

The logo for BIM4Ren features the text 'BIM4Ren' in a teal, sans-serif font. The number '4' is highlighted in yellow. The text is overlaid on a network diagram consisting of various colored nodes (teal, yellow, red, black, grey) connected by thin grey lines.

# BIM4Ren

## Lessons Learned from Designing and Using bcfOWL

Oliver Schulz, Jyrki Oraskari, Jakob Beetz  
Design Computation  
RWTH Aachen University

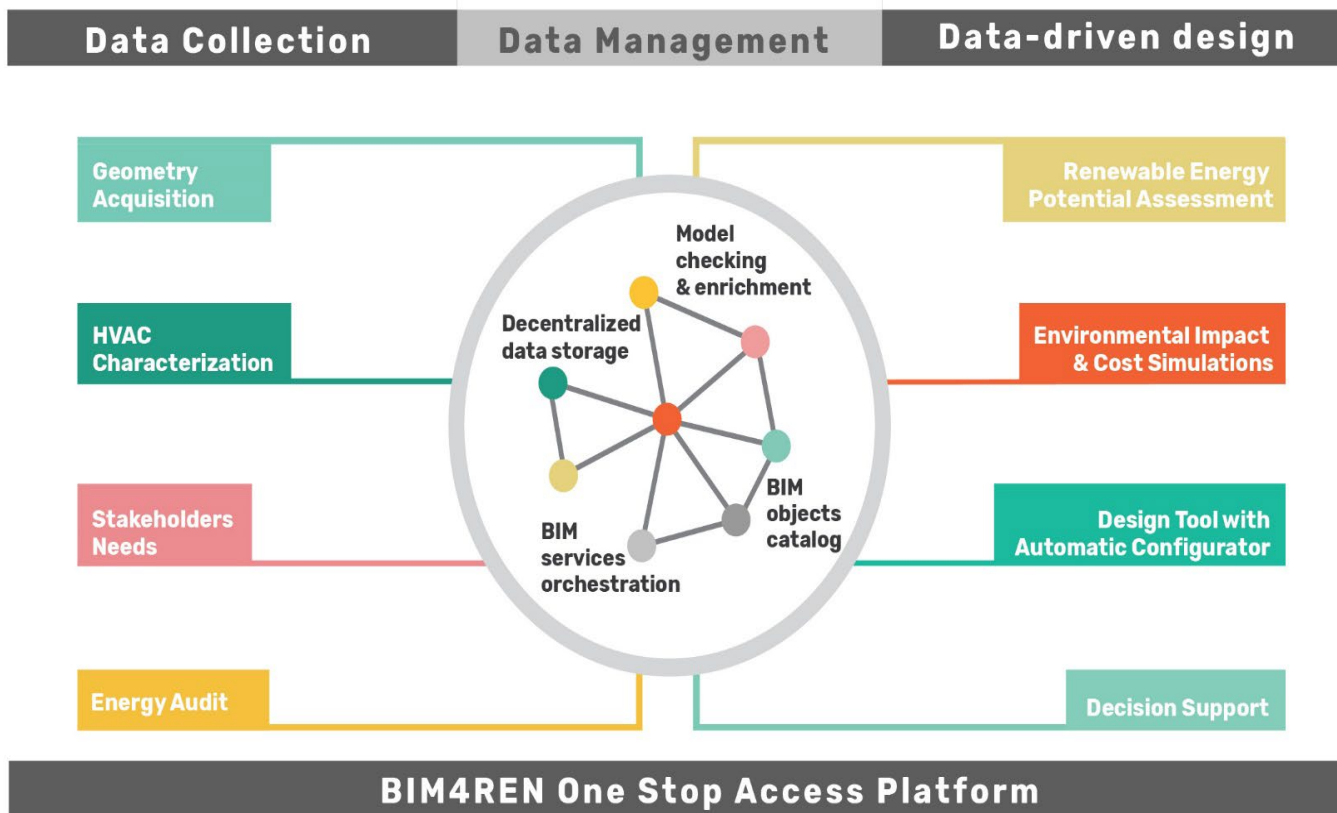
LDAC 2023 – Matera – 15/06/2023



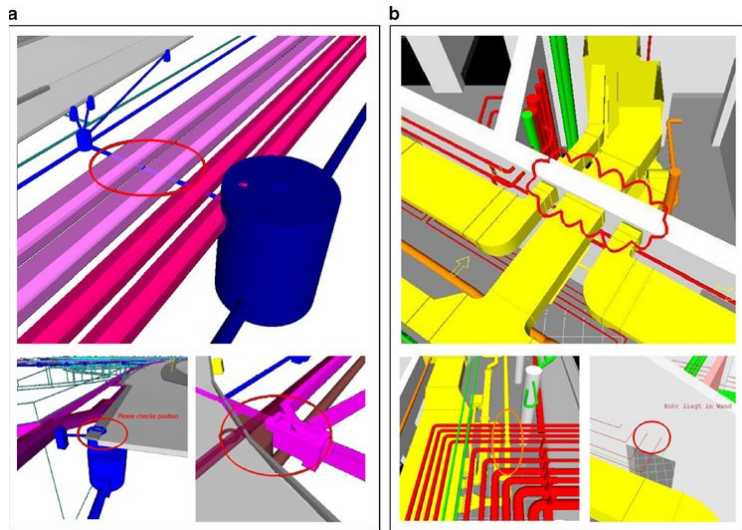
This project has received funding from the H2020  
programme under Grant Agreement No. 820773

# Introduction

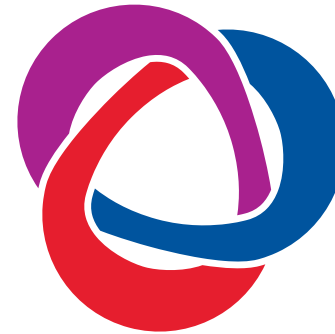
- Online framework for renovation-oriented BIM (H2020)
- Interconnecting heterogeneous information sources and tools represented as services
- Toolchains for real-world renovation scenarios
- 23 partners across Europe
- Practitioners, Developers, Researchers, SMEs
- One Stop Access Platform (Common Data Environment)



