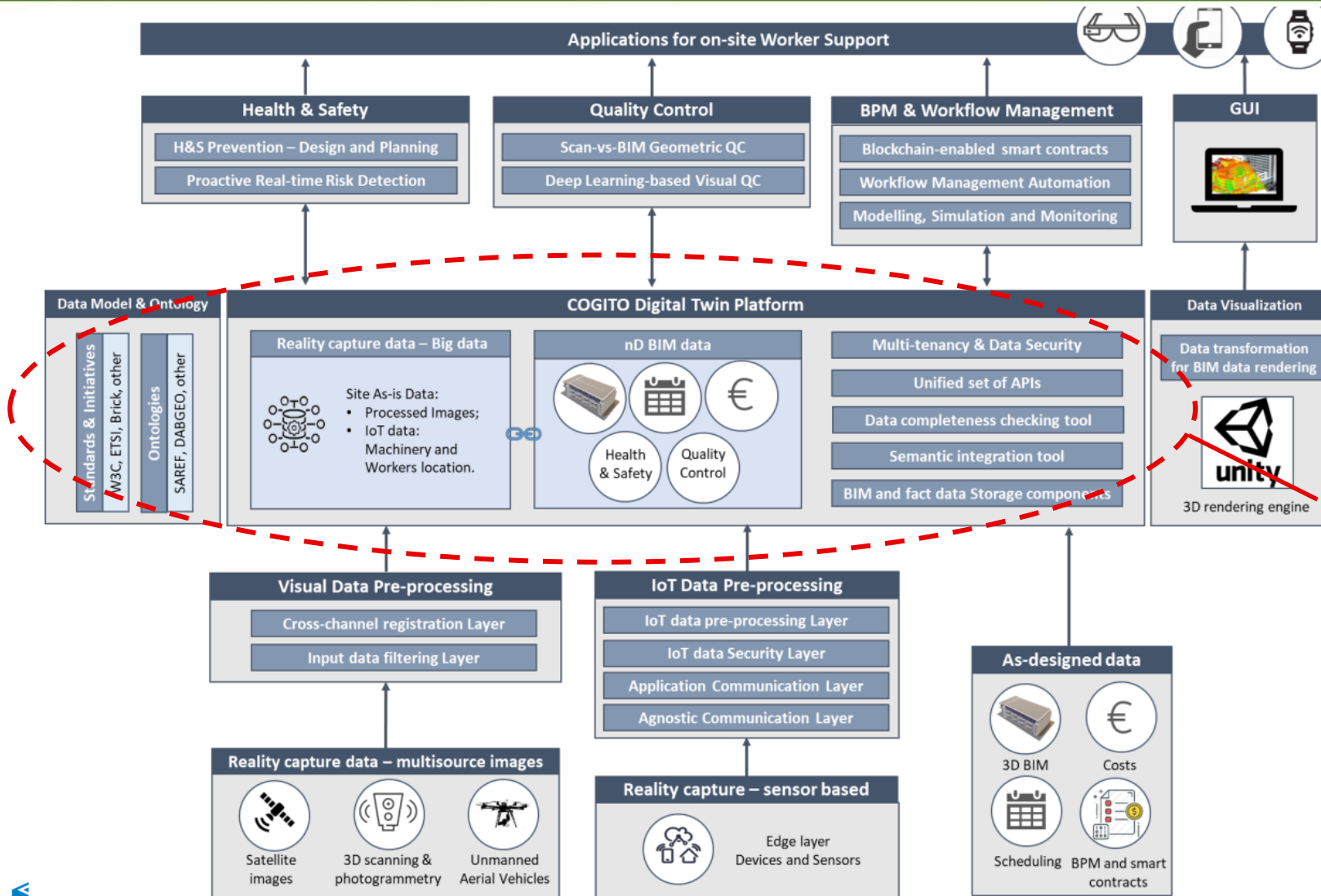
T8.4



Partner: Ferrovial

Site: High-Speed Underground Station

Description: Adapting the current railway corridor for the implementation of High-Speed services and supporting intermodality. The project includes 30.3 million of cubic meters of reinforced concrete, 197.3 thousand square meters of retaining walls, and 734 thousand cubic meters of excavated volume.



Need for interoperability between heterogeneous data formats, sources, schemas, etc. for data exchange.

Solution: Common data models derived from ontologies, and application of other semantic web technologies.



Interoperability



Exchange

Understanding

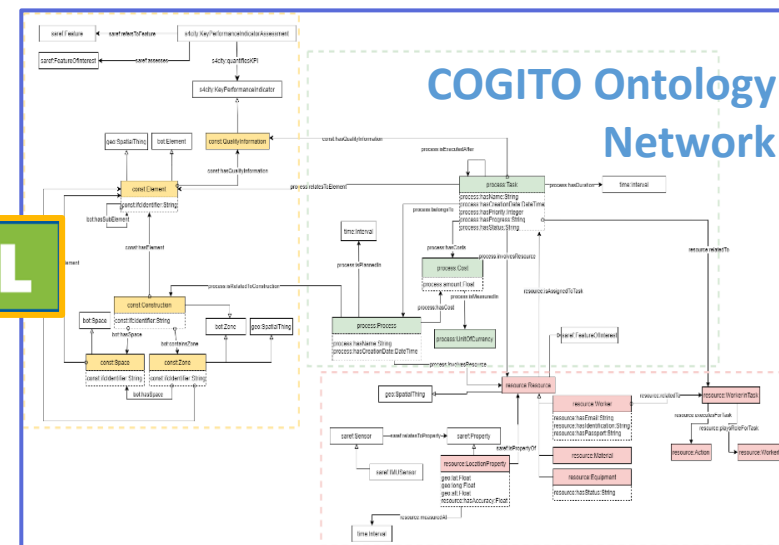


Linking

Data normalisation

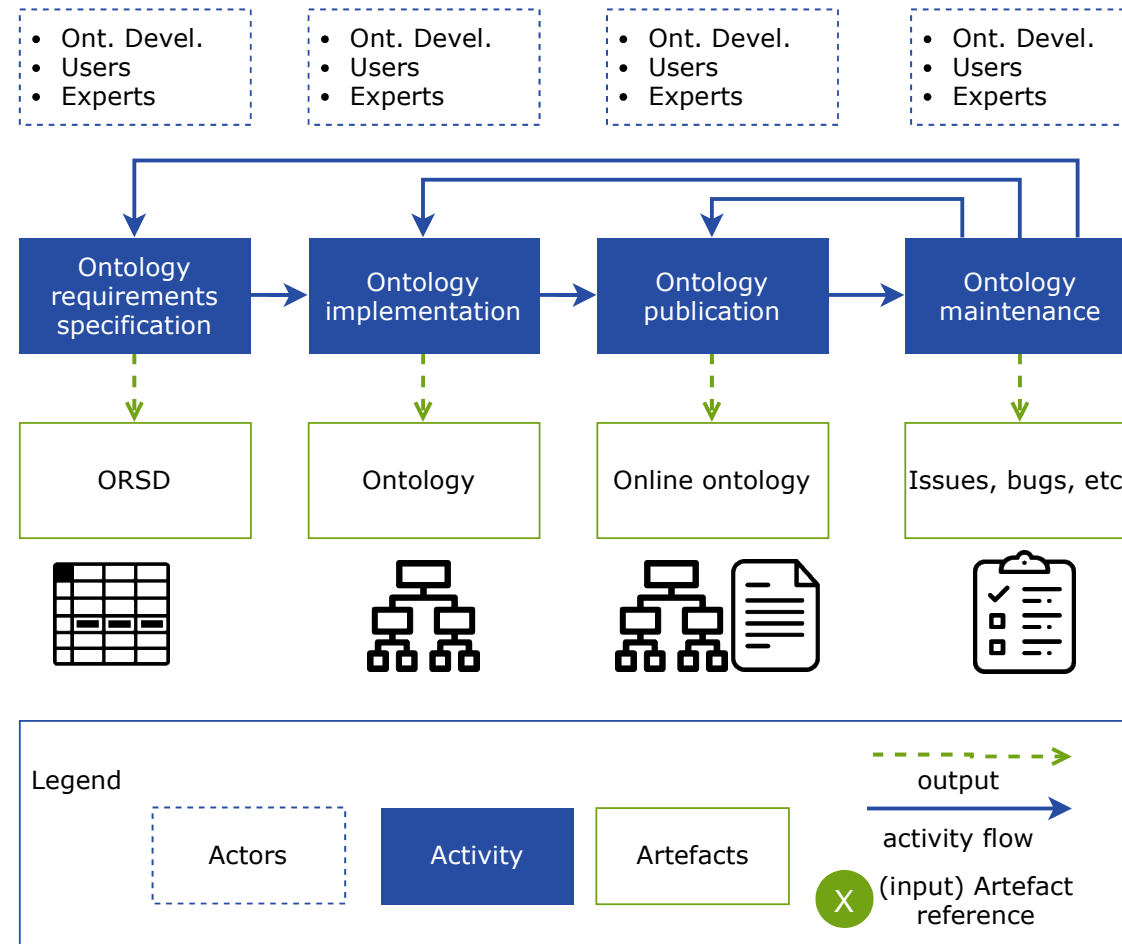
