Attendees

- Pieter Pauwels [Ghent University]
- Jakob Beetz [RWTH Aachen]
- Anna Wagner [TUDarmstadt]
- Nicolas Bus [CSTB]
- Georg Schneider [Fraunhofer]
- Michel Böhms [TNO]
- Jun Wang
- Alberto Pavan
- Aaron Costin
- Fangzheng Lin [TUDresden]
- Claudio Benghi (Northumbria University)
- Claudio Mirarchi [Polimi]
- Kyriakos Katsiqarakis [TU Crete]
- Georgios N. Lilis [TU Crete]
- Pouya Zangeneh [University of Toronto]
- Gonçal Costa [LaSalle University]
- Markus Rickert, Alexander Perzylo [fortiss]
- Maxime Lefrancois
- Viktor Malvar
- Mads Holten Rasmussen
- Matthias Weise [AEC3 Deutschland]
- Mathias Bonduel
- Zohreh Pourzolfaghar (DCU)
- Emilio Sanfilippo (LS2N)

Excused

- Stjelja Davor
- Wendelin Sprenger
- Ana Roxin [University of Burgundy]
- Markus helfert (DCU)

Date and time

- 29/01/2018
- 16:00 CET

Agenda

1. Overall status update of the W3C LBD CG
2. Relation towards buildingSMART and its LDWG
3. BOT - Product - Props open issues and example implementations

4. Future meetings and open remarks (round table)

Minutes

0. Introductions

- Introduction Claudio Benghi, Fangzheng Lin, Matthias Weise

1. Overall status update of the W3C LBD CG

- Repositories online with ontologies: https://github.com/w3c-lbd-cg/. Most work has focused on the below three ontologies and their alignments with outside ontologies.
    - PROPS
    - PRODUCT
    - BOT

  These ontologies are getting more and more elaborate, and a number of use cases were presented at the LDAC2017 workshop (http://linkedbuildingdata.net/ldac2017/). Further work has by now happened on the usage of these ontologies, and stress-testing them in more realistic settings.
- Ontologies have been proposed to capture 3D geometry. Multiple ontologies could be used in this respect, depending on the use case.
- It seems more and more reasonable to split the Community Group into (1) a Working Group focusing on the semantics of buildings (BOT, PRODUCT, PROPS) and (2) a Community Group focusing on 3D geometry over the web. A lot of work has already been prepared for the former group to take place. The topic of the latter is broader than buildings only. This would be of interest also for geospatial experts and product modellers.