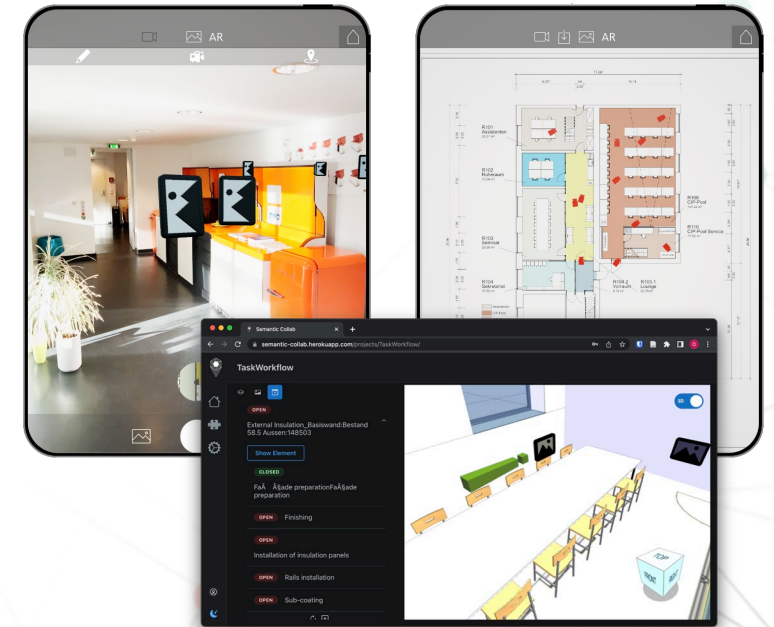
# Introduction



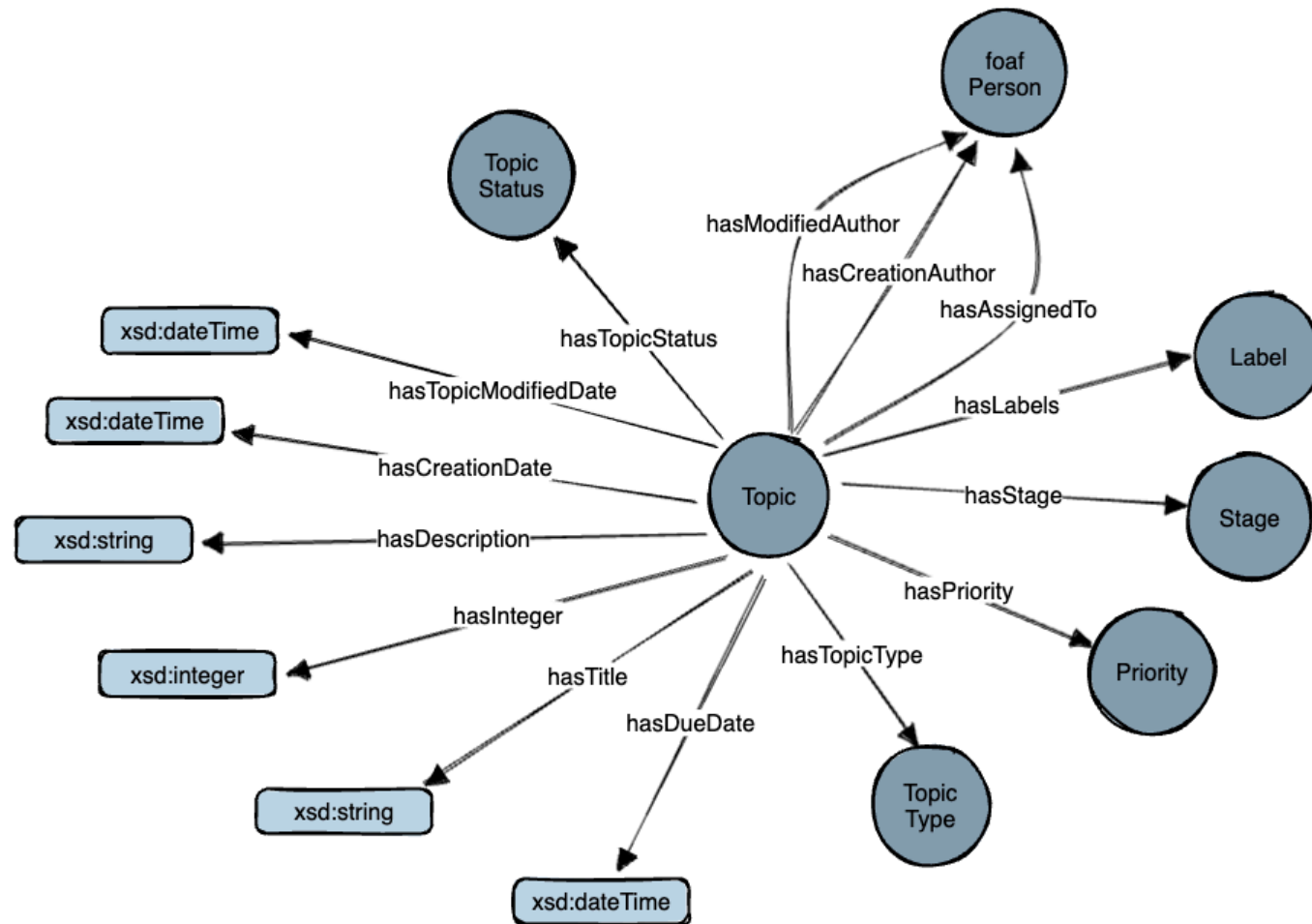
Borrmann, König, Koch, Beetz 2015



Source: buildingSMART GitHub  
(<https://github.com/buildingSMART/BCF-XML/>)



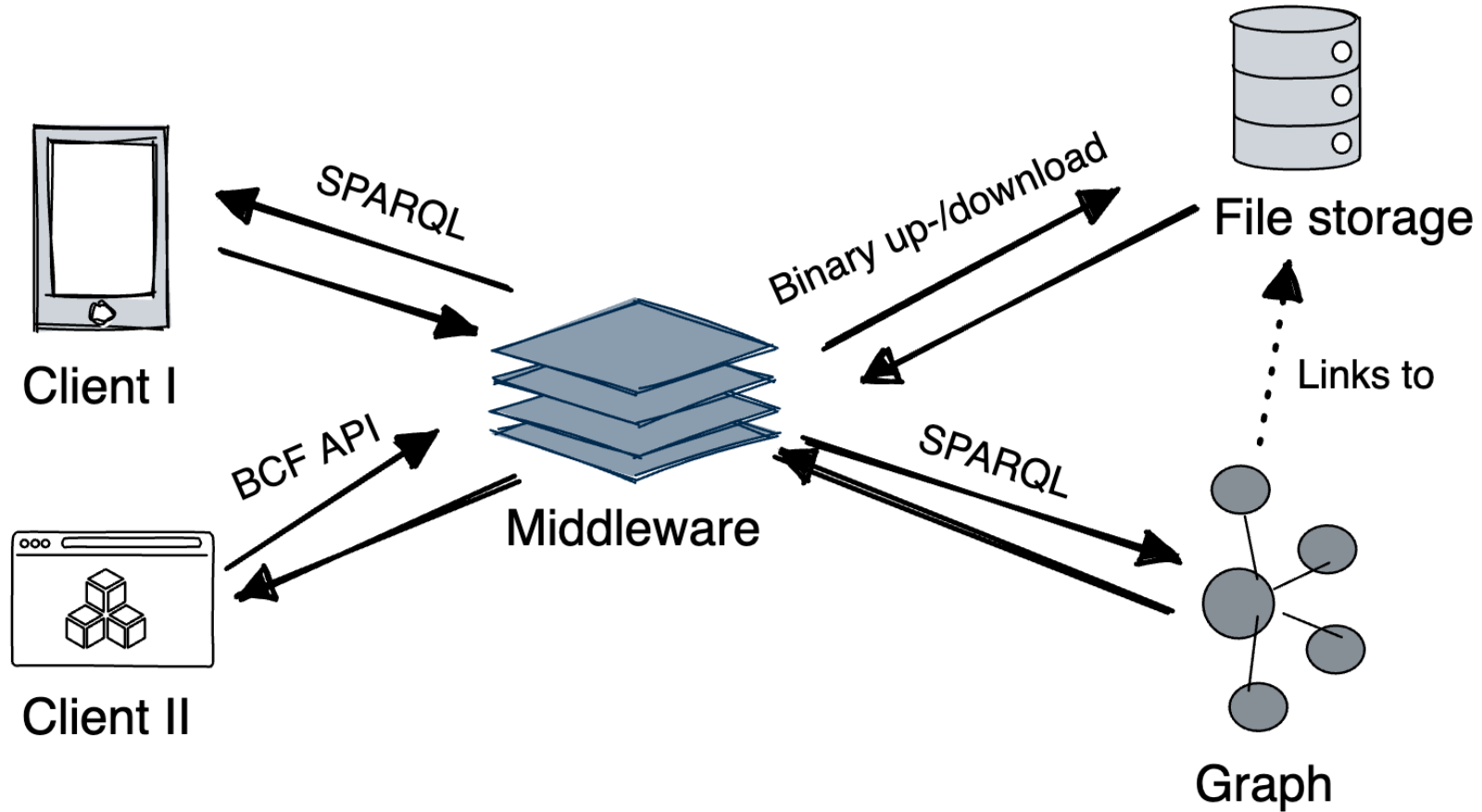
# bcfOWL



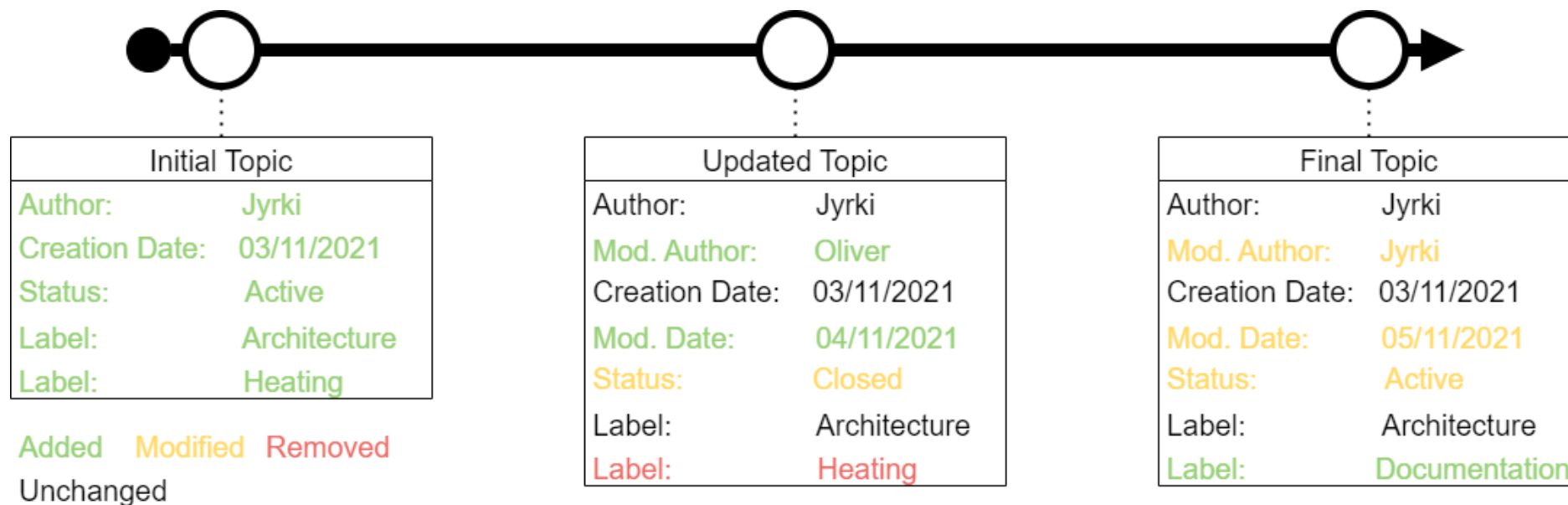
Schulz, Oraskari, Beetz 2021



# bcfOWL Server

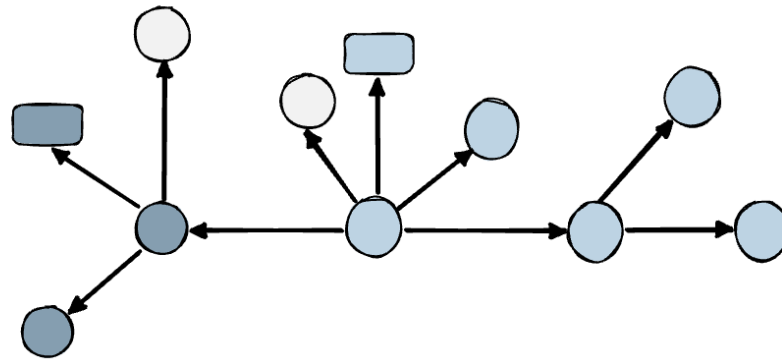
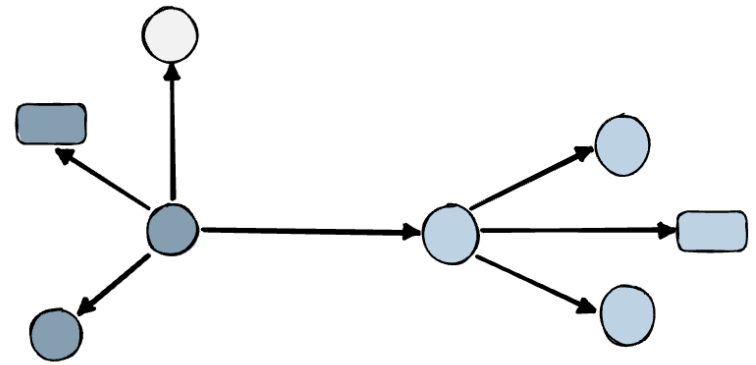
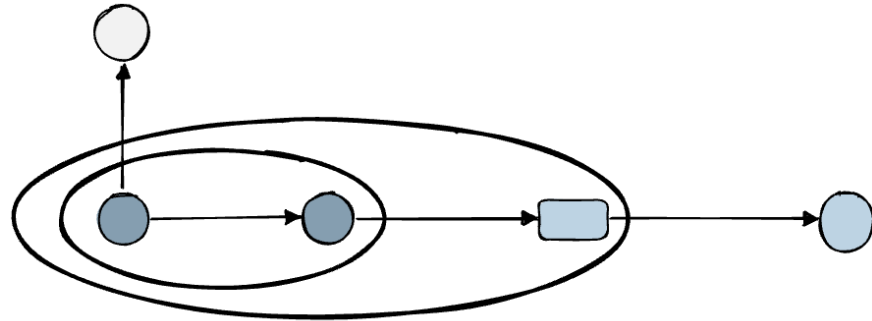