Validation

Discovery

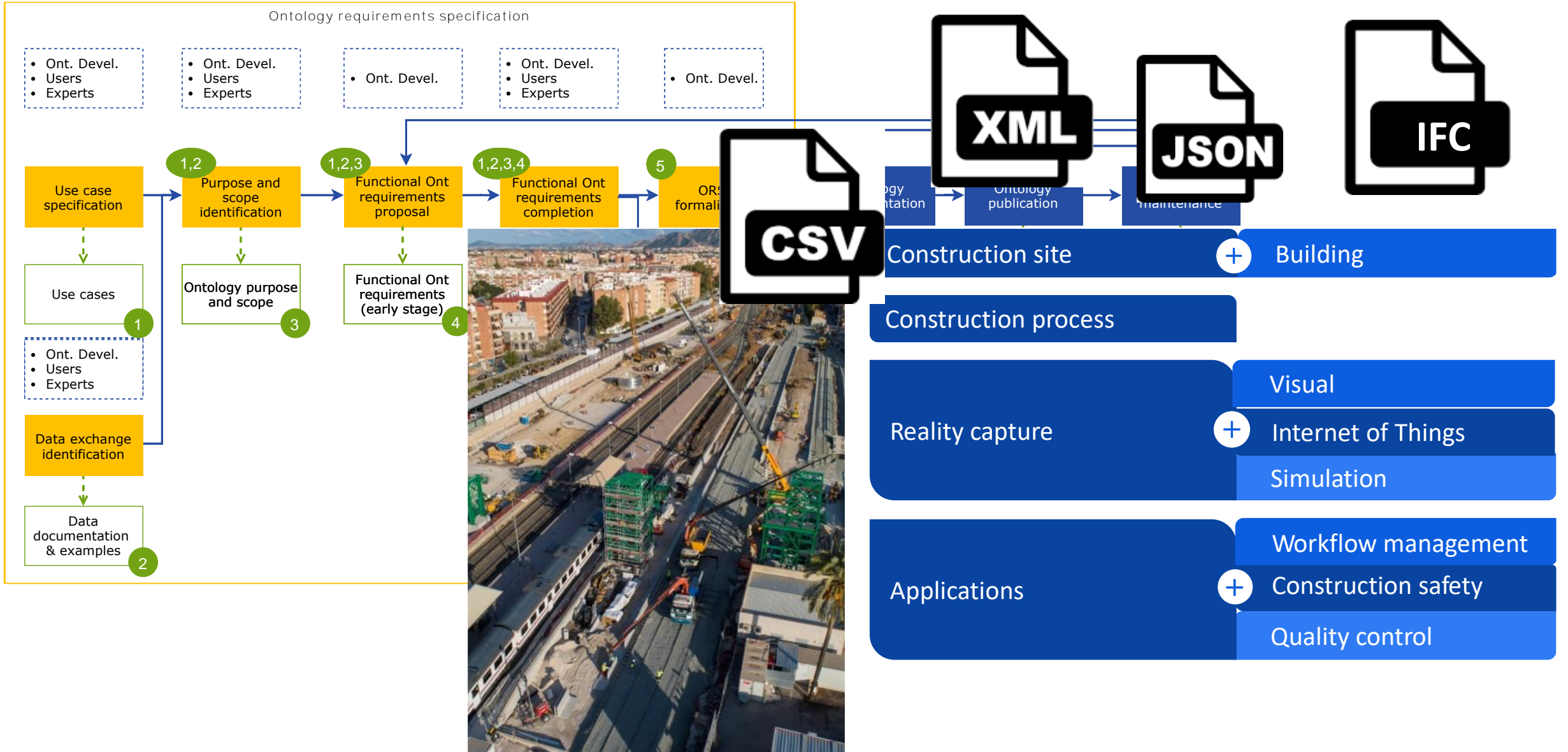


<http://lot.linkeddata.es/>

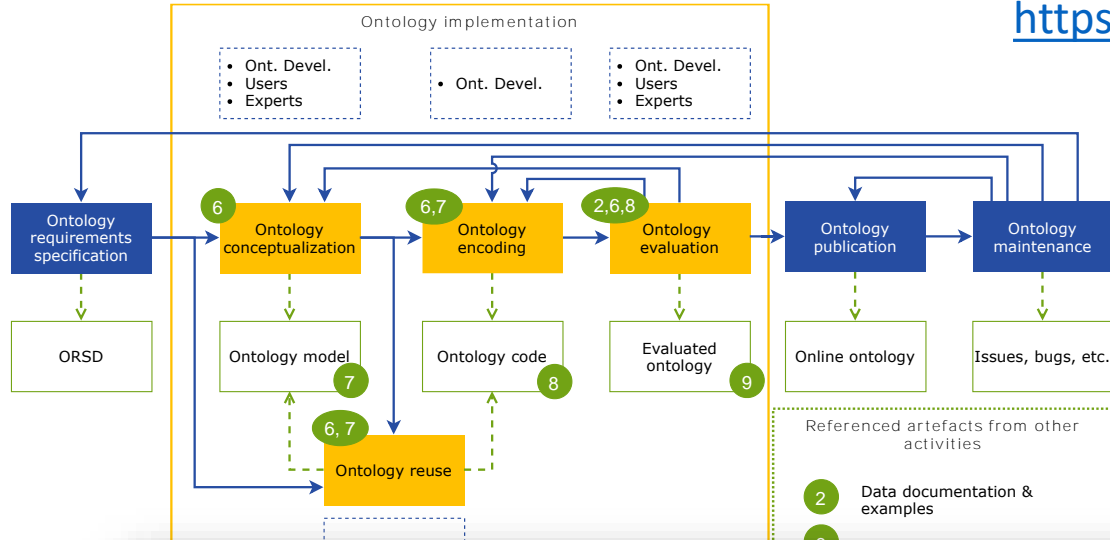
<https://doi.org/10.1016/j.engappai.2022.104755>



Gathering requirements



Implement & Reuse

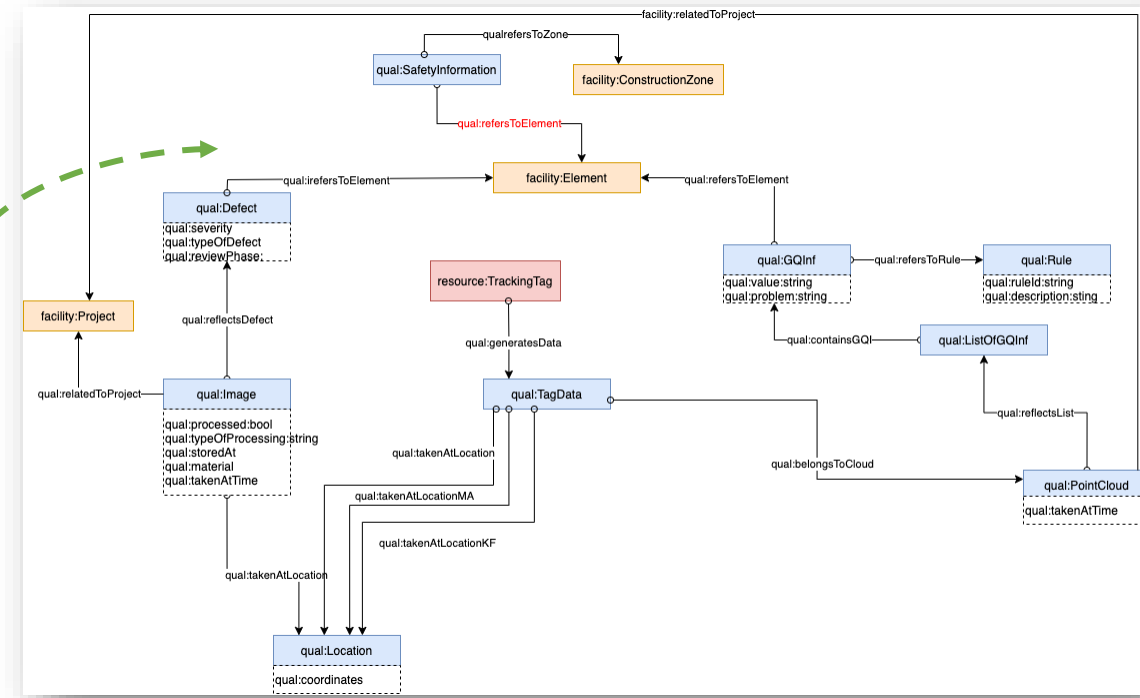
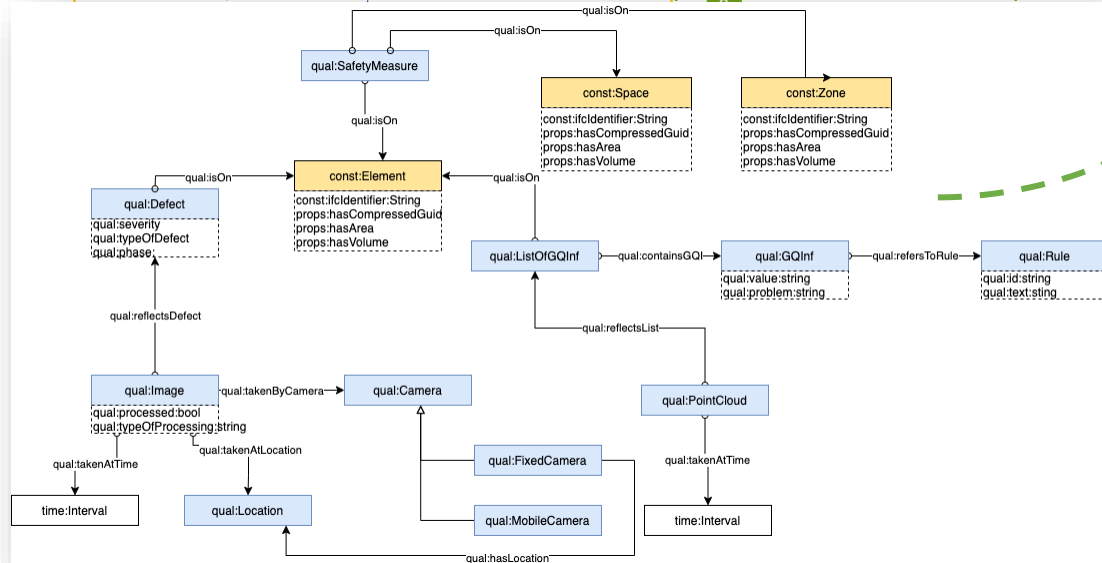


<https://chowlk.linkeddata.es/>



Chowlk
Notation

Chowlk
Converter



Four ontology modules:

Facility (yellow)

Process (green)

Resource (pink)

Quality (blue)

Reuses:

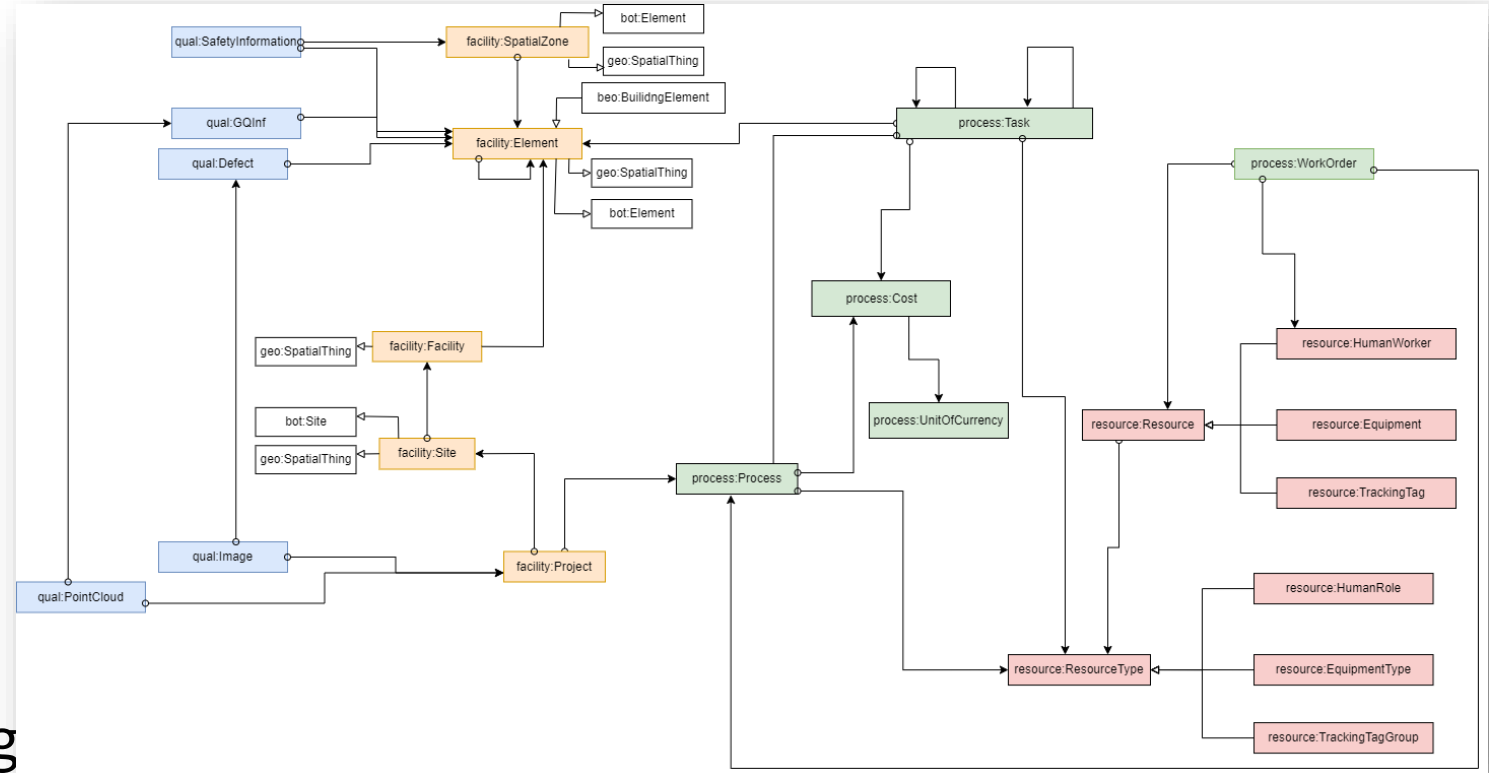
~~W3C Time~~

W3C BOT

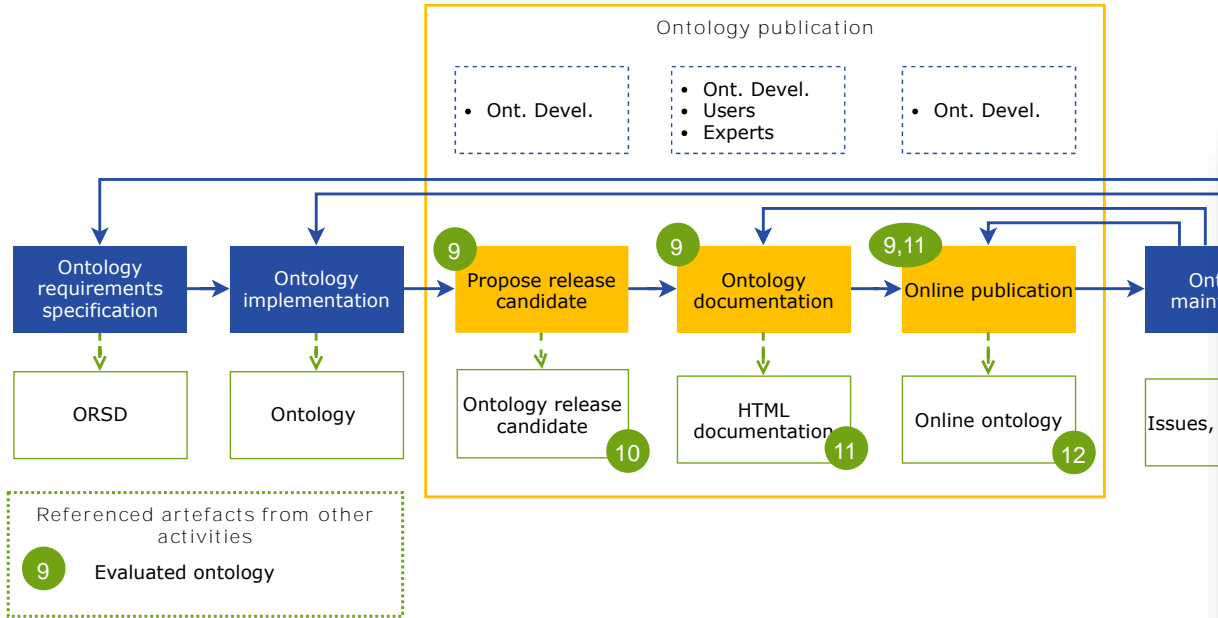
ETSI SAREF (ongoing)

ETSI SAREF4CITY (ongoing)

WGS84



Resources available



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

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

Development of incremental versions of the ontology according to:

- New requirements from meetings / app development
- Discussions on open issues
- Design patterns from existing ontologies
- Alignment with standards

SHACL validation



2ND BUILDING DIGITAL TWIN International Congress

ORGANIZED BY:



**BUILDING DIGITAL TWIN
ASSOCIATION**



SPHERE
BIM DIGITAL TWIN ENVIRONMENT



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S H2020 PROGRAMME UNDER GRANT AGREEMENT NO. 820805.