FIