W3C LBD Community Group
Minutes - Call 16/10/2023

Attendees:

- Alex Donkers (Eindhoven University of Technology, NL)
- Katja Breitenfelder (Fraunhofer IBP/ acatech, GE)
- Peyman Zoghian (RWTH Aachen University, GE)
- Hervé Pruvost (Fraunhofer IIS/EAS, GE)
- Klaus Linhard (iabi, GE)
- Jakob Martin (iabi, GE)
- Michele Allori (e-Metodi, IT)
- Prof. Rasso Steinmann (iabi, GE)
- Tommaso Bortoli (in2it, IT)
- Mario Caputi (in2it, IT)
- Jan-Iwo Jäkel (RWTH Aachen University, GE)
- Eva Heinlein (RWTH Aachen University, GE)
- Lasse Hamborg (DTU, DK)
- Francisco Regateiro (TU Lisbon, PT)
- Zhangcheng Qiang (ANU School of Computing, AU)
- Sergio Acero Gonzalez (empa, CH)
- James Allan (empa, CH)
- George ?
- Mohammed Zoghian (RWTH Aachen University, GE)
- Steffen Wallner (Fraunhofer IOSB, GE)

Presentation slides

- https://github.com/w3c-lbd-cg/lbd/blob/gh-pages/presentations/231016_Presentation_Klaus-Linhard-et-al_OpenDBL-project.pdf

Date and time
- 16/10/2023, Monday, 14:00-15:30@UTC/ 16:00-17:30@CEST/ 07:00-08:30@PDT

Moderators

1. Katja Breitenfelder

Agenda
1. Introduction of new members
2. Klaus Linhard: "A pluggable ontology driven data model"
3. Discussion
4. Further topics

Minutes
1. Introduction of new members

Prof. Rasso Steinmann: Founded iabi. Professor for IT in construction at university of applied sciences in Munich.

Jan-Iwo Jäkel: PhD student at RWTH Aachen, Institute of Construction Management and Ind. Engineering. Slowly starting to implement semantic web technologies and hopes to learn from this group.

Eva Heinlein: Studying industrial engineering at RWTH Aachen. New to this topic, and interested to learn more.

Mario Caputi: Owner and founder of in2it. Participates in the OpenDBL horizon project. Likes to learn from the group and from similar initiatives.

Tommaso Bortoli: Building engineer and coordinator. Also works for in2it and participates in the OpenDBL project.

2. **Klaus Linhard, Jakob Martin, Michele Alori: "A pluggable ontology driven data model"**
   Three persons will present. Michele starts with an intro to the EU-project "OpenDBL".

   a. **Michele Alori: Introduction**
   e-Metodi technical partner for producing the OpenDBL platform. This will be a web platform with multiple services. The ontology data model is considered one of the services and is the complex part of the project.

   Overview
   The OpenDBL platform will provide participants/users with access to multiple services, as can be seen below. It combines graph databases, an IFC manager (based on ifc open shell), user authentication and collaboration, sensor data gateway, etc.
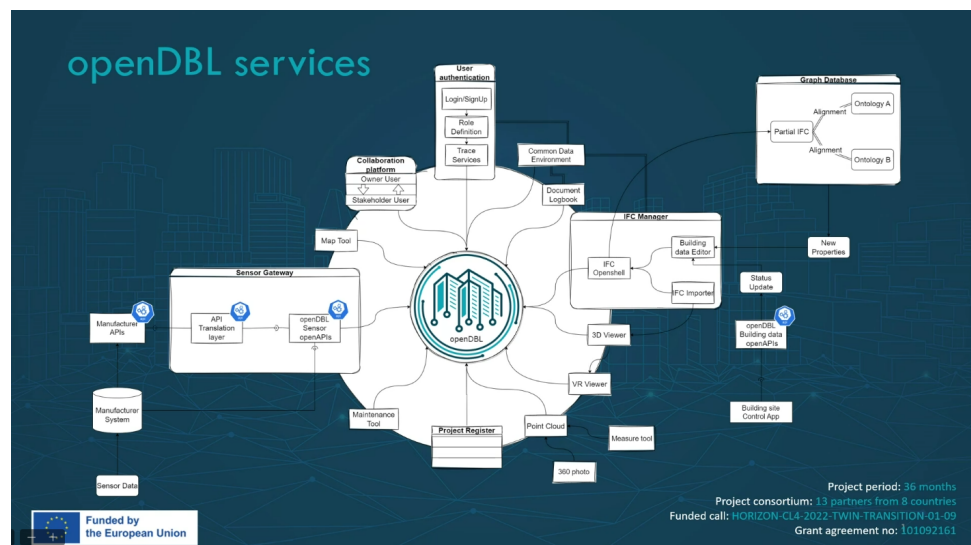
   User auth.
   Different projects will have different users and roles. User authentification will allow to identify those users and their roles. Based on those, users can access different services in the platform.