# Lessons Learned: Versioning



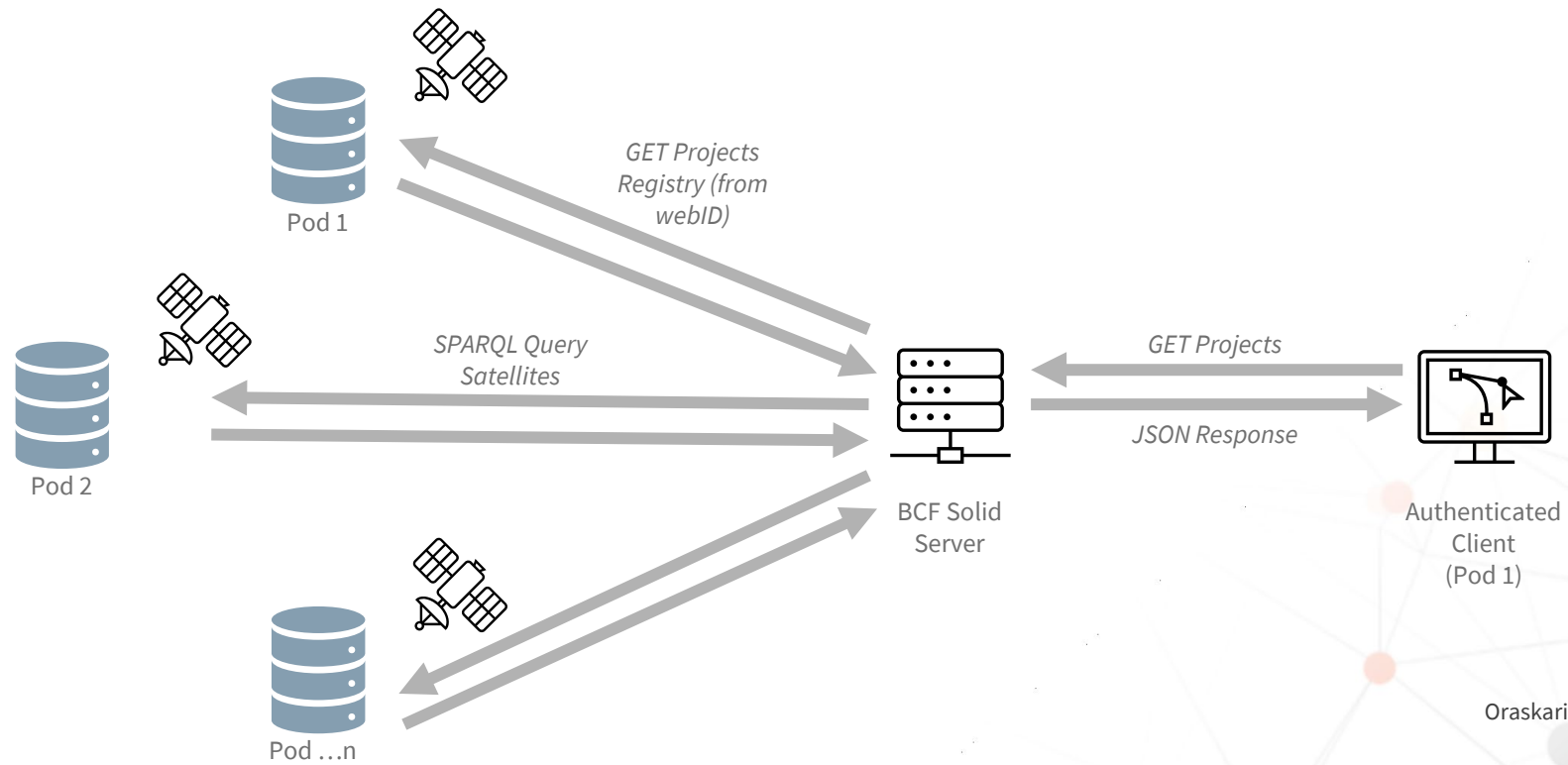
Oraskari, Schulz, Beetz 2022

# Lessons Learned: Versioning



Oraskari, Schulz, Beetz 2022

# Lessons Learned: Federated (Container) Environment

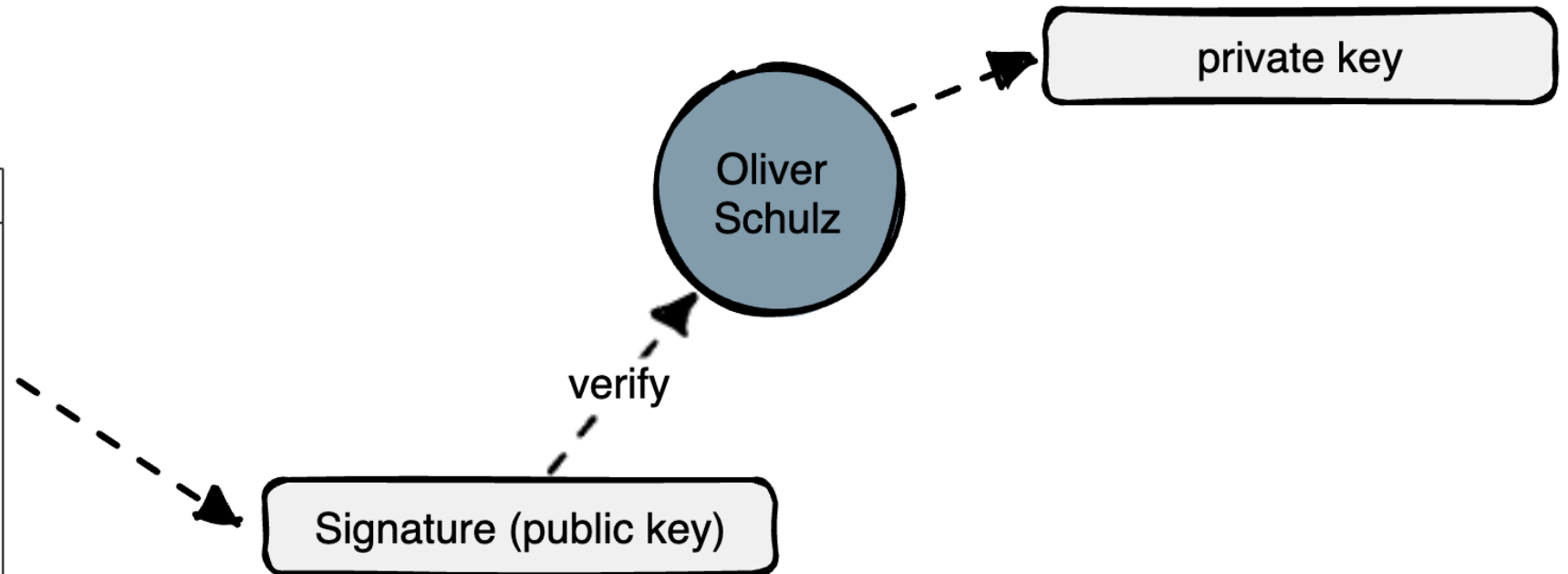


Oraskari, Schulz, Werbrouck, Beetz 2022

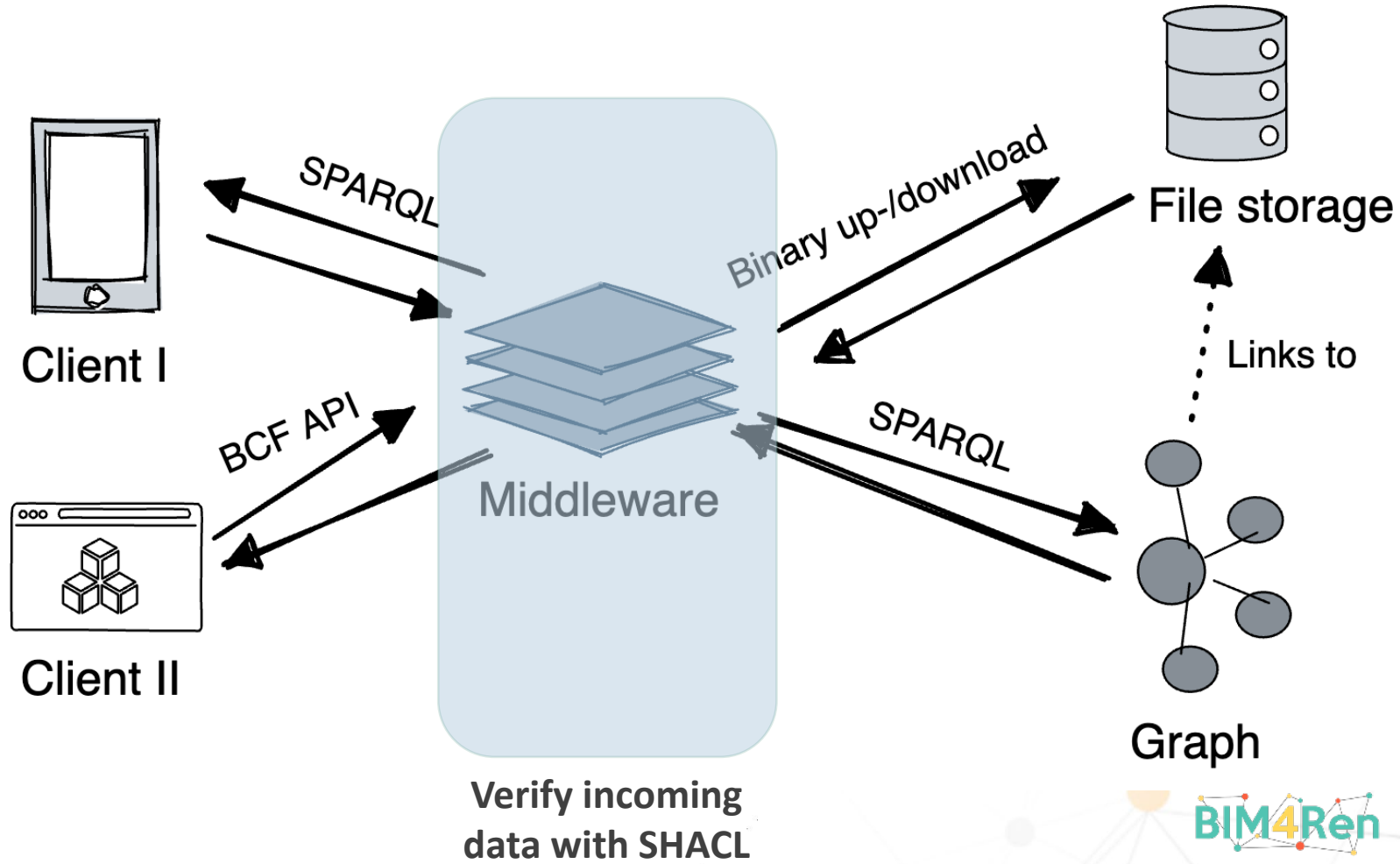


# Lessons Learned: Signing

| Updated Topic  |              |
|----------------|--------------|
| Author:        | Jyrki        |
| Mod. Author:   | Oliver       |
| Creation Date: | 03/11/2021   |
| Mod. Date:     | 04/11/2021   |
| Status:        | Closed       |
| Label:         | Architecture |
| Label:         | Heating      |



