bcfOWL:
A BIM collaboration ontology

12. October 2021

LDAC 2021
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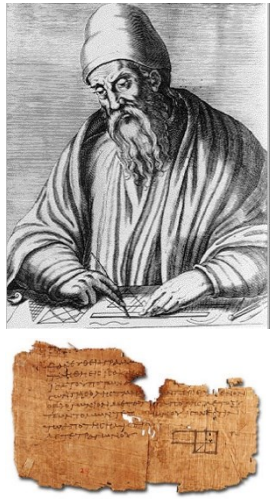
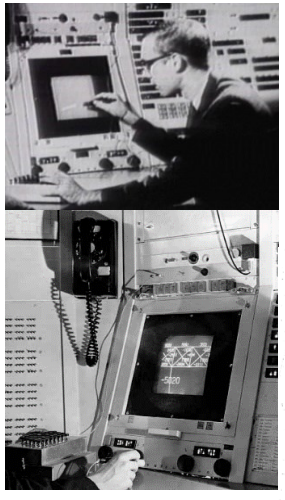
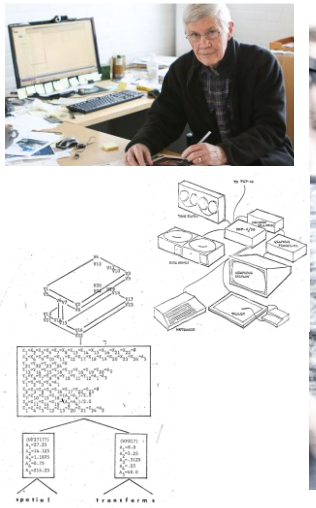