   CDE
   Based on ISO 19650, the platform will have a horizontal web-based common data environment. Accessing data related to various projects is based on the user role and requires access granted by a project manager.

   Project register
   A database with all the metadata of projects.

Document logbook

A tree view of all the available documents. Names of documents (or types) will be dynamically updated based on the location (or country) of the project.

IFC manager

The platform enables loading and visualizing IFC files. It uses IfcOpenShell. The tool also hosts a 'Building Data Editor', which is an editable list of non-geometric data. A graph database is the backbone of this Building Data Editor. The bSDD comes into place to align properties across projects.

3D Viewer

A web-based viewer, probably using IFC.js or similar libraries, to visualize the IFC model in the browser.

Point Cloud Visualizer

The platform also aims to have a point cloud visualizer, including certain basic geometric functionalities (such as measuring).

Maintenance tool

Based on all the proposed functionalities, a maintenance layer can be added in the platform that uses all the information in the tool to perform data-driven decision-making in maintenance. Various functionalities can be considered. The layer is not polished and functionalities will develop over time.

Sensor gateway

The aim is to work towards Digital Twins by adding a sensor gateway. The gateway is called 'gateway' because it should function as a translation layer between the existing systems of various vendors and the OpenDBL platform.

b. **Klaus Linhard: Outcome of the first 9 months**

Previous projects: A lot of static integration of data. This was very error prone, hard to extend and hard to use for new projects.

Therefore, data integration in the OpenDBL project is done using their so-called 'Pluggable Ontology Driven Data Model'.
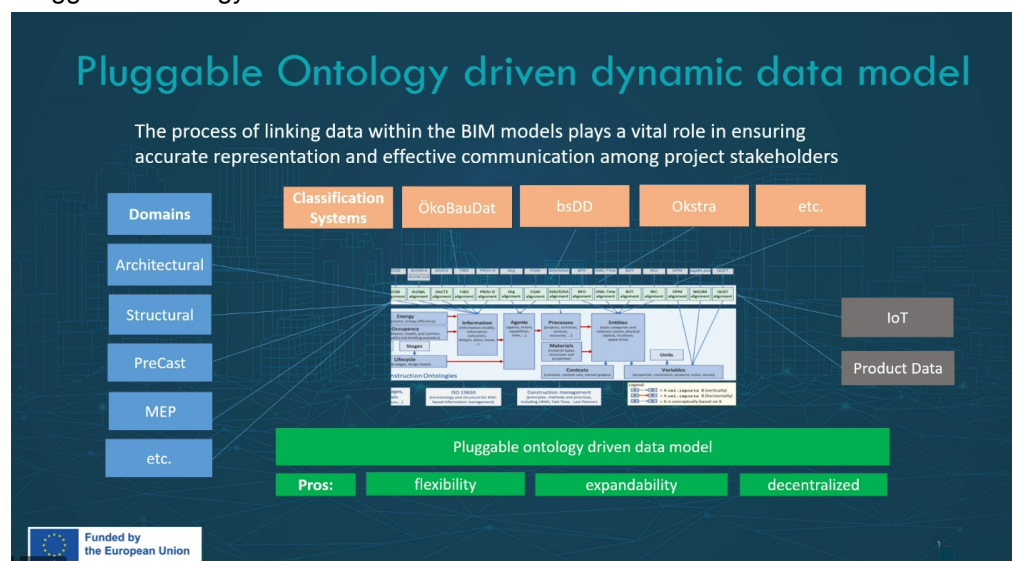
Pluggable: ontologies can be dynamically integrated at any stage of the project.
Ontology: fundamental data schema and thus supply data specification.
Dynamic: not only does the project consider existing data, but also data that might be added in the future.
Data model: applies to each domain. Domains have their own data models, reflecting their specific domain expertise.

