

Attendees:

- Anna Wagner (individual, affiliated with PROSTEP)
- Mathias Bonduel (KU Leuven and Neanex)
- Mads Holten Rasmussen [NIRAS / DTU]
- Antonio Gonzáles
- Christian Kreyenschmidt (Jade University)
- Katja Breitenfelder (Fraunhofer IBP / acatech)
- Franco Cheung (Birmingham City University)
- Joel Bender (Cornell University)
- Alex Donkers (Eindhoven University of Technology)
- Jeroen Werbrouck (UGent / RWTH Aachen)
- Philipp Hagedorn (Ruhr-University Bochum)
- Conor Shaw (University College Dublin)
- Edlira Vakaj (Birmingham City University)
- Diellza Elshani (ICD, University of Stuttgart)
- Seppo Törmä (Metropolia / Visualynk)
- Stig Brinck
- Rehel Zeleke Kebede
- Rasmus Lundsgaard Christian
- Hervé Pruvost
- Pierre Bourreau
- Odilo Schoch
- Kristine Marburger Jensen
- Tamás Ádám Kovács
- Anna Kirketerp Krusell
- Allan James
- Alexander Schlachter
- Hazar Karadag

Date and time

- 25/01/2022, Tuesday, 16:00-17:30@UTC/ 17:00-18:30@CET/ 08:00-09:30@PST/
00:00-01:30@CST

Agenda (tentative)

1. Introduction of new participants
2. IFC.js and Linked Building Data (Mads Holten Rasmussen & Antonio González Viegas):
[slides online](#)
3. Q&A

4. Open Discussion

Minutes

1. Introduction of new participants
 - a. [Kristine Marburger Jensen] TU Denmark, working together for thesis with Mads, subject on simulation data, room geometry and indoor climate; actively using LD
 - b. [Anna Kirketerp Krusell] also student at TU Denmark, working together with Kristine
 - c. [Allan James] works at Empa in Switzerland, participated in LDAC 2019 Lisbon, LD for energy modeling, new project will start soon working with energy planning and control systems, other project on infrastructure level using LD for digital twinning
 - d. [Alexander Schlachter] working with Mads in Denmark, wrote thesis with Mads on temporary construction elements, now actively using LD, presented paper at LDAC
 - e. [Rasmus Lundsgaard Christiansen] works with Mads, learning more on LD
 - f. All new members are asked to share pitches with the chairs
2. IFC.js and Linked Building Data
 - a. Meeting will be recorded > if not OK for someone, the participant can leave the meeting. Questions will be held at the end
 - b. [meeting recording started]
 - c. [Antonio] Introduction
 - i. Demo app hosted on github (lbd-hackers)
 - ii. IFC.js using IFC inside a browser
 - iii. Mads: LD, automatic rule checking, working at NIRAS
 - iv. Antonio: civil architect in Spain by study, got in software BIM company (Autility) after graduating, started to develop IFC.js as a project and development made speed
 - d. [Antonio] What is the IFC.js project
 - i. Open source library to work with IFC files on the web
 - ii. making BIM software is hard (worked with Revit API in the past) > only affordable for large companies, which result in proprietary, closed software. Different to other industries (e.g. car manufacturing, video game development)
 1. Consequences: high prices, slow development, software that does not meet the needs, poor documentation
 - iii. Open source library helping innovation, allows other players to skip the first steps
 - iv. IFC contains geometry of a building, properties > parsing is difficult, as it's an old format (technical debt). IFC schema is huge and not-user friendly documentation. If you want to create a new BIM application, you need data IO to start
 - v. IFC.js is based on three.js (wide application)

1. Create HTML canvas
 2. Open IFC
 3. Uses WASM = web assembly (parser based on C++ for efficiency, almost as fast as a native application)
- vi. Example: 20 line app based on IFC.js
1. Load IFC file from disk
 2. View IFC geometry, clipping planes
 3. Click building elements > on select: shows properties (direct and indirect) in browser console
- vii. Three layers in IFC.js
1. Parsing core in C++ (web-ifc): use IFC as an in-memory database, also allows making changes
 2. Applies web-ifc and uses three.js for 3D rendering (web-ifc-three)
 3. Basic BIM application with the library (web-ifc-viewer): ootb BIM application that is starting point for new applications
- e. [Antonio] Who's involved in the IFC.js project?
- i. Tom: BimCollab company
 - ii. Harry: Parametricals company in UK
 - iii. Antonio: payed by Autility company > develops features for his company, but publishes it open source for others. Result is that the project (less than 1y old) goes really fast
 - iv. Open to more collaborations: collaborators get decision-making in the project
- f. [Antonio] Some parts of the library still under development > next spring.
Tutorials available
- g. [Antonio] BIM tools anywhere on the web
- i. Google chrome extension for BIM app inside Twitter (iframe HTML element). Anyone with the extension will be able to see the BIM data
 - ii. BIM and GIS example (made in less than 48h): used IFC.js for BIM and x for GIS
 1. BIM models are parsed in the browser > serverless apps
 2. Source is open: parametricals/citylite
 - iii. Desktop application with Electron with IFC.js > even faster loading of large BIM models
- h. [Antonio] Sustainability
- i. Companies participate: they make a product, give their code back to the library and get decision-making benefits (besides others). Contributions through Open Collective => BIM programming courses (quick start, advanced users). Patreon: people making requests can propose a bounty
- i. [Mads] IFC-LBD converter based on IFC.js
- i. Parse IFC data in browser to LD
 - ii. Apply as CLI tool (through NPM) or with web-ifc-three
 1. Demo of CLI tool > output is JSON-LD serialization of RDF graph

