

## **W3C LBD Community Group Minutes - Call 19/10/2021**

### **Attendees:**

- Conor Shaw (University College Dublin)
- Ranjith Soman (Imperial College London)
- Karl Hammar (Jönköping University)
- Mathias Bonduel (Neanex Technologies)
- Christian Kreyenschmidt (Jade University)
- Philipp Hagedorn (RUB, Germany)
- Joel Bender (Cornell University)
- Anna Wagner (Individual assoc. With PROSTEP)
- Mads Holten Rasmussen (NIRAS)
- Jeroen Werbrouck (UGent - RWTH Aachen)
- Alex Donkers (Eindhoven University of Technology)
- Rahel Zeleke (Jönköping University)

### **Presentation slides**

- [https://github.com/w3c-lbd-cg/lbd/blob/gh-pages/presentations/construction\\_planning/20211019\\_AEC-controlRoom\\_RanjithSoman.pdf](https://github.com/w3c-lbd-cg/lbd/blob/gh-pages/presentations/construction_planning/20211019_AEC-controlRoom_RanjithSoman.pdf)
- The meeting was recorded and a link can be requested via the chairs (Anna Wagner, Karl Hammar, Katja Breitfelder or Mathias Bonduel).

### **Date and time**

- 19/10/2021, Tuesday, 15:00-16:30@UTC/ 17:00-18:30@CEST/ 08:00-09:30@PST

### **Moderator**

1. Mathias Bonduel

### **Agenda**

1. Introduction of new/returning members
2. Presentation by Ranjith Soman: "AEC Production control room- Role of linked data"
3. Q&A
4. Call for elevator pitches and announcement of next meeting

### **Minutes**

1. Introduction of new/returning members
2. Presentation by Ranjith Soman: "AEC Production control room- Role of linked data"

- a. Demonstrator project w/ industry, aiming to transfer knowledge from academia to industry settings.
- b. Success of infrastructure projects depends on staying within planned time- and cost boundaries. Causes of overruns include inefficient monitoring and control. Automation can help, but large amounts of data generated from automation needs to be made accessible/integrated.
- c. AEC production control room aims to visualize and interact with real-time construction information.
- d. Previous setup: typically whiteboard-based, sticky notes, etc., Lacking traceability, fragmented data.
- e. Goal: data recorded through digital systems (mobile app, web app, touch screens) and visualized through large screens etc.
- f. Four main processes to be supported:
  - i. Planning / Contract programme and delivery programme
  - ii. Look ahead planning
  - iii. Document control
  - iv. Site logistics
- g. A “simple” process such as a truck delivering to the construction site could consist of 5+ steps, each with a number of data points of interest, in different systems/platforms, different people involved, etc. The knowledge of these processes is typically held in the head of individual people.
  - i. This is exacerbated by multiple stakeholders (subcontractors) who may have only partial knowledge of the current state of each others’ work/project (that they have dependencies on/to), leading to clashes and delays on-site.
- h. Three sets of data to integrate initially:
  - i. Documents and files
  - ii. Real time data
  - iii. Planning and 4D information
- i. Key aspects of developed ontology
  - i. Location
  - ii. Activity (Time + Prov)
  - iii. Documents
  - iv. Organisation
- j. Reuses existing best-practice ontologies heavily (Prov, BOT, W3C Time,
- k. SHACL used to model constraints for data validation
  - i. Advantages: modular, can be reused across projects, rules enable modelling unit testing environment
- l. Comparatively simple constraints can be quite helpful and save quite a lot of time on-site by validating data quality. “A little semantics goes a long way”?
- m. Reinforcement learning utilized to generate look ahead schedule
  - i. Penalties for constraint violations

- n. Visualization platform based on PowerBI builds on top of the integrated data, enabling contextual information about actors, current work steps, locations on the site, times, weather, deliveries, etc.
  - o. Key insights enabled:
    - i. Predict task confidence levels
    - ii. Identify workspace conflicts
    - iii. Generate look ahead schedules
  - p. Challenges noticed during the project:
    - i. Data accessibility
    - ii. Data extraction
    - iii. Submission format
    - iv. Naming consistency
    - v. Semantic environment
    - vi. Collaboration
    - vii. Resilience
3. Q&A
- a. Calin Boje: really interesting way to use SHACL, well done Ranjith. Off-topic, how did you compute the reward score based on the rules?
    - i. Three sets (paper currently in the making):
      - 1. How fast is the algorithm converging in respect of the process - reward
      - 2. Resource utilization - if the chart is waving, it means it is inefficient - reward
      - 3. Based on SHACL constraint violation. Penalty proportional with the number of violations - penalty
  - b. Mathias Bonduel: You developed the ASPCR ontology and are currently aligning with other ontologies. What is hindering you in directly reusing existing ontologies?
    - i. Technically, it would be easier to reuse. Development under time constraint, so we first developed the ontology, made the POC and then aligned it.
    - ii. Karim Farghaly: We are currently rebuilding the ontology with only concepts from other concepts without creating a new ontology over again.
    - iii. Mathias Bonduel: Workflows for creating new ontologies are well discussed and existing. But workflows for reviewing existing ones and applying them to your use case are lacking
    - iv. Ranjith: Currently working on a search engine for LD in AEC similar as is already available in medicine
  - c. Mathias Bonduel: Do you use reasoning with the reused ontologies? Combining several ontologies with different complexities may result in inconsistencies. As a community, we need a best practice on which ontology combinations are valuable for which use cases.
    - i. Mathias: In context of using SHACL besides validation (creating Application Profiles indicating the coherence between terminology of different ontologies), it would also be great to have a modelling tool for SHACL, maybe based on [CHOWLK](#).

- d. Calin Boje: Since you have so many tools on each construction project, how do we ensure the population of a central graph (like your ontology) with relevant data? I think you had a slide on this process
  - i. PoC sometimes “hacked” to get the data. Data integration is a complicated task.
  - ii. Karim: We used to extract data as CSVs from source systems, using individual users with individual logins. Those files have then be mapped and visualized in PowerBI
- e. Calin: What is the effort on the SHACL rules? How many did you do? How complicated was it?
  - i. Basic rules were easy, but there were more complex rules, e.g. document-based. More than 50 SHACL shapes only for documents, which also required SPARQL writing.
- f. Mathias: SHACL is used in different places in the workflow. How did you manage your SHACL shapes?
  - i. Four major headings for labeling.
  - ii. Back references to ontologies is not optimal for all shapes, as SPARQL SHACL may query across multiple ontologies.
  - iii. Mathias: An annotation ontology for grouping SHACL shapes would be beneficial
- 4. Call for elevator pitches and announcement of next meeting
  - a. Advertisement by Karl: Check out Workshop on Ontology Design and Patterns at ISWC 2021: <http://ontologydesignpatterns.org/wiki/WOP:2021>

## Next Call

- 02/11/2021, Tuesday, 15:00-16:30@UTC/ 17:00-18:30@CEST/ 08:00-09:30@PST

### Agenda: TBD

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](mailto: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://www.w3.org/community/lbd/meeting-minutes/>  
<https://github.com/w3c-lbd-cg/lbd/tree/gh-pages/minutes>