# Lessons Learned: Validation

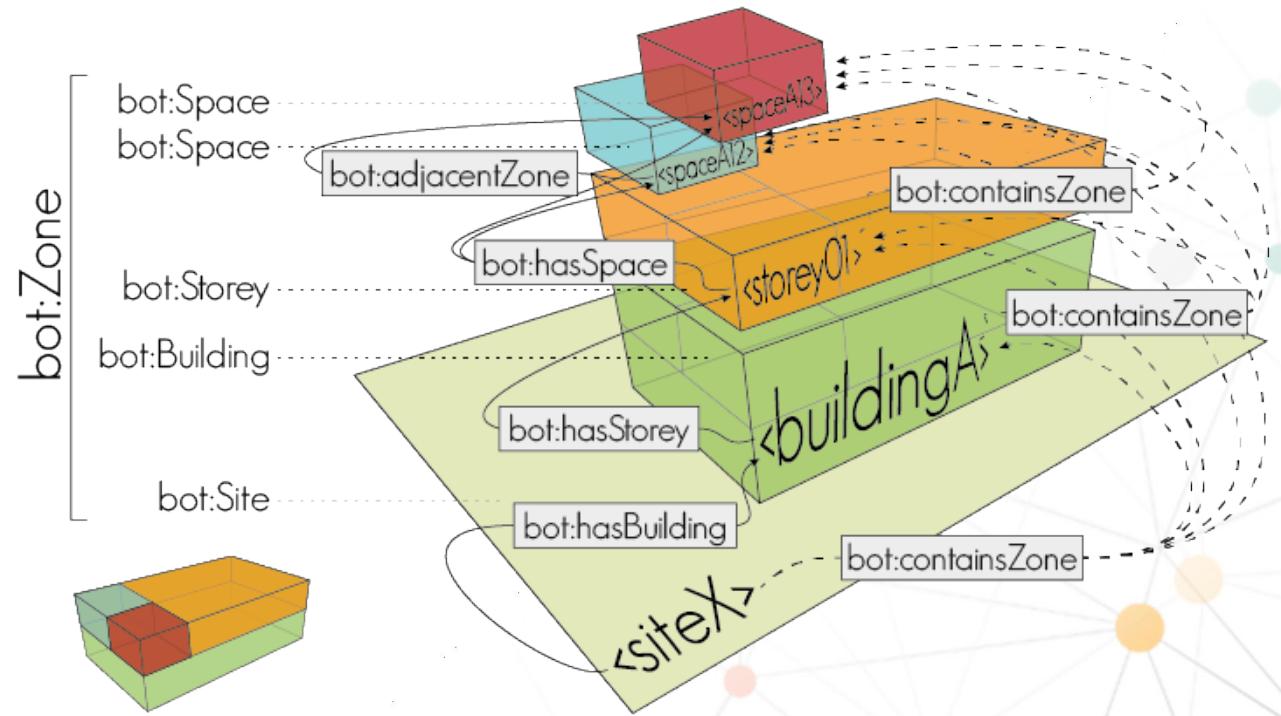


# Lessons Learned: Generic Framework

Ontology Design Patterns (ODPs)

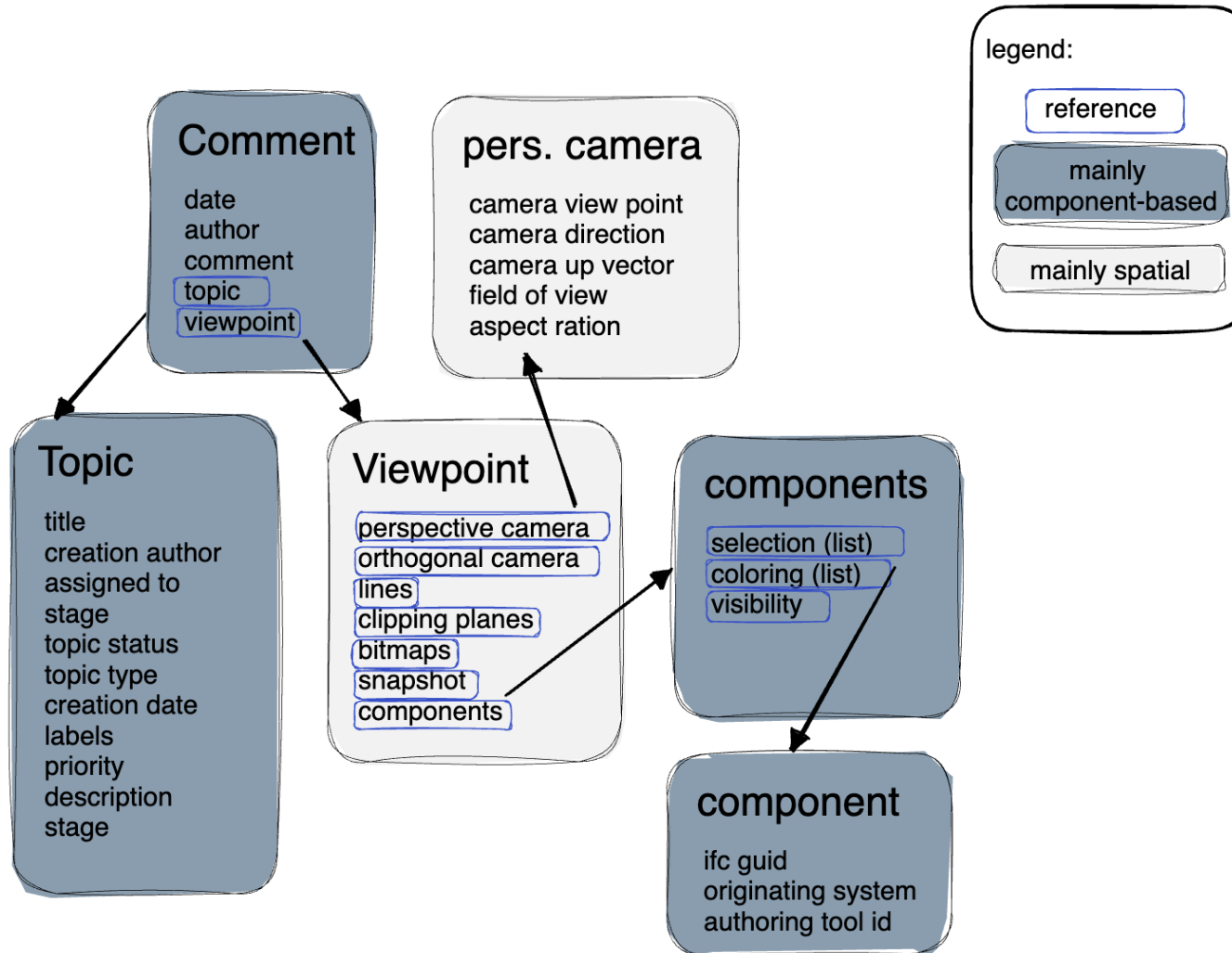
- **The reusability of ontologies is a big challenge.**
- **It is often easier to create a new ontology than to reuse existing ones**
  - (They simply don't quite fit)
- **Considering reusability right from the design stage**
- **They should be small and modular**

A. Gangemi, V. Presutti 2009



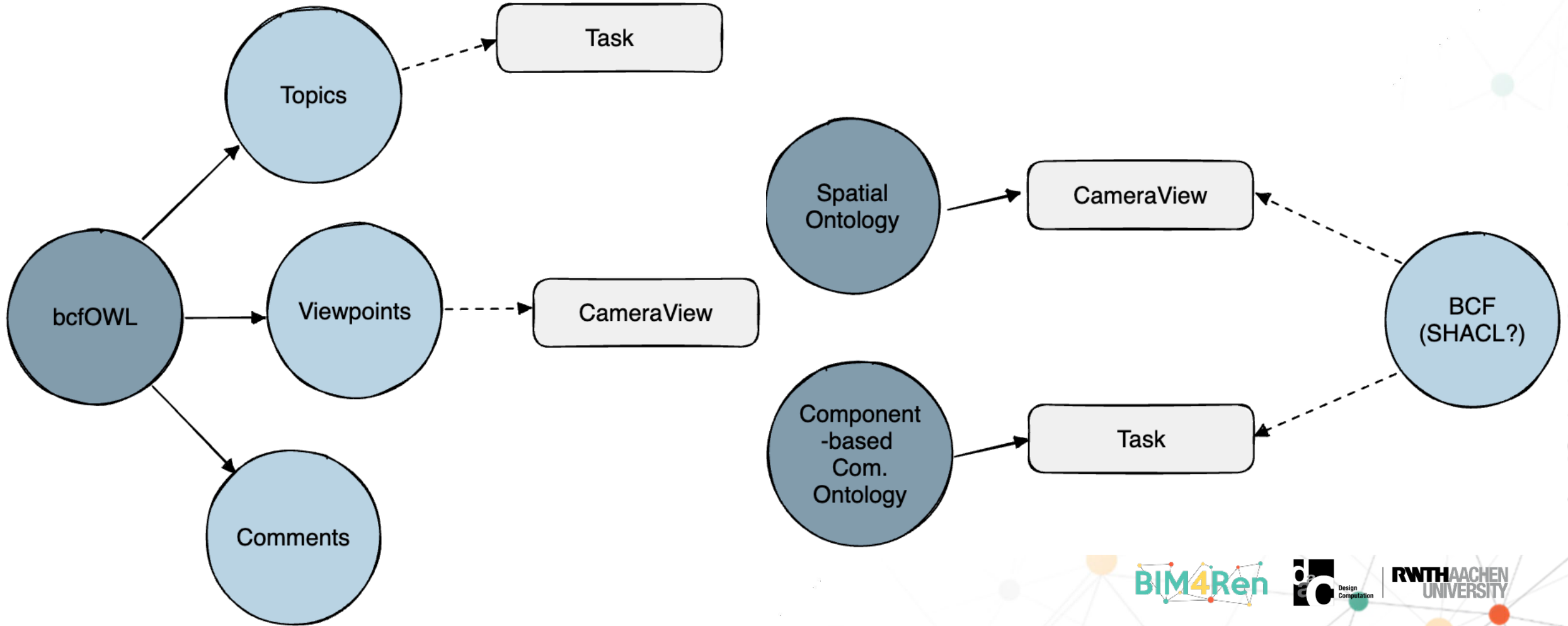
Rasmussen et al. 2019

# Lessons Learned: Generic Framework



Schulz, Oraskari, Beetz 2023 (in print)