- 2. Use in app: import web-ifc and ifc-lbd
 - iii. Ontologies supported: BOT, products, FSO
 - 1. Discussion with Seppo Torma and Jyrki Oraskari > will join the project
 - iv. Written in typescript > stable and easy to extend
 - v. Challenges
 - 1. Generating relations
 - 2. Post-processing needed in some cases: with SPARQL quite easy
 - a. Applied N3.js store and Comunica query engine => serialize with N3.js stream writer
 - b. Comunica query engine works in javascript > possible to create extensions. E.g. GeoSPARQL extension for calculating distances => open source project
 - vi. Demo application
 - 1. SPARQL querying on loaded IFC file, next step is highlighting based on queries
 - vii. Slides
 - 1. https://lbd-hackers.github.io/slides/20220125_IFCjs_vs_LBD.html
 - 2. Discord channel of IFC.js: <https://discord.com/invite/FXfyR4XrKT>
 - viii. [recording has stopped]
3. Discussion/Q&A
- a. [Mathias] applied RDF.js specification in the IFC-LBD converter? [Mads] quick hack, applied libraries (N3.js, Comunica) implement RDF.js. Next steps are properties
 - b. [Mathias] support in IFC.js for geometry analysis on the loaded IFC? [Antonio] explicit content is always available after the parsing, but implicit knowledge derived from the geometry is not. Currently no functions in the IFC.js library to extract this, but the three.js library functions can be used (e.g. centerpoint, bounding box, etc). The conversion results at the moment in one large mesh with parts of that mesh corresponding to individual building elements
 - c. [Philippe Hagedorn] which IFC versions supported? [Antonio] IFC2x3 and IFC4 for buildings. Now working on new IFC4 for infrastructure
 - d. [Jeroen Werbrouck] are the conversions the same over time? Or do you need to store the RDF file to later enrich it? [Mads] URIs are based on the global ID of the IFC elements and URL encoded them. Intermediate relationships have URIs based on space boundaries. [Jeroen] possible to keep IFC as original source of truth, so you don't need to store the triples per se. [Antonio] IFC.js can already write back to IFC, but is still cumbersome
 - e. [Joel Bender] what is the MEP model in the tests of the IFC-LBD converter project? [Mads] small hydraulic system [Joel] want to move to fault detection use cases. Add another layer on building automation systems

- f. [Pierre Bourreau] how easy is it to add IFC.js to a page? [Antonio] returns a JS object. If there's a reference to another element, you'll see it nested in the object by the API
- g. [Pierre Bourreau] change a property for all windows [Antonio] writing requires more knowledge of IFC (implicit entities). Will restructure this
- h. [Pierre Bourreau] What are the future projects regarding energy simulations [Antonio] one of the main use cases of BIM. Have been talking with developers of ladybugs tools. They use internal format for Honeybee (energy+) application. Making a bridge between Ladybugs and IFC.js will start (hopefully) next week
- i. [Mathias] what geometry types from IFC are supported by IFC.js? (meshes, BREP, NURBS, CSG) [Antonio] BREP as most common geometry type, CSG is partially supported (some cases are really difficult to compute correctly). NURBS might get on the agenda (geometry from Rhinoceros CAD, geometry from infrastructure-oriented CAD)
- j. [Diellza Elshani] IFC.js relies on a properly generated IFC from a proprietary tool? Possible to create IFC file from zero? [Antonio] possible to create IFC, but is cumbersome (similar to adding/editing properties). Will become easier over 1-2 months. [Mathias] BlenderBIM? [Antonio] IFC modeling application idea
- k. [Anna] what are the next research steps, Mads? Properties, OPM? [Mads] worked a bit with OMG (geometry). Clash detection. Looking into Draco compression for meshes (faster scene navigation). Call for participation in the [LBD hackers github group](#), less formal. Ideas for damages (DOT). [Mathias] creating LBD graph with IFC geometry and serialize as regular IFC file?

Next Call

- 08/02/2022, Tuesday, 16:00-17:30@UTC/ 17:00-18:30@CET/ 08:00-09:30@PST/ 00:00-01:30@CST

We are interested in getting suggestions from the community about potential agenda items for the following calls. Please send your suggestions to public-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>