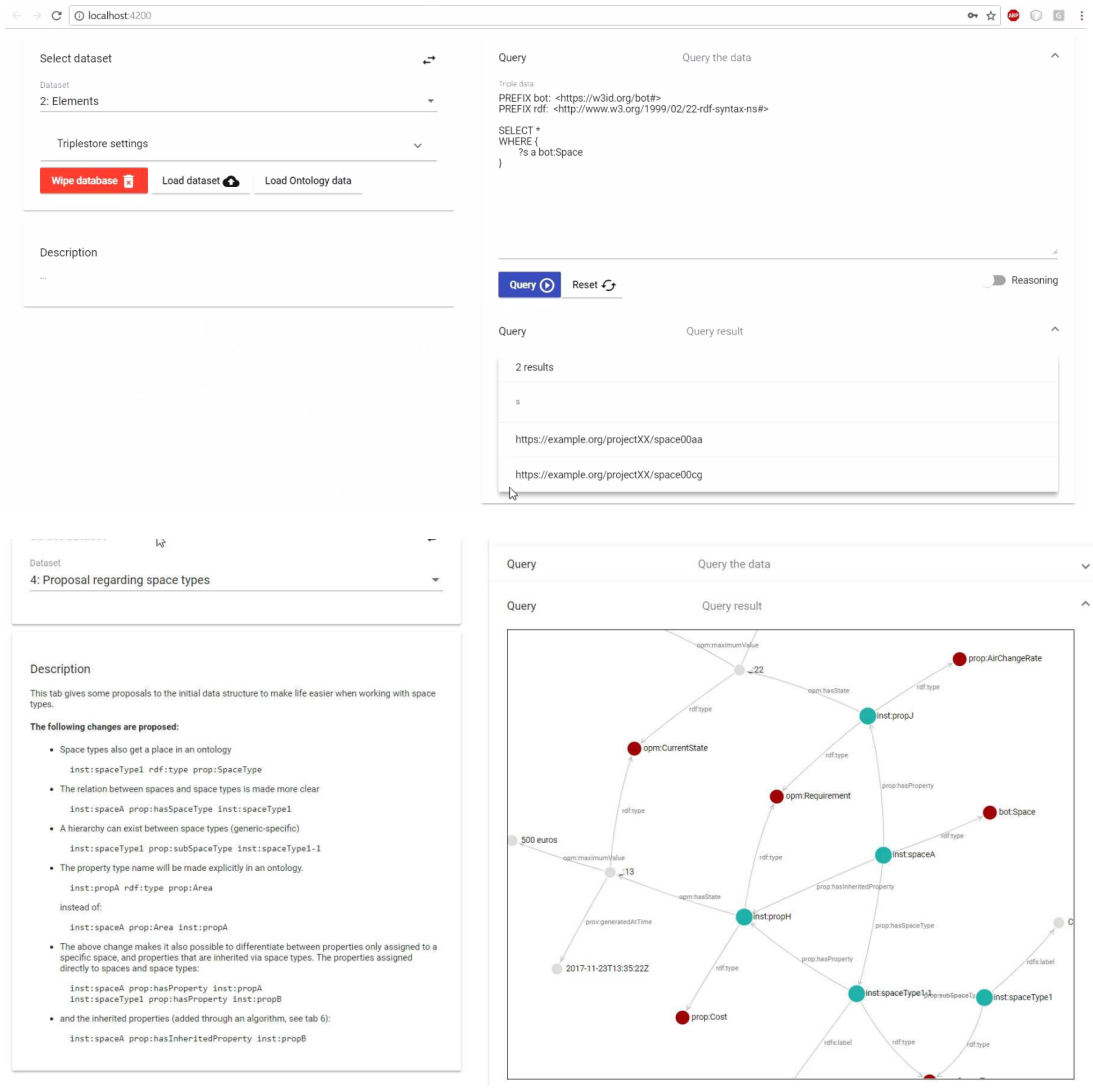
2. Relation towards buildingSMART and its LDWG

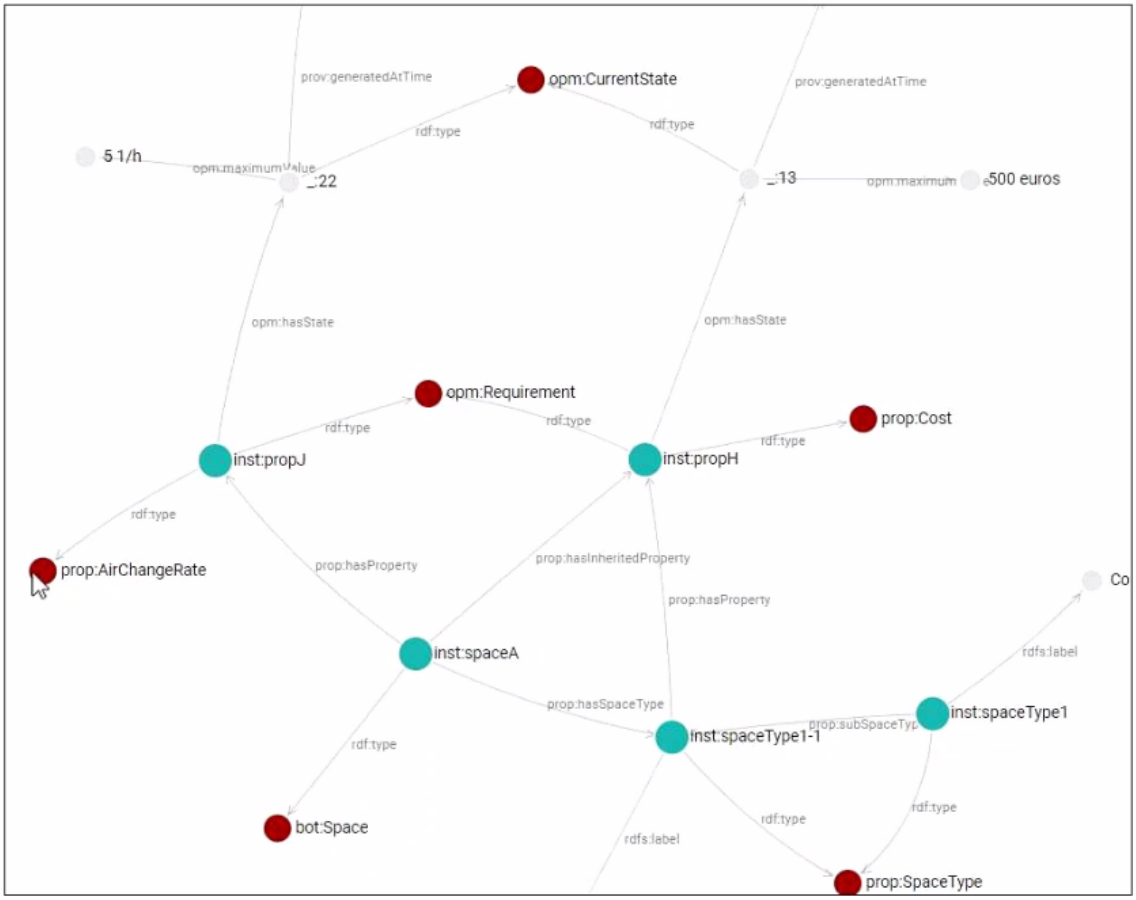
- The LDWG has until now worked rather separate from the W3C Linked Building Data CG. The LDWG has a focus mainly on IFC and buildingSMART's other standards, hence influencing the discussions a lot in that direction. This has been entirely different in the W3C, where work has been done more from scratch, yet inspired by IFC. Yet, in both groups are the same interests present, namely, being able to represent and use building data over the web, ideally in a simple, modular and extensible manner.
- There is an option to join the W3C LBD CG and the buildingSMART LDWG, provided they work towards the same shared goal listed above. In that case, it would make sense to promote the use of the W3C LBD ontologies to capture building data (BOT, PRODUCT, PROPS, GEOM), instead of relying directly on ifcOWL, which is inherently EXPRESS-based and thus less amenable for simple, modular, and extensible usage. That would imply that compliance or interaction of these developed ontologies with IFC needs to be shown.
- It is not sure how the LDWG would merge with a community group that is in the process of splitting in two.

3. BOT - Product - Props open issues and example implementations

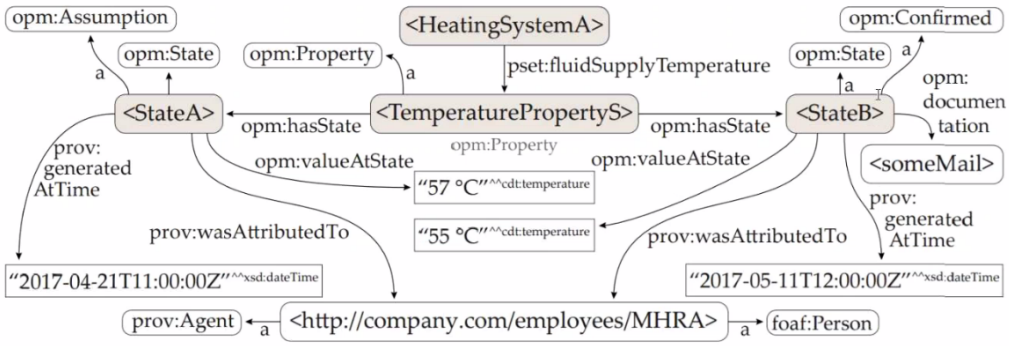
- A number of implementations have been developed by now.

- **Sparql-visualizer tool** (Mads and Mathias) - https://madsholten.github.io/sparql-visualizer/
    - Allows to query a dataset in memory or an online dataset.
    - How to state that something is a requirement for a property


localhost:4200
Select dataset
Dataset
2: Elements
Triplestore settings
Wipe database
Load dataset
Load Ontology data
Description
...
Query
Query the data
Triple data
PREFIX bot: <https://w3id.org/bot#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT *
WHERE {
?s a bot:Space
}
Query
Reset
Reasoning
Query
Query result
2 results
s
https://example.org/projectXX/space00aa
https://example.org/projectXX/space00cg
Dataset
4: Proposal regarding space types
Description
This tab gives some proposals to the initial data structure to make life easier when working with space types.
The following changes are proposed:
Space types also get a place in an ontology
inst:spaceType1 rdf:type prop:SpaceType
The relation between spaces and space types is made more clear
inst:spaceA prop:hasSpaceType inst:spaceType1
A hierarchy can exist between space types (generic-specific)
inst:spaceType1 prop:subSpaceType inst:spaceType1-1
The property type name will be made explicitly in an ontology.
inst:propA rdf:type prop:Area
instead of:
inst:spaceA prop:Area inst:propA
The above change makes it also possible to differentiate between properties only assigned to a specific space, and properties that are inherited via space types. The properties assigned directly to spaces and space types:
inst:spaceA prop:hasProperty inst:propA
inst:spaceType1 prop:hasProperty inst:propB
and the inherited properties (added through an algorithm, see tab 6):
inst:spaceA prop:hasInheritedProperty inst:propB
Query
Query the data
Query
Query result
prop:AirChangeRate
inst:propJ
opm:CurrentState
opm:Requirement
bot:Space
500 euros
inst:spaceA
inst:propH
2017-11-23T13:35:22Z
prop:Cost
inst:spaceType1-1
inst:spaceType1



- Open issues around Props (Mads & Mathias):
  - Proposal: use object properties, so that hasProperty points to an instance of a specific property class (e.g. AirChangeRate), which has then further links to values and types. Type inheritance can then also be defined.
  - Proposal: the above allows to capture states of properties (assumptions, requirements, realised property, ...) and then also do versioning.



  - This proposal uses the OPM ontology, the ontology for property management, which was also made available online in the GIT repo of the W3C LBD CG.

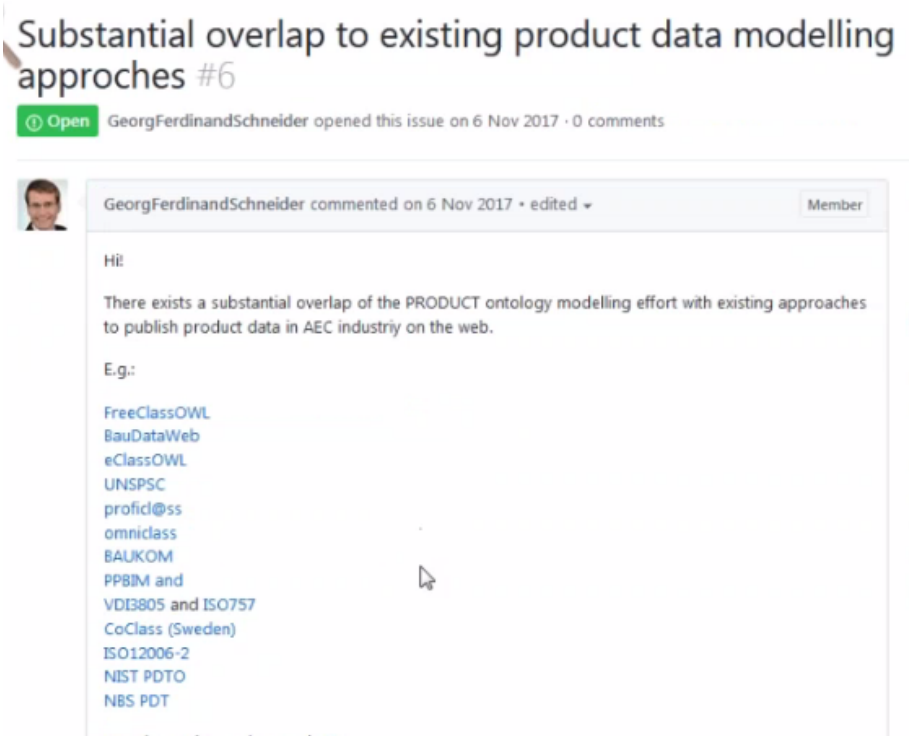
- **IFCtoBOT&CO by Jyrki Oraskari**
  - Relies on the PRODUCT and PROPS ontologies made available at: https://github.com/pipauwel/product and https://github.com/w3c-lbd-cg/props; and aims at representing IFC data using these alternative ontologies.

```
60  props:flammabilityRating
61          a                       owl:DatatypeProperty ;
62          rdfs:comment            "Classement de l'inflammabilité de l'élément selon la classification natic
63          rdfs:label              "Inflammabilité"@fr-FR , "Entflammbarkeitsklasse"@de-DE , "flammabilityRat
64          rdfs:range              xsd:string ;
65          schema:domainIncludes   <https://w3id.org/product/Covering> .
66
67  props:minimumPartLoadRatio
68          a                       owl:DatatypeProperty ;
69          rdfs:comment            "Minimum part load ratio as a fraction of nominal capacity."@en , "Coeffic
70          rdfs:label              "minimumPartLoadRatio"@en , "CoefficientMinimalChargePartielle"@fr-FR ;
71          rdfs:range              <https://w3id.org/measurement/positiveRatio> ;
72          schema:domainIncludes   <https://w3id.org/product/Compressor> .
```