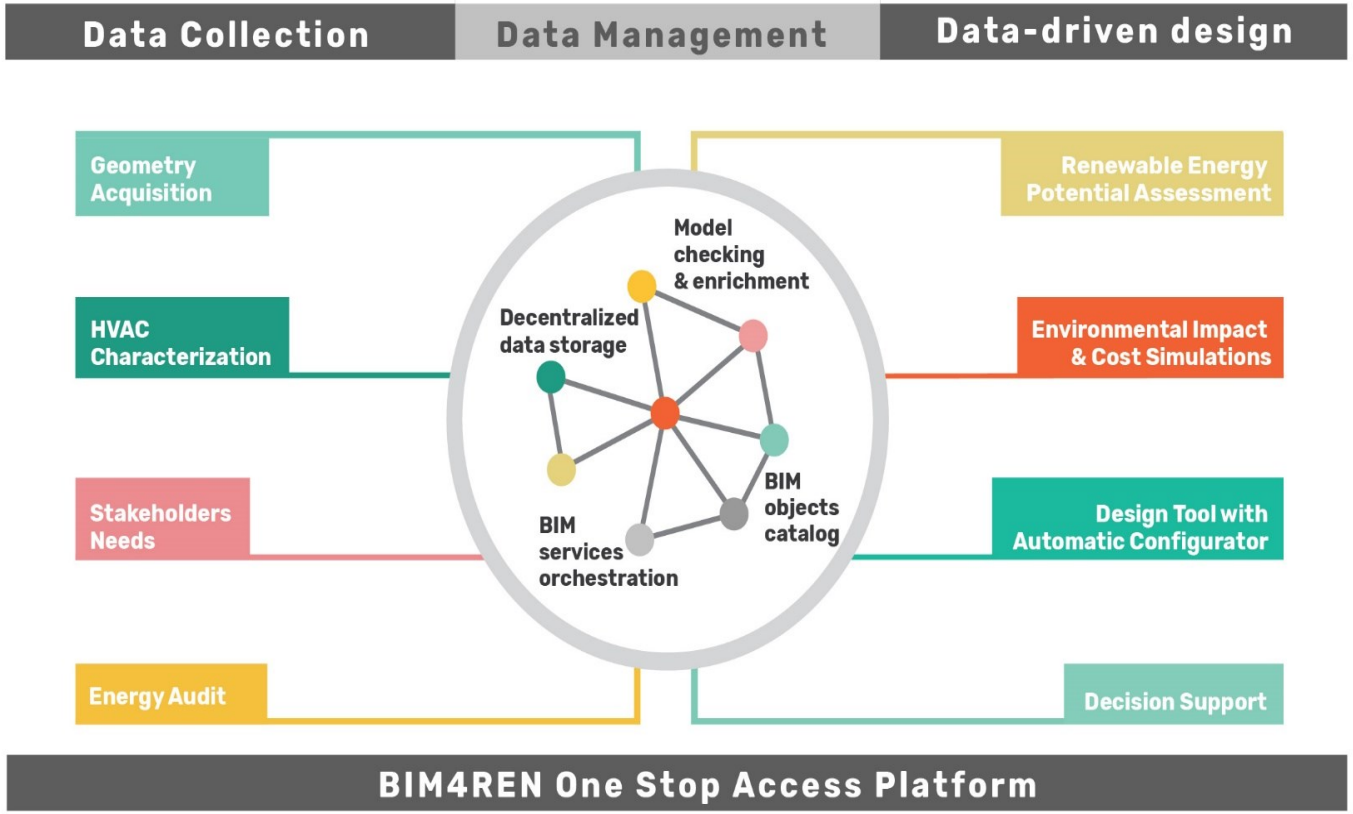

Quelle: Deutsche Fotothek



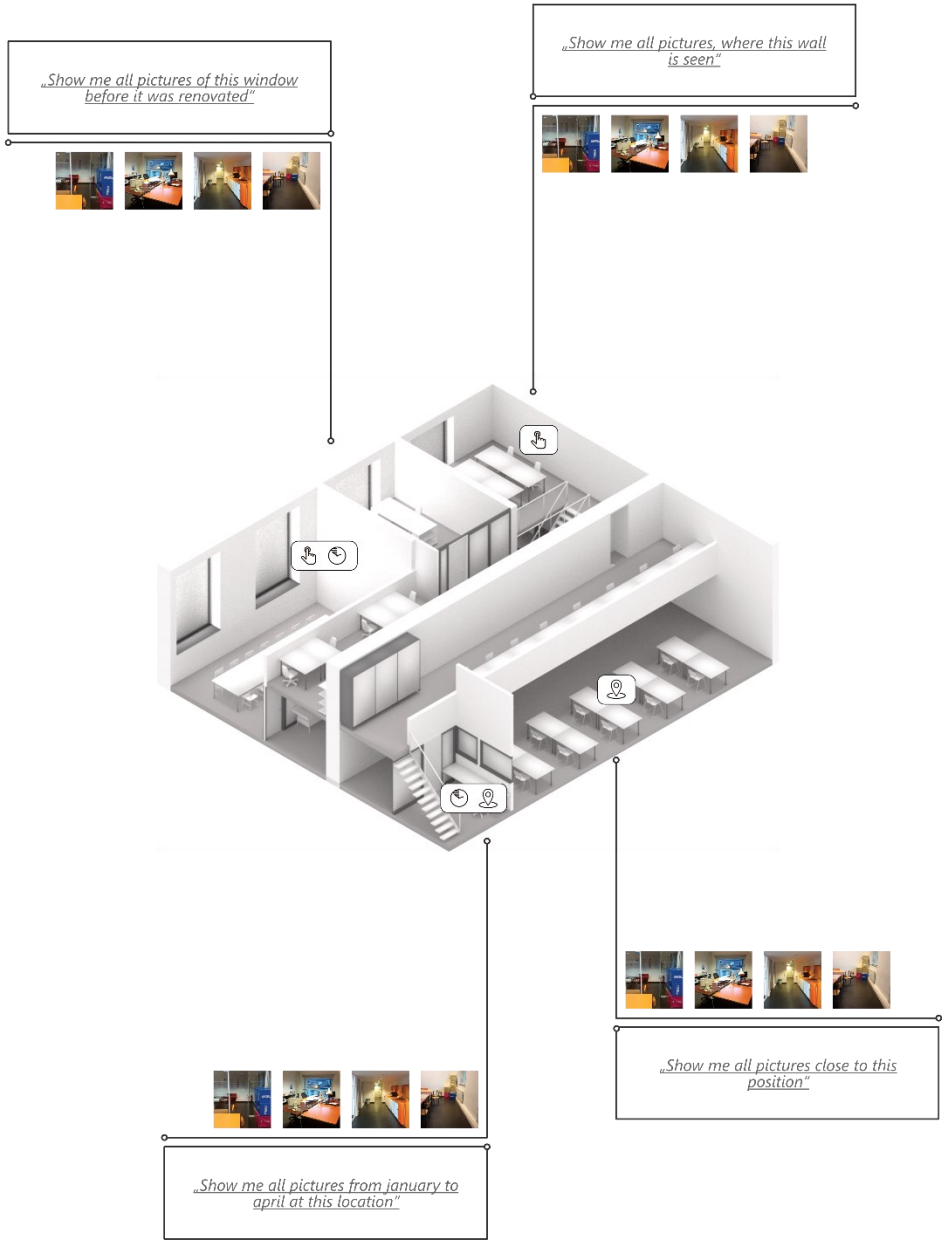


BIM for Renovation: BIM4Ren

- 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)