Ontologies are aligned using alignment modules.

The system has some core ontologies that can be extended by other domain-specific ontologies.

c. **Jakob Martin**:
**Software decisions**
First started with Neo4j, but Ontotext had significant pros compared to Neo4j.

	Ontotext (Pros)	Ontotext (Cons)	Neo4j (Pros)	Neo4j (Cons)
Underlying Model	Supports RDF and is suitable for semantic web applications	RDF might be less intuitive to some users compared to property graphs	Uses property graph model, encompassing both nodes and relationships	Doesn't have the same standards focus as RDF
Use Cases	Particularly suitable of semantic web application and linked data	Might be less ideal for general graph applications in some use-cases	Versatile for a wide range of applications e.g. social network	Inference and semantic reasoning is limited
User-Interface	Easy to use, especially when it comes to Data import- and export			User-Interface and data exchange is complicated

RDF has benefits for AI
- Rich semantic data models (linked data/ontologies/knowledge graphs) make it easier for to add contextual information to AI models
- Inferencing capabilities
- Standardized querying
- Interoperability between systems and datasets, which is good for AI applications that use data from various sources
- Schema flexibility

A conversion tool to convert IFC to RDF ttl is created in python.
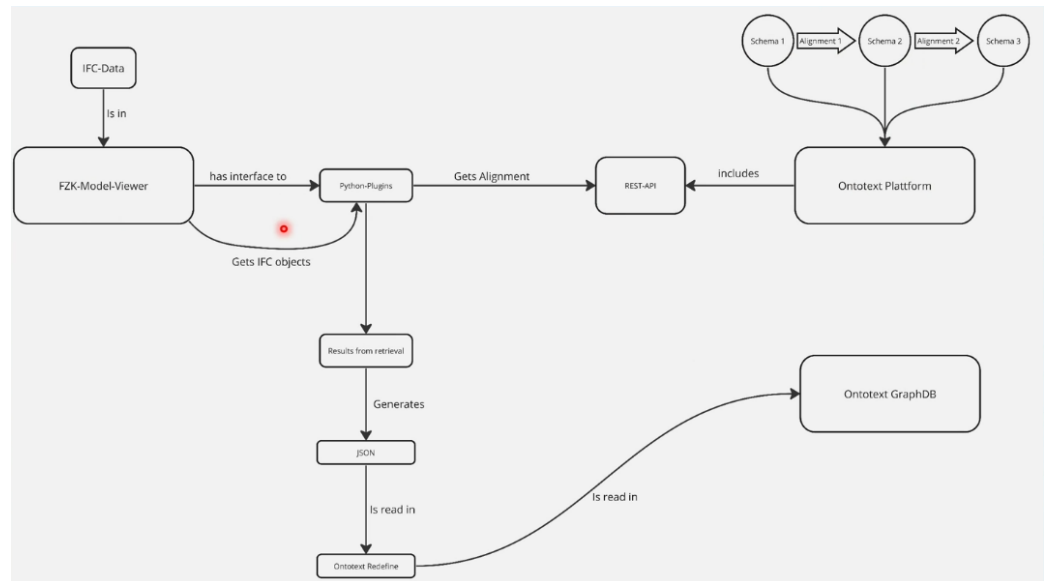
AI concept

Data from two different STEP files is converted to TTL and queried (from the TTL file). e.g. door length. The OpenDBL project tries to match the results from the queries with specific ontologies.