  - IFC data can be made available in compliance with these simpler ontologies. In this case, however, a separate ‘product’ ontology is then proposed and needed; and properties are

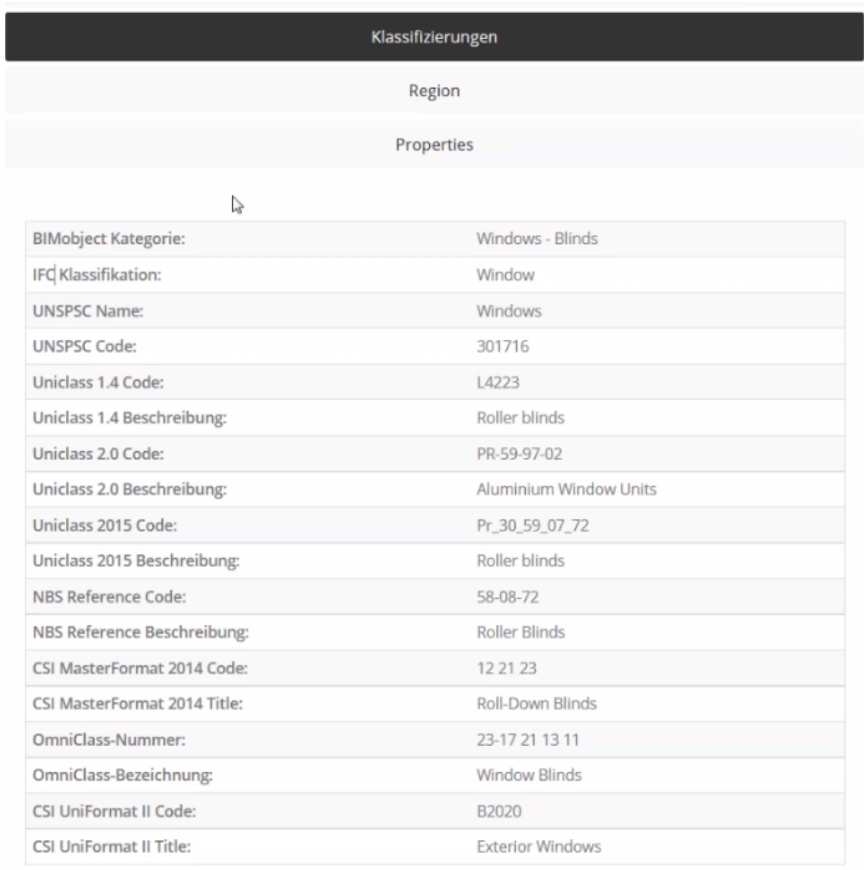
made available as direct data properties rather than object properties and classes with values and units. This is thus quite different from the above approach (Mads & Mathias).
- In this tool, geometry is considered out of scope.
- The product ontology is linked to bSDD concepts and subjects, but not (yet) with other product ontologies or classifications.

- **Product and property modelling**
  - In the LDAC workshop, there was an agreement to try to reuse as much as possible existing classification systems and ontologies. This conclusion is documented in http://linkedbuildingdata.net/ldac2017/files/LDAC2017Report.pdf ("Track B - Product data and Props ontologies"). The considered product ontology above would actually have overlap with the below list of product data modelling approaches.



  - So, there are a number of options for taking these ontologies on board:
    a. Not make a new product ontology and opt to use any of these ontologies directly
    b. Link or map to these existing product ontologies from the above product ontology.
  - Mathias Weise: this interlinking to existing ontologies is indeed highly needed (e.g; German national standards). How is this done?
    a. This can be done using type links (links between OWL ontologies); (Pieter: such mappings had been made previously for BOT)
    b. This can be done using transformation rules (SHACL, SPIN, …);
    c. This can be done using instance links (loose links)

- Georg Schneider: these classifications and mappings are also seemingly present in bimobject.com:



Klassifizierungen

Region

Properties

BIMobject Kategorie:	Windows - Blinds
IFC Klassifikation:	Window
UNSPSC Name:	Windows
UNSPSC Code:	301716
Uniclass 1.4 Code:	L4223
Uniclass 1.4 Beschreibung:	Roller blinds
Uniclass 2.0 Code:	PR-59-97-02
Uniclass 2.0 Beschreibung:	Aluminium Window Units
Uniclass 2015 Code:	Pr_30_59_07_72
Uniclass 2015 Beschreibung:	Roller blinds
NBS Reference Code:	58-08-72
NBS Reference Beschreibung:	Roller Blinds
CSI MasterFormat 2014 Code:	12 21 23
CSI MasterFormat 2014 Title:	Roll-Down Blinds
OmniClass-Nummer:	23-17 21 13 11
OmniClass-Bezeichnung:	Window Blinds
CSI UniFormat II Code:	B2020
CSI UniFormat II Title:	Exterior Windows

- Gonçal argues for the need of examples/case studies connected with small sample datasets
    - This could be done in conjunction with IFC environments, or
    - In other independent data sources (e.g. design specs, requirements …)
- Claudio Benghi: also we are very familiar with IFC and would be interested in making plugins or providing use case example implementations of what has been proposed here so far, bringing this back to 3D models and commercial environments and so on.
- Matthias Weise: We have a use case already and wanted to contact you with that, Claudio.
- Mathias Bonduel: note that not all use cases need to revolve around BIM. Other use cases outside the regular BIM environments are also perfectly feasible. In my case, I am mainly working on data for existing buildings. Also Mads is working on use cases that do not really start from a BIM environment. So that is also possible.
- Pieter Pauwels: yes, there are two sorts of use cases there. One kind of use case starts from a BIM environment, and usually goes through an IFC export, after which an LD application can take place. A second kind of use case starts directly from the ontologies designed here.

- Claudio Benghi: just a matter of semantics, whatever we do with an ontology in construction, I would call that “BIM”; BIM is not necessarily equal to EXPRESS or IFC.

- **Geometry and model checking**
  - Pieter Pauwels: our group has also looked into geometry. There are various ways to represent geometry and take that on board in any semantic environment. There are semantically highly expressive ontologies, but there are also much simpler boundary representations, well-known text strings and so forth. It seems that the choice for any of these geometry representations depends a lot on the use case, with a strong impact coming from the requirement whether geometry should be editable or not. A lot of use cases in the construction industry require geometry to be editable (BIM authoring tools), and they require a lot of semantics to enable that. Other use cases require just viewing of geometry (BIM viewers; web viewers) and could thus rely on a simpler representation of geometry (BREP - WKT - …)
  - Claudio Benghi: We usually don’t build environments that support geometric model editing. But there might be added value in converting a number of alternative geometric formats into ontological solid formats for the purpose of verification of the quality of the model.
  - Matthias Weise: Geometry is probably not the best example for arguing for ontologies for model quality verification (e.g. clash detection); and this is very well done by existing tools. There is another type of model-checking, which is covered by mvdXML, and that looks to verify whether all required data is made available; and this could be supported by using ontologies.
  - Pieter Pauwels: there are indeed a lot of different kinds of model-checking. Besides the geometric model quality checks, which is indeed covered quite well by existing tools, there is the data hand-over validation, which is then covered usually with mvdXML; and third is checking a model for compliance with building regulations. That last one also often requires for a large part geometric algorithms, e.g. to compute the distance from a space to a door. And that is usually not the strength of semantic models.

4. Future meetings and open remarks (round table)

- A lot of content has been covered in the call. It would be good if the content streams a bit better towards publicly accessible online locations, so that anyone can go through the material at his own pace. A lot of examples and use cases have been made available already in the separate repositories underneath https://github.com/w3c-lbd-cg/. This could be further extended to capture also the more recent work above.
- Include prototypes and tools and use cases in the GIT repository

- The 6th LDAC Workshop will take place on 19 to 21 June in London. Everyone in the group is highly welcomed to send in contributions, which are max. 8 page papers. More information is available at http://linkedbuildingdata.net/ldac2018/.

Previous minutes

https://docs.google.com/document/d/147232O4omUv7aBOCw05IdV2DiGrtZTPF1ShNN6gTMj0/edit#

Next Calls

12 February 2018 (16:00 CET)
26 February 2018 (16:00 CET)
12 March 2018 (16:00 CET)
26 March 2018 (16:00 CET)
9 April 2018 (16:00 CET)
23 April 2018 (16:00 CET)