# Lessons Learned: Generic Framework



# Conclusion

- Consider Versioning from the beginning.
- Enable Container Environments.
- Establish trust via signing.
- Less focus on OWL and more on SHACL.
- Establish generic concepts first ( e.g. ODPs), then map to a specific schema.
  - Try to express the ideas of the standard, not copy the standard

**These results are not universally applicable!**



# References

- A. Borrmann, M. König, C. Koch, and J. Beetz, eds. *Building Information Modeling: technologische Grundlagen und industrielle Praxis*. VDI-Buch. Wiesbaden: Springer Verlag, 2015.
- O. Schulz, J. Oraskari, J. Beetz, bcfOWL: A BIM collaboration ontology, in: Proceedings of the 9th Linked Data in Architecture and Construction Workshop, Luxembourg, 2021, pp. 1–12. [https://linkedbuildingdata.net/ldac2021/files/papers/CIB\\_W78\\_2021\\_paper\\_122.pdf](https://linkedbuildingdata.net/ldac2021/files/papers/CIB_W78_2021_paper_122.pdf)
- J. Oraskari, O. Schulz, J. Beetz, Towards describing version history of BCF data in the Semantic Web, in: Proceedings of the 10th Linked Data in Architecture and Construction Workshop Co-Located with 19th European Semantic Web Conference (ESWC 2022), Hersonissos, Greece, 2022, pp. 87–98. <https://ceur-ws.org/Vol-3213/paper08.pdf>
- J. Oraskari, O. Schulz, J. Werbrouck, J. Beetz, Enabling Federated Interoperable Issue Management in a Building and Construction Sector, in: Proceedings of the 29th EG-ICE International Workshop on Intelligent Computing in Engineering, EG-ICE, 2022, pp. 92–101. doi:10.7146/aui.455.c200, <https://ebooks.au.dk/aui/catalog/view/455/312/1848-2>
- A. Gangemi, V. Presutti, Ontology Design Patterns, in: Handbook on Ontologies, 2009, pp. 221–243. doi:10.1007/978-3-540-92673-3\_10
- M. H. Rasmussen, M. Lefrançois, G. F. Schneider, P. Pauwels, BOT: The building topology ontology of the W3C linked building data group, *Semantic Web* 12 (2019) 143–161. doi:10.3233/SW-200385, <https://research.tue.nl/en/publications/bot-the-building-topology-ontology-of-the-w3c-linked-building-dat>





thank you for your  
attention

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<http://bim4ren.eu/>



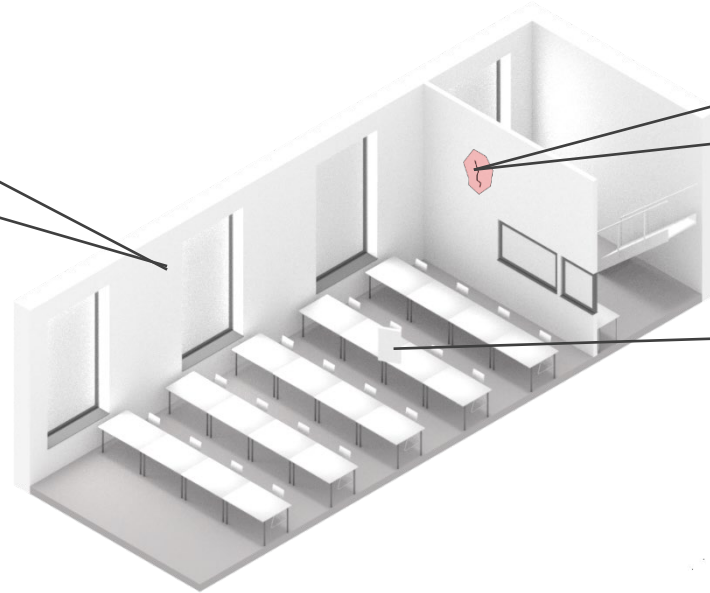
[@bim4ren](https://twitter.com/bim4ren)



# bcfOWL Linked Data

In the AEC Domain

ifcOWL  
Building Topology  
Ontology



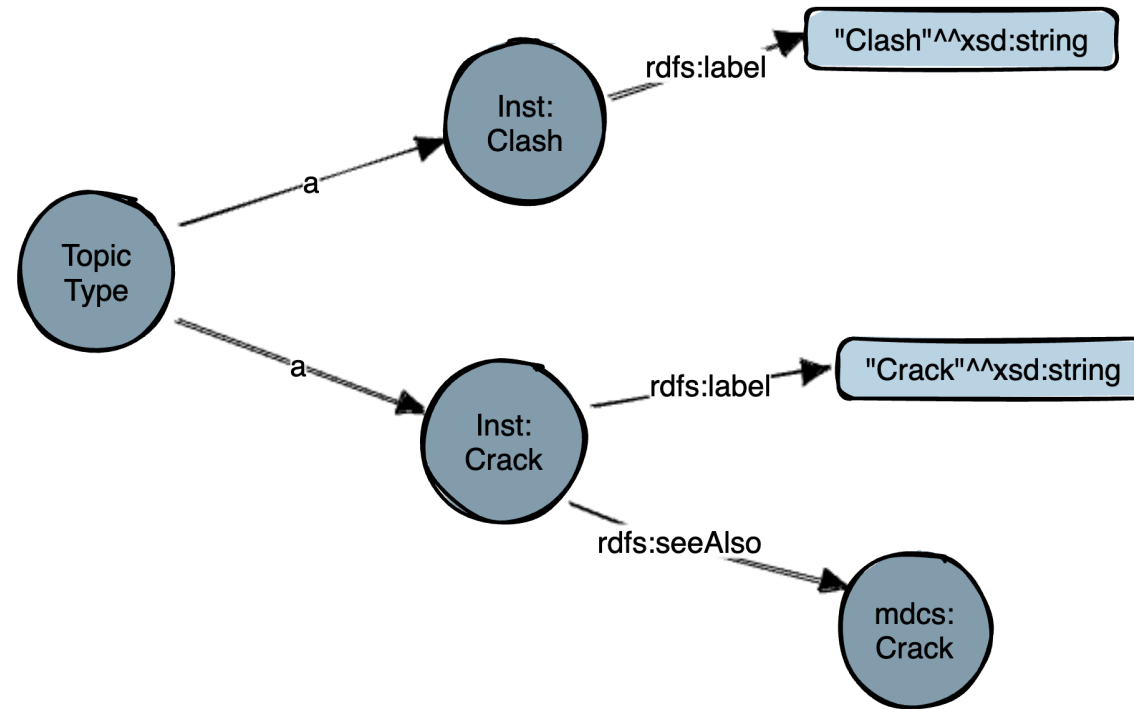
MDCS damage atlas  
Ontology  
Damage Topology  
Ontology

bcfOWL\*

Schulz, Oraskari, Beetz 2021

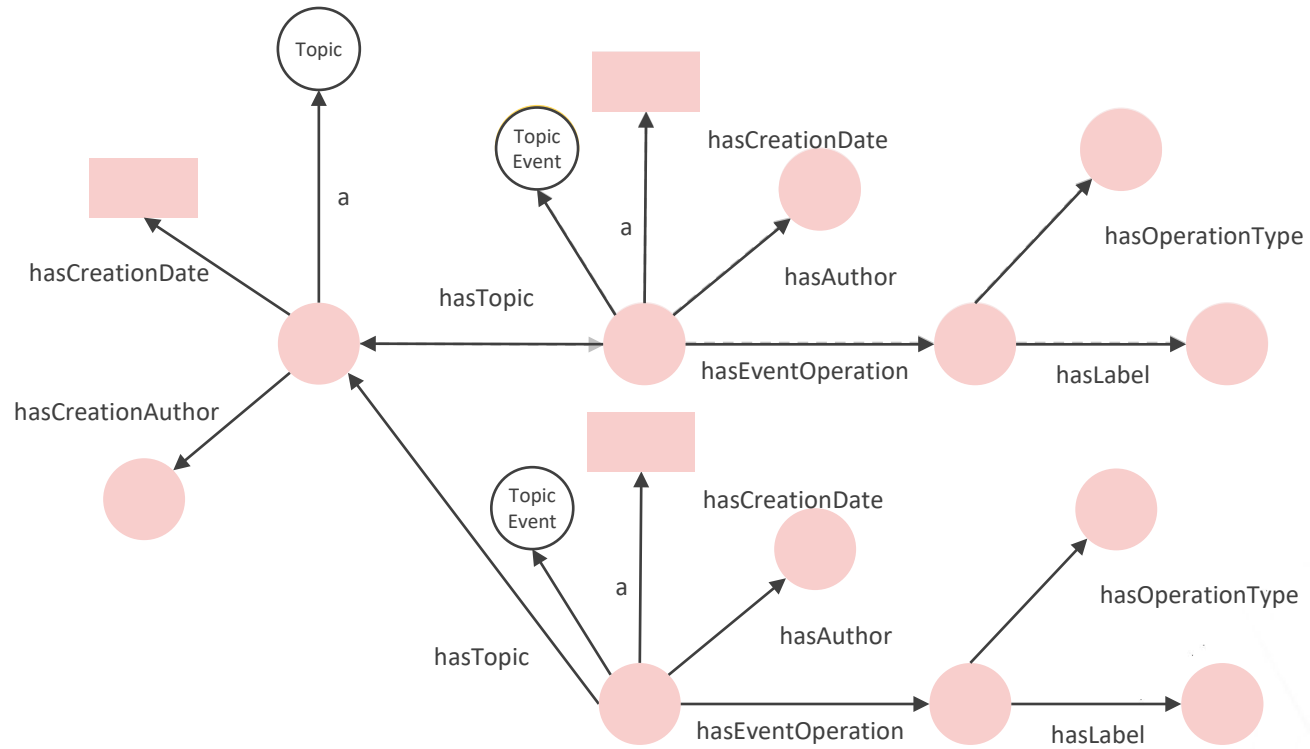


# bcfOWL Extensions

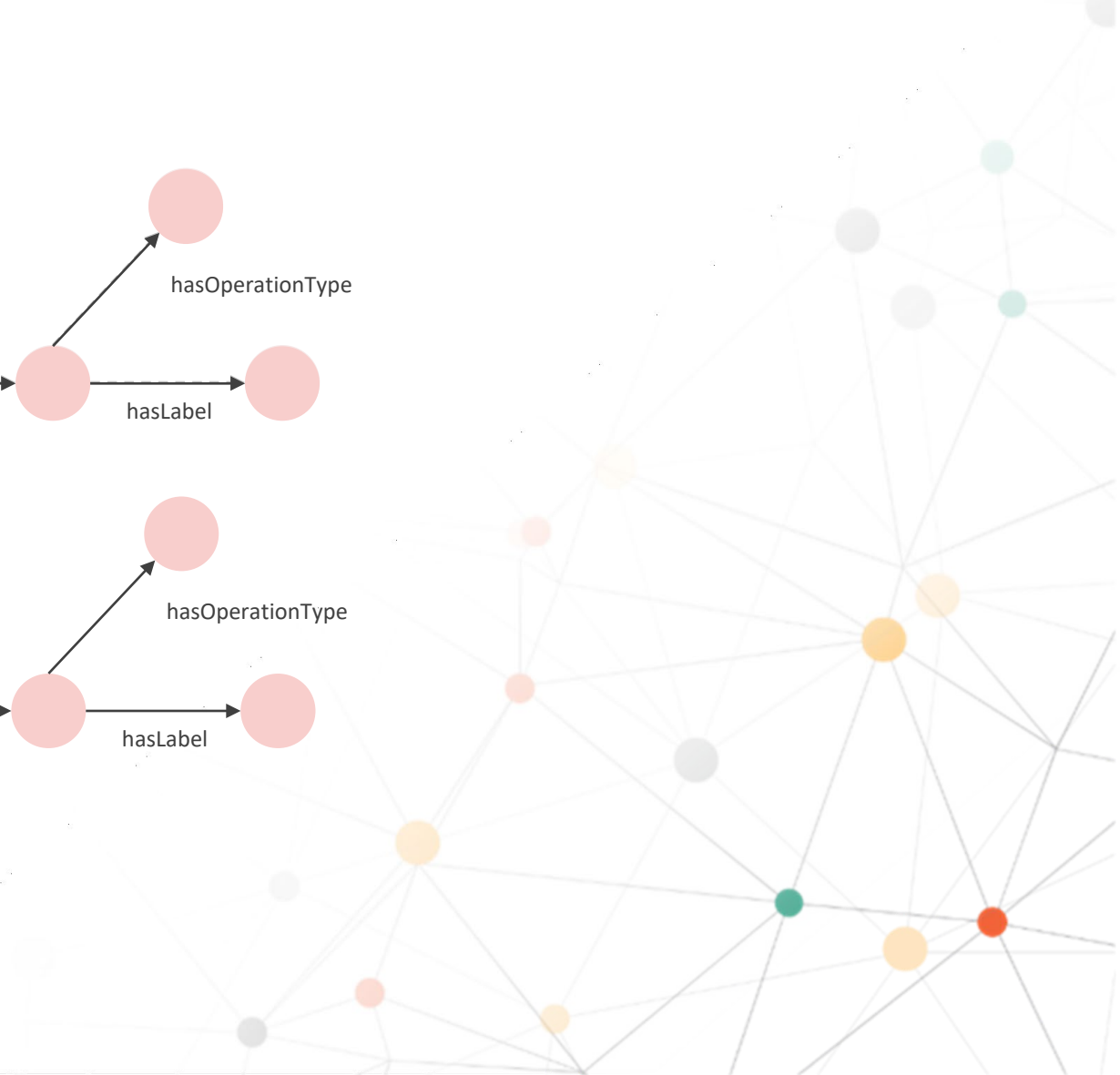


Schulz, Oraskari, Beetz 2021

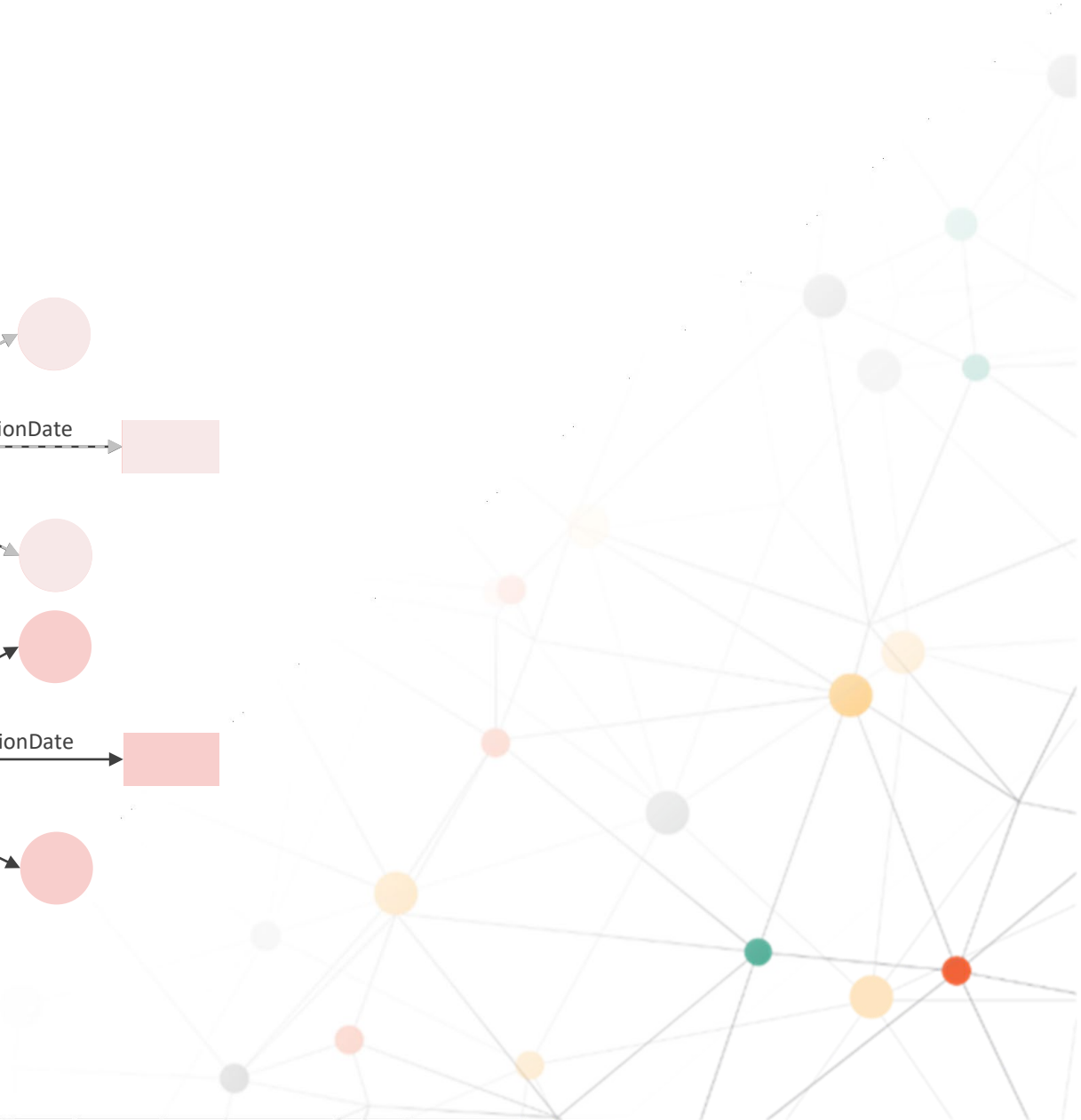
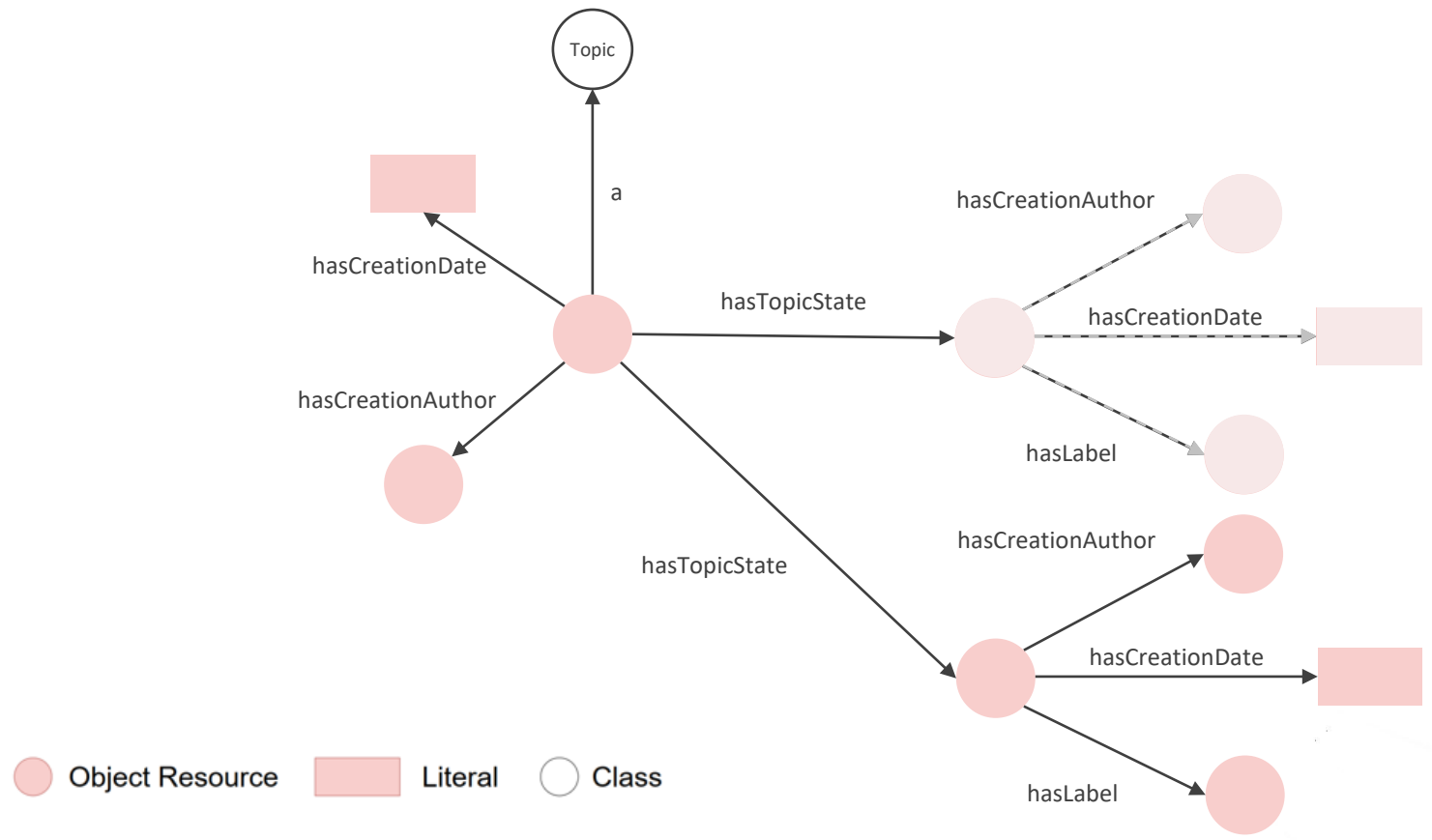
# Events



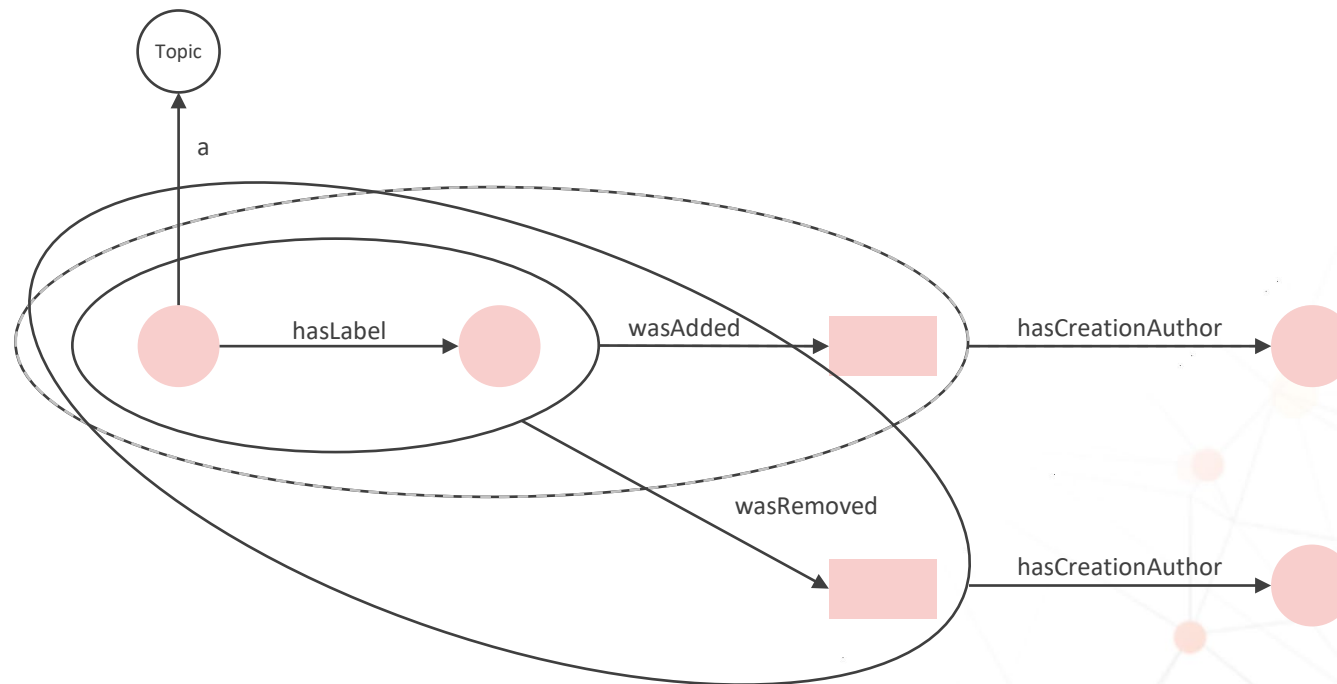
● Object Resource    ■ Literal    ○ Class



# States



# Statements of Statements



● Object Resource    ■ Literal    ○ Class

# Object Property Annotations