The system should be a human-in-the-loop system where humans check the results of the AI module, as results are never 100% certain.
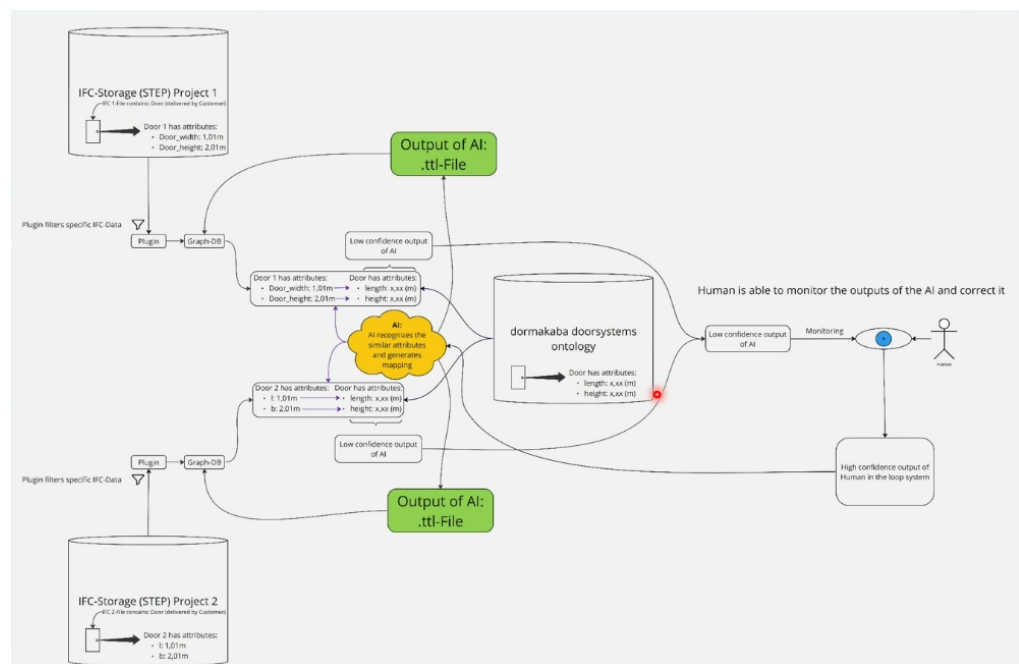
d. Klaus Linhard: Final words

The project is closely related to concepts as bSDD and Product Data Templates.

3. Discussion

[George]: How did you train your AI agent?
[Martin]: We are only 9 months in. AI is not trained yet. The project will use pre-trained LLM.
In the AEC industry, we typically don't have access to training data.

[Katja]: Can we go back to the platform overview please and discuss a bit more?
[Michele]: This is more of a front-end view. The AI should run in the backend to align properties and writing mistakes.
[Jakob]: IFC to TTL conversion creates 10x to 12x because the entire IFC schema is converted every time. This is why they only convert snippets of IFC files.

[Michele]: IfcOpenShell will be used to rewrite the IFC file after the AI procedure.

4. **Further topics**

Next Call

- 20/11/2023, Monday, 14:00-15:30@UTC/ 16:00-17:30@CEST/ 07:00-08:30@PDT

   Agenda: Diellza Elshani, PhD candidate at Universität Stuttgart

   We are interested in getting suggestions from the community about potential agenda items and **Elevator Pitches** for the following calls. Please send your suggestions to the chairs or to internal-lbd@w3.org, whether you have a short presentation to bootstrap the discussion, and an approximate duration you think the discussion will last.

Previous minutes

https://github.com/w3c-lbd-cg/lbd/tree/gh-pages/minutes