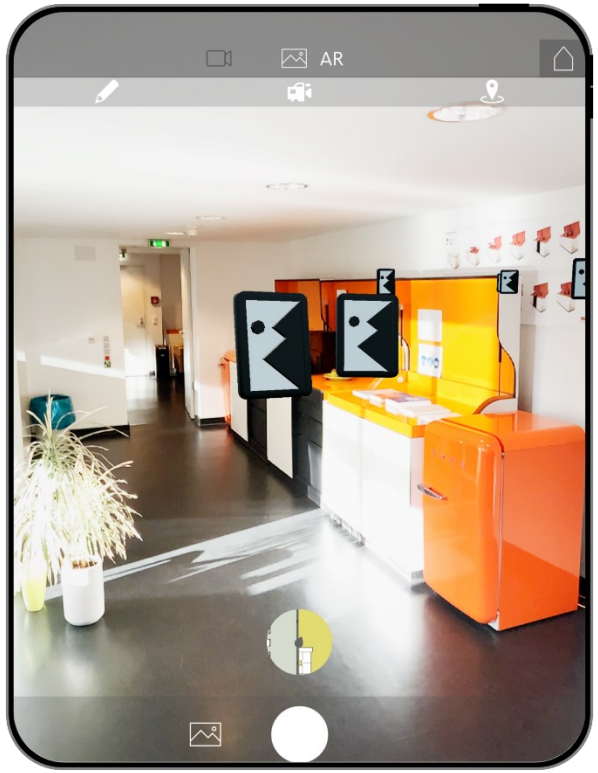


Introduction



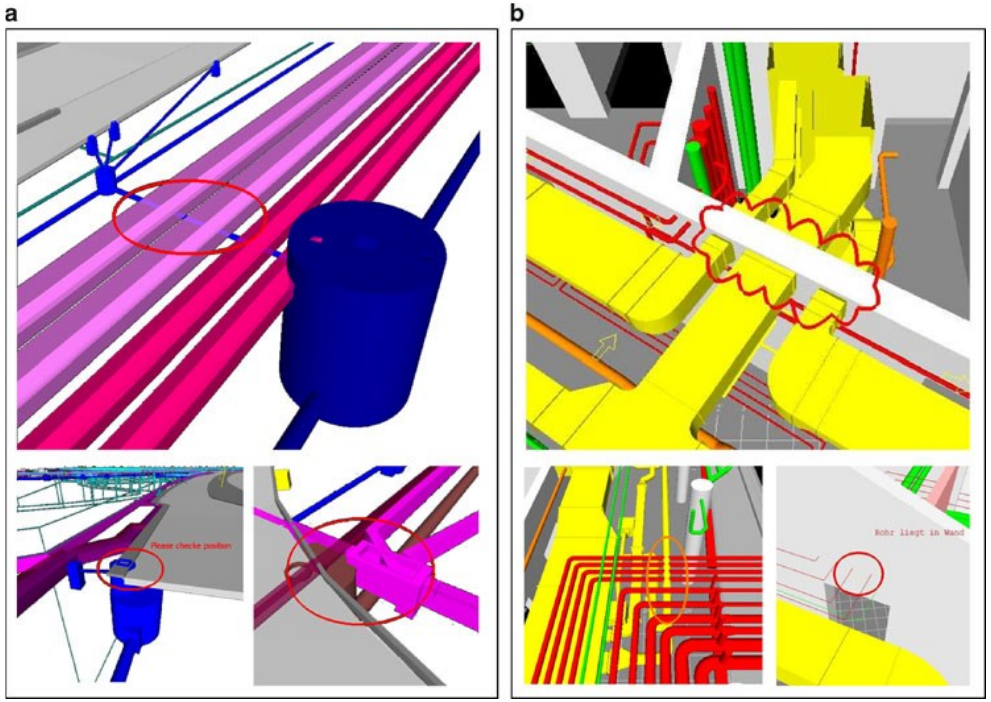
Source: Schulz and Beetz 2019

Introduction



Introduction

BIM Collaboration Format



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

Source : Borrmann, König, Koch, Beetz 2015

BIM Collaboration Format

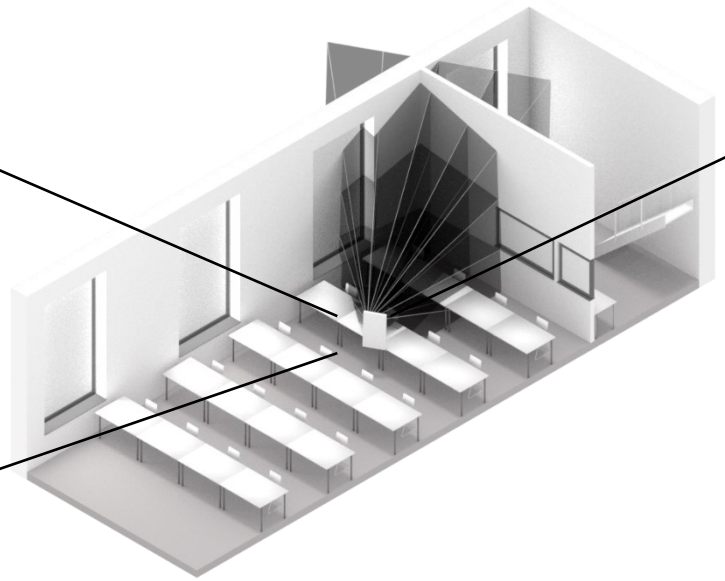
<Title>
BCF XML
</Title>

http://bcf.api

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

BIM Collaboration Format

Topic
Issue

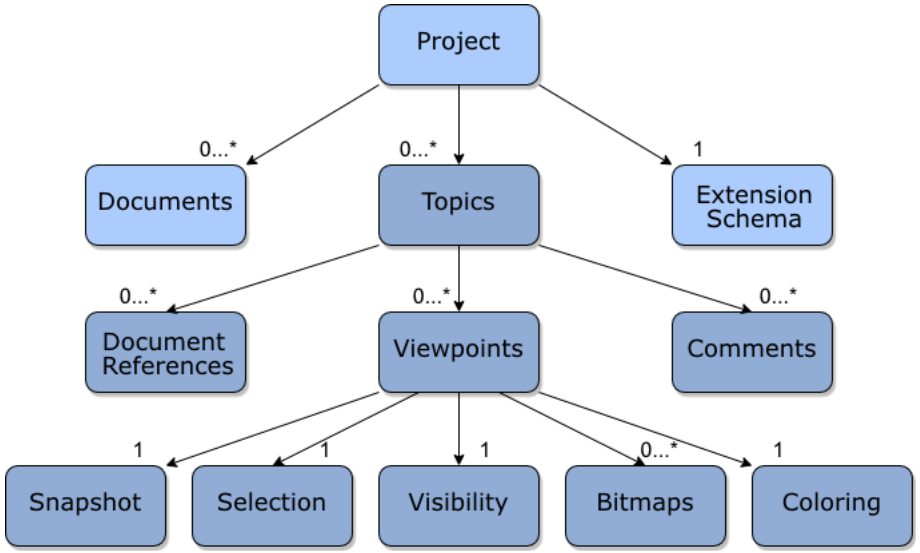


Viewpoint
Camera

Comment
Discussion

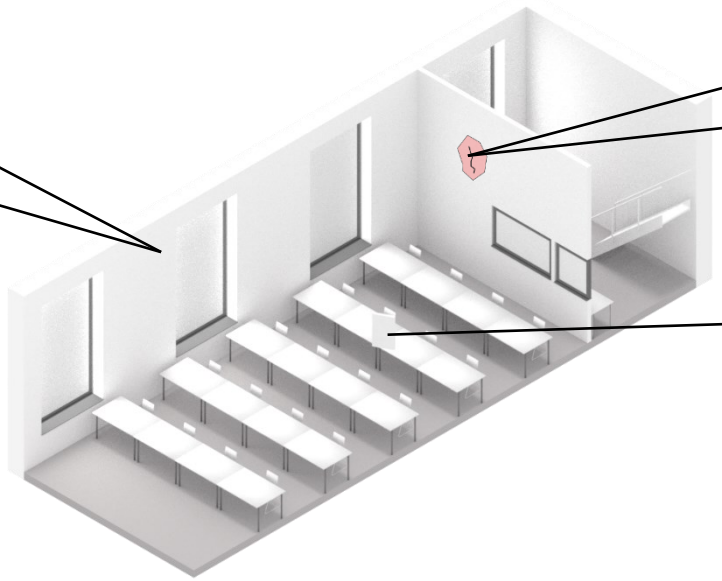
BIM Collaboration Format

Structure

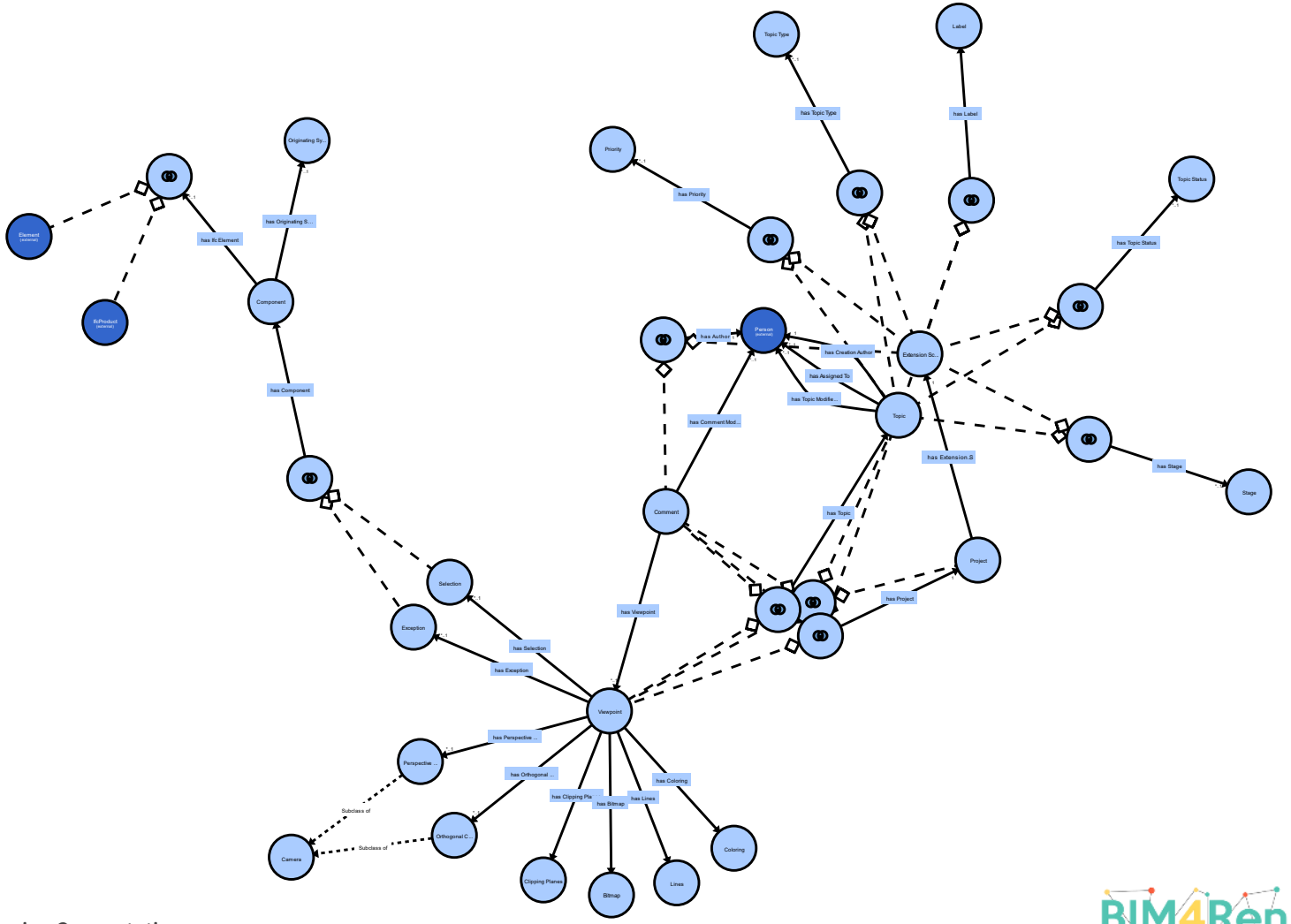


Linked Data

In the AEC Domain



bcfOWL

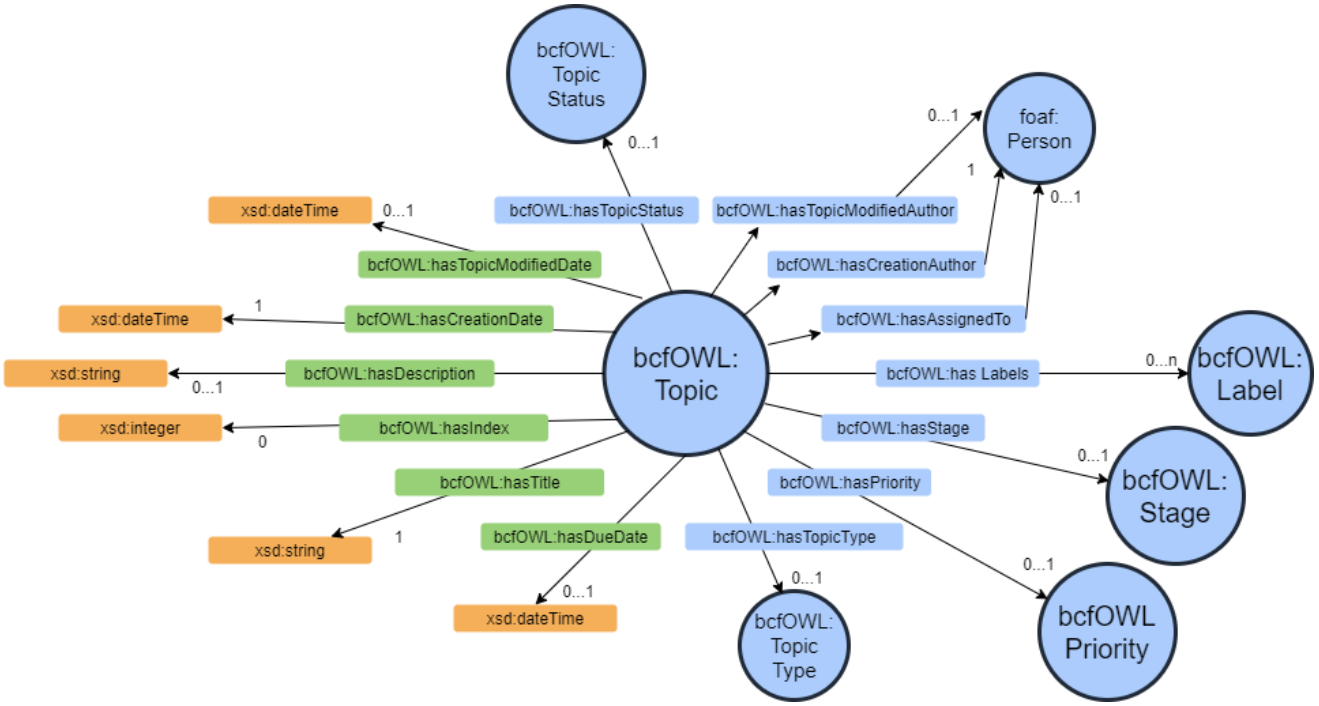


~ 21 Classes
~ 28 Object Properties
~ 22 Data Properties

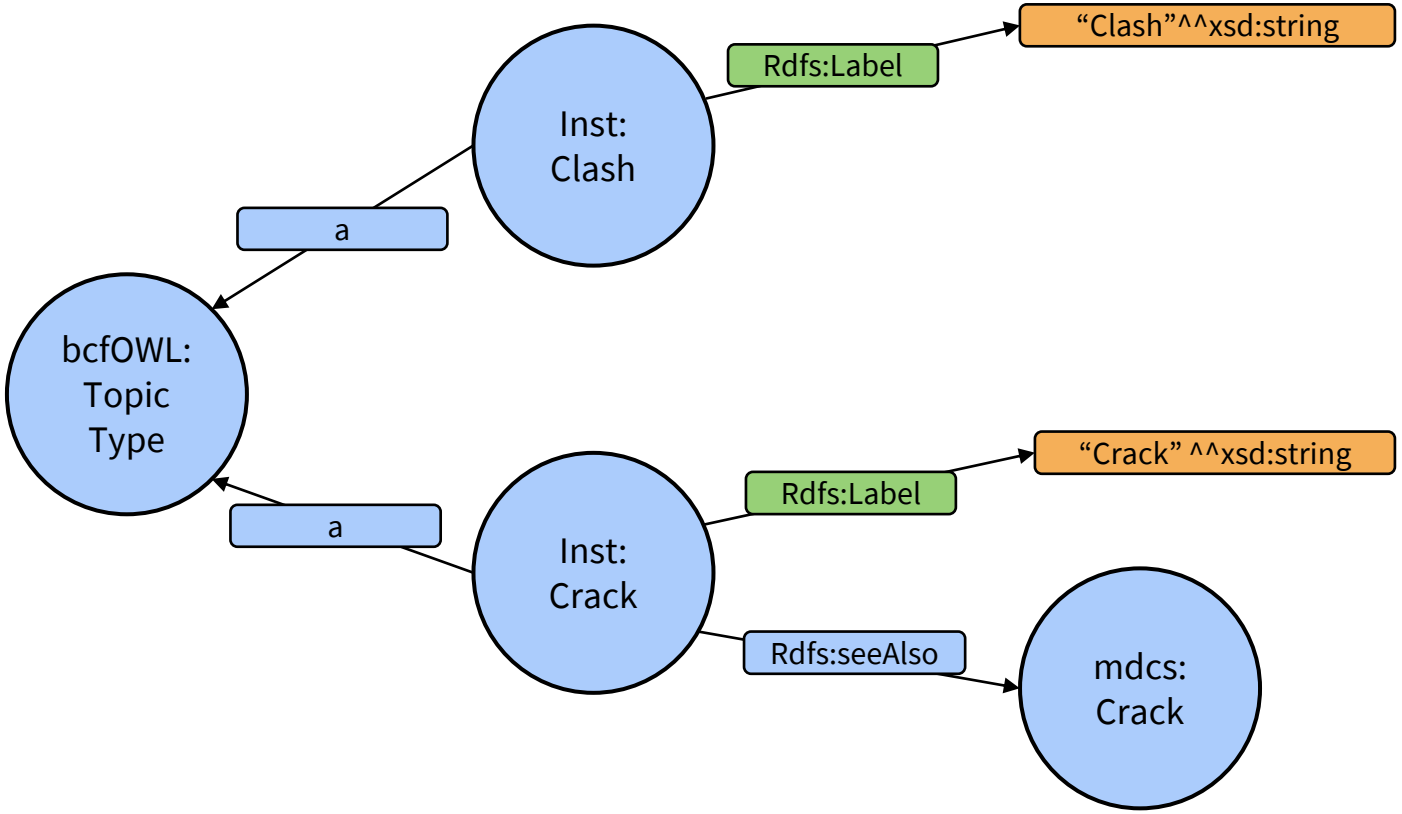
Best Practices

1. **Complexity should be kept simple** (Hammar, 2021)
2. **Checking for pitfalls** (Poveda-Villalón et al. , 2014)
3. **W3C best practices** (https://www.w3.org/TR/ld-bp/)

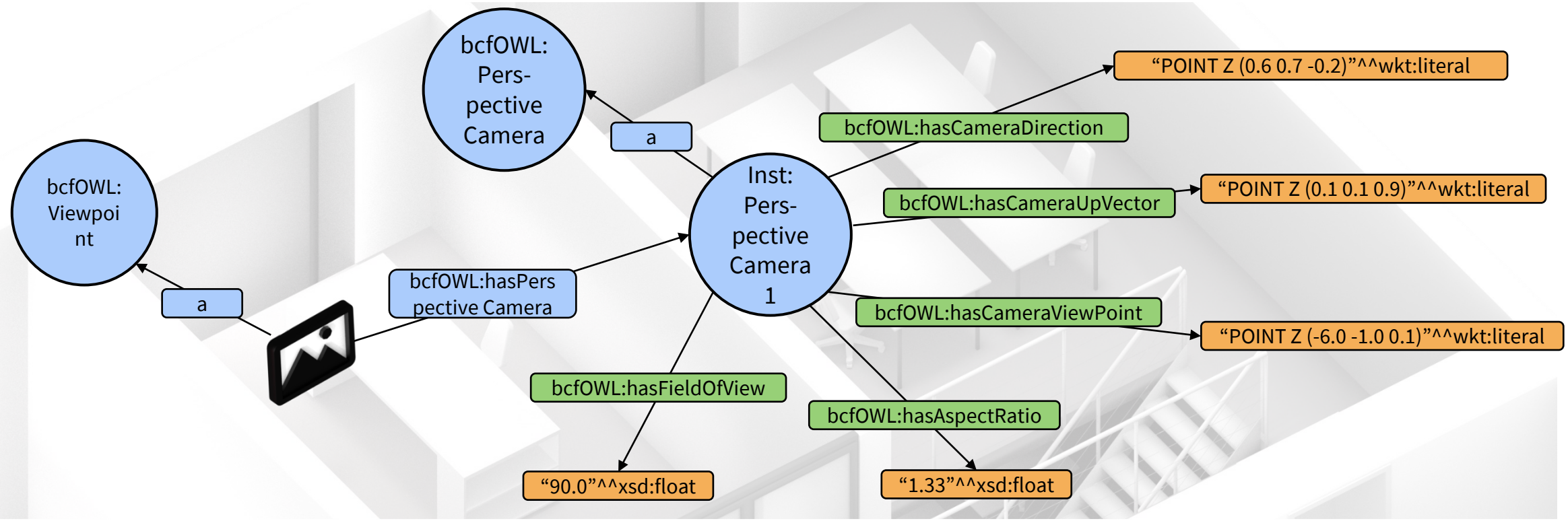
Topics


bcfOWL: Topic Status
0...1
foaf: Person
0...1
1
0...1
xsd:dateTime
0...1
bcfOWL:hasTopicStatus
bcfOWL:hasTopicModifiedAuthor
bcfOWL:hasTopicModifiedDate
bcfOWL:hasCreationAuthor
xsd:dateTime
1
bcfOWL:hasCreationDate
bcfOWL:hasAssignedTo
bcfOWL: Topic
xsd:string
0...1
bcfOWL:hasDescription
bcfOWL:has Labels
0...n
bcfOWL: Label
xsd:integer
0
bcfOWL:hasIndex
bcfOWL:hasStage
0...1
bcfOWL: Stage
bcfOWL:hasTitle
bcfOWL:hasPriority
xsd:string
1
bcfOWL:hasDueDate
bcfOWL:hasTopicType
0...1
0...1
xsd:dateTime
bcfOWL: Topic Type
bcfOWL Priority

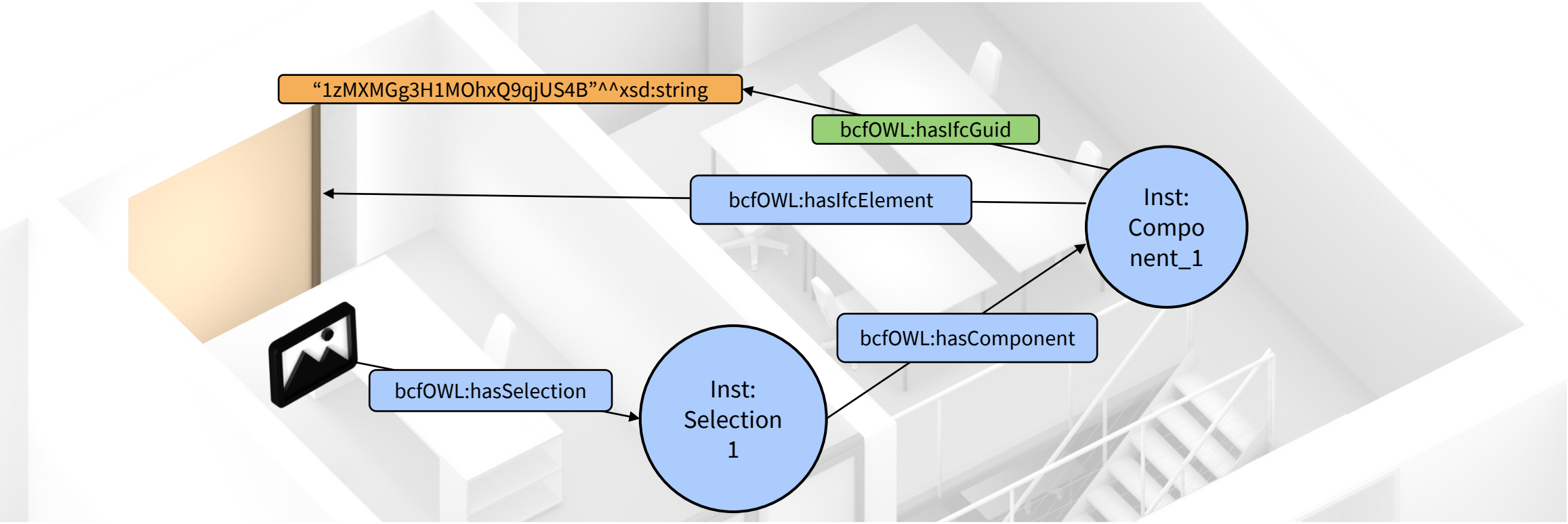
Extensions


"Clash"^^xsd:string
Rdfs:Label
Inst:
Clash
a
bcfOWL:
Topic
Type
"Crack" ^^xsd:string
Rdfs:Label
a
Inst:
Crack
Rdfs:seeAlso
mdcs:
Crack

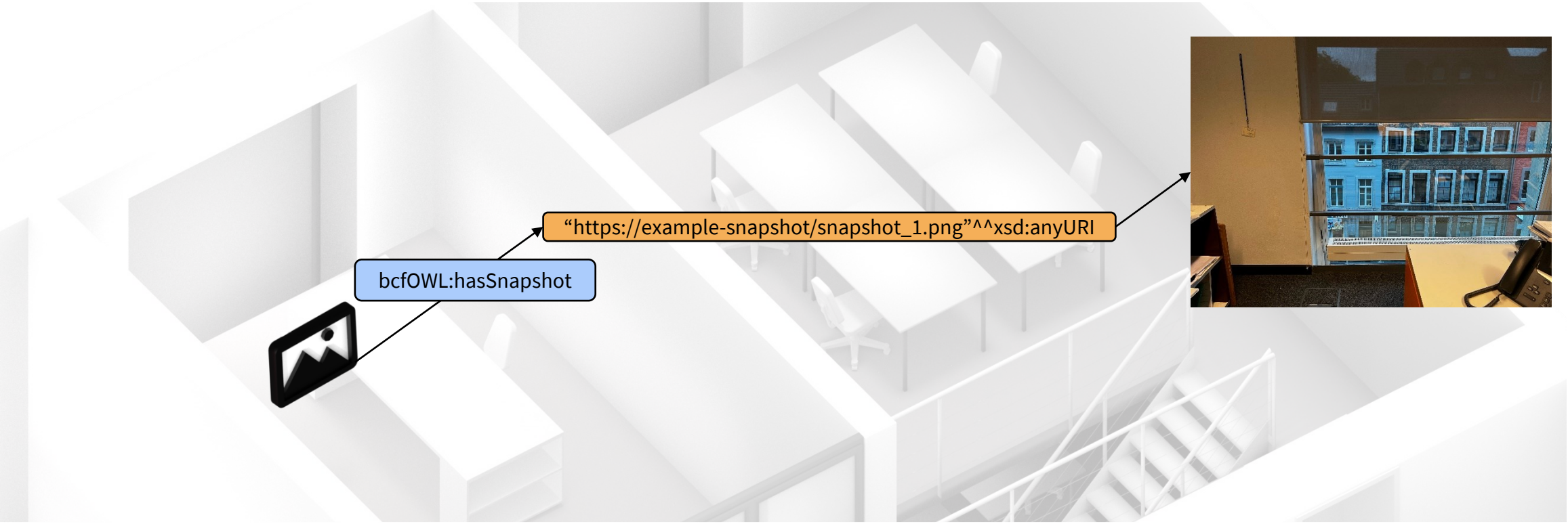
Locations


bcfOWL: Pers-pective Camera
a
bcfOWL: Viewpoi nt
a
bcfOWL:hasPers pective Camera
Inst: Pers-pective Camera 1
bcfOWL:hasCameraDirection
"POINT Z (0.6 0.7 -0.2)"^^wkt:literal
bcfOWL:hasCameraUpVector
"POINT Z (0.1 0.1 0.9)"^^wkt:literal
bcfOWL:hasCameraViewPoint
"POINT Z (-6.0 -1.0 0.1)"^^wkt:literal
bcfOWL:hasFieldOfView
"90.0"^^xsd:float
bcfOWL:hasAspectRatio
"1.33"^^xsd:float

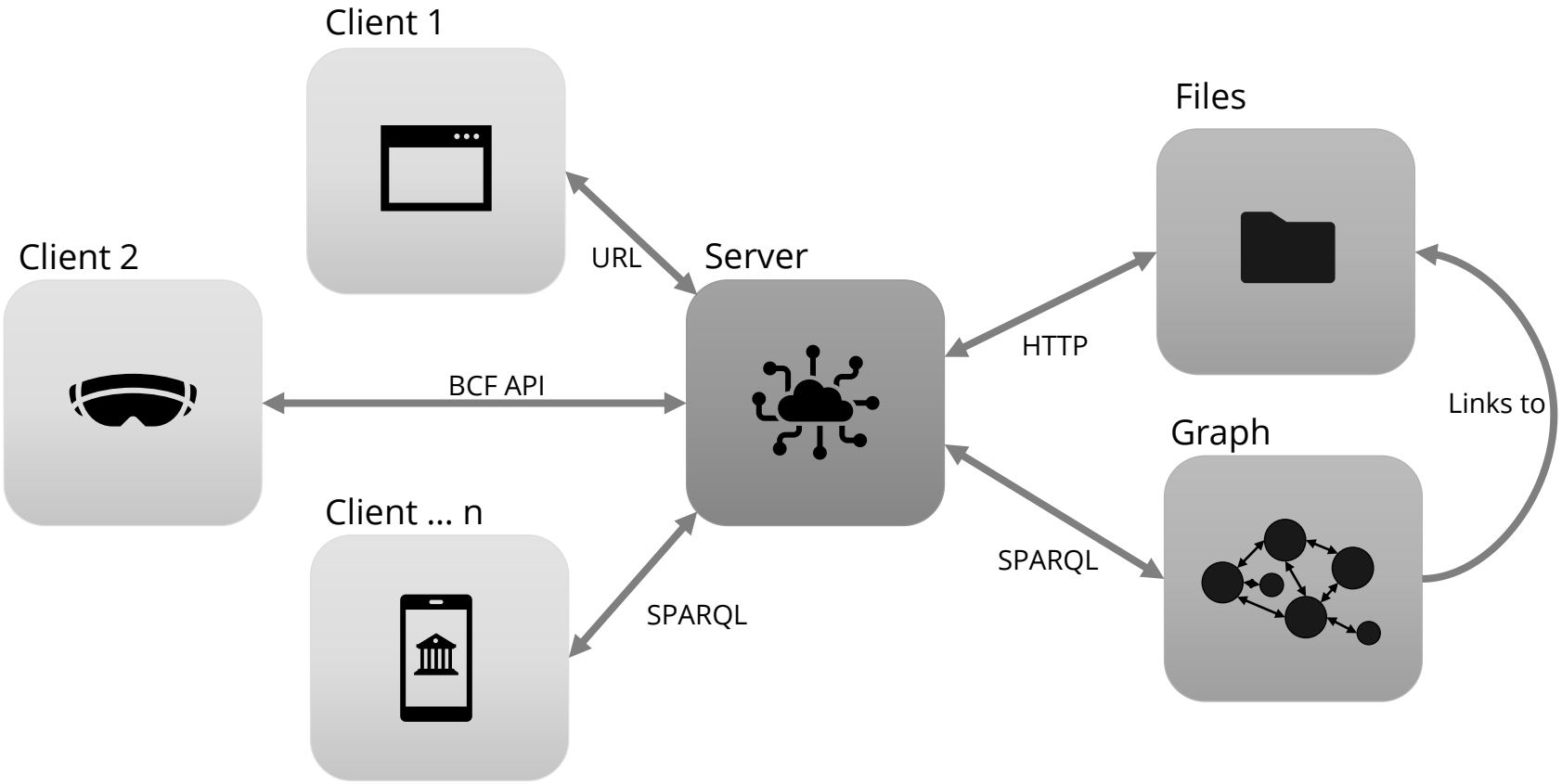
Selection


“1zMXMGg3H1MOhxQ9qjUS4B”^^xsd:string
bcfOWL:hasIfcGuid
bcfOWL:hasIfcElement
Inst: Compo nent_1
bcfOWL:hasComponent
bcfOWL:hasSelection
Inst: Selection 1

Images


bcfOWL:hasSnapshot
“https://example-snapshot/snapshot_1.png”^^xsd:anyURI

Implementation: bcfOWL Server



Discussion

GET {{BASE_URL}}/bcf/{{VERSION}}/projects/{{PROJECT_ID}}/topics ...

Params Auth Headers (7) Body Pre-req. Tests Settings

Body 200 OK 219 ms 5.33 KB

Pretty Raw Preview Visualize JSON


```
[
    {
        "guid": "597b5010-a29d-4b34-94dc-15632e8b7fc1",
        "topic_type": "Information",
        "topic_status": "Active",
        "creation_author": "schulz@dc.rwth-aachen.de",
        "creation_date": "2021-09-22T14:33:30.995Z",
        "title": "Image Sep 22, 2021, 2:33:17 PM"
    },
    {
        "guid": "fbba949e-111d-4765-b6af-2cee0eecb77a",
        "topic_type": "Information",
        "topic_status": "Active",
        "creation_author": "schulz@dc.rwth-aachen.de",
        "creation_date": "2021-09-22T14:33:31.194Z",
        "title": "Image Sep 22, 2021, 2:33:21 PM"
    },
    {
```


```
PREFIX bcfOWL: <http://lbd.arch.rwth-aachen.de/bcfOWL/>
PREFIX project_1: <https://caia.herokuapp.com/379b9dd6-b1e9-43a2-96e9-6051836dc2c5/>

SELECT ?s ?p ?o

WHERE {
    ?s  a   bcfOWL:Topic ;
        bcfOWL:hasProject project_1:379b9dd6-b1e9-43a2-96e9-6051836dc2c5 ;
        ?p ?o .
 }
```

QUERY RESULTS

Table Raw Response

Showing 1 to 50 of 72 entries

Search: Show 50 entries

	s	p	o
1	project_1:a52e757f-7dad-495c-ac00-484213a6d644	<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>	bcfOWL:Topic
2	project_1:a52e757f-7dad-495c-ac00-484213a6d644	bcfOWL:hasGuid	"a52e757f-7dad-495c-ac00-484213a6d644"
3	project_1:a52e757f-7dad-495c-ac00-484213a6d644	bcfOWL:hasTopicType	project_1:Information
4	project_1:a52e757f-7dad-495c-ac00-484213a6d644	bcfOWL:hasTopicStatus	project_1:Active
5	project_1:a52e757f-7dad-495c-ac00-484213a6d644	bcfOWL:hasProject	project_1:379b9dd6-b1e9-43a2-96e9-6051836dc2c5
6	project_1:a52e757f-7dad-495c-ac00-484213a6d644	bcfOWL:hasCreationAuthor	<http://my-bcf-url/users#Oliver_Schulz_ce9f1a95-f413-42fc-a40a-ad0462a8e968>

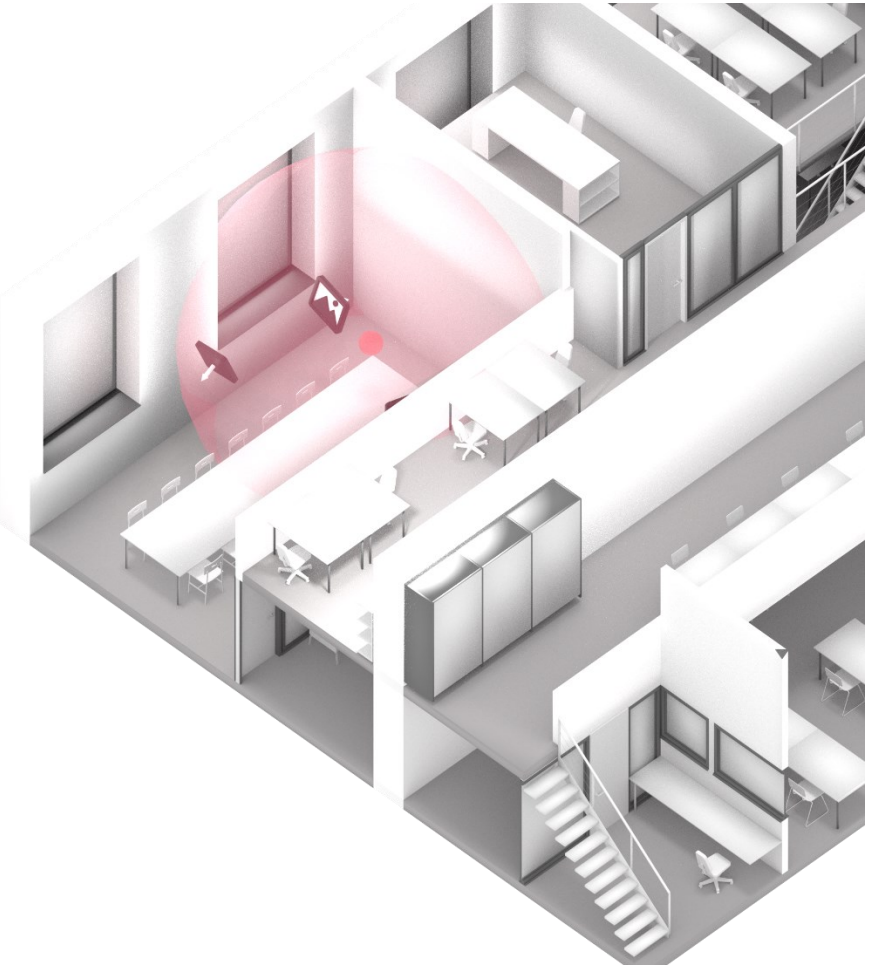
Conclusion

- Better accessibility of information
- Compatible to BCF
- Interlinked with (building) information

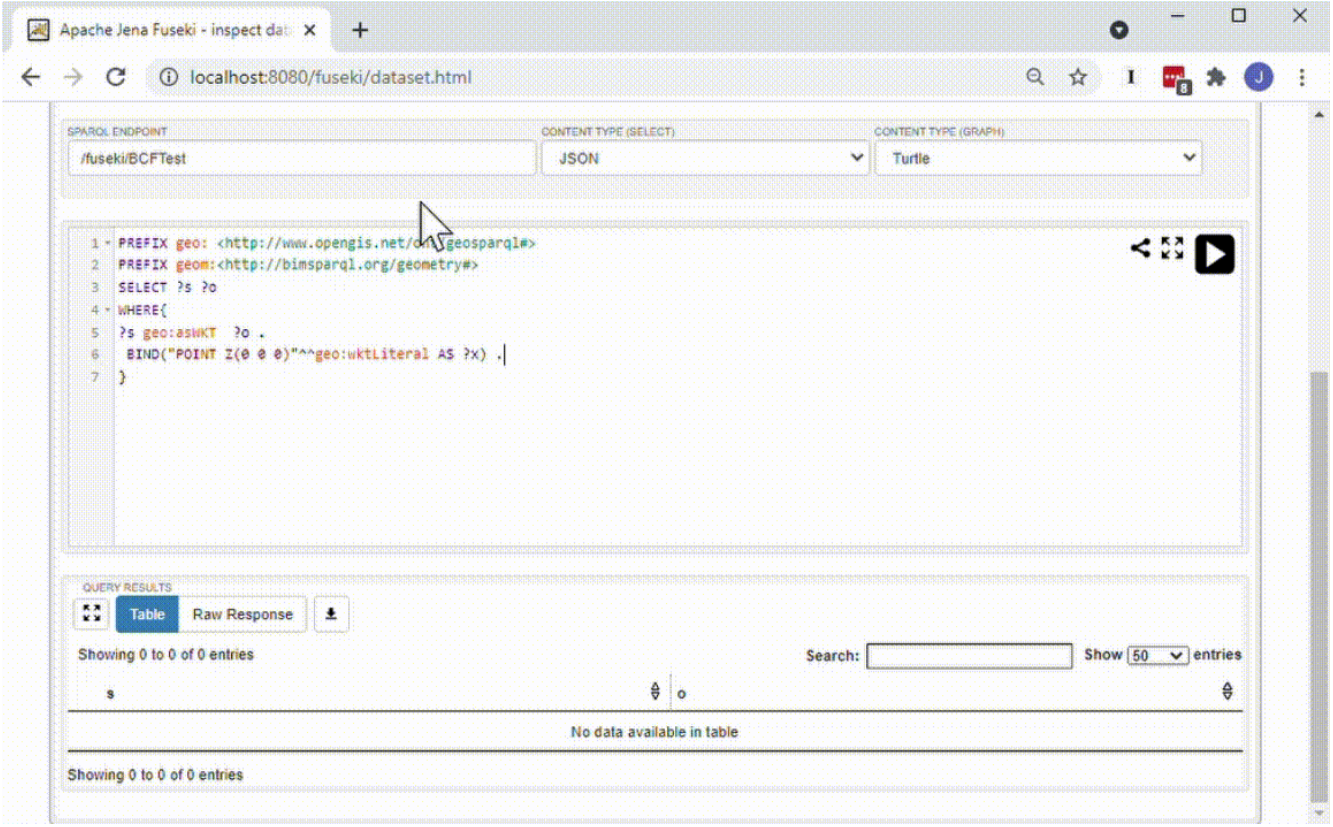
Future Work

- Validation
- CDE environment
- Spatial interoperability

Spatial interoperability



Spatial interoperability



References

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- Borrmann, A., König, M., Koch, C., & Beetz, J. (Eds.) (2018). Building Information Modeling: Technology Foundations and Industry Practice. Springer International Publishing. https://doi.org/10.1007/978-3-319-92862-3
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Thank you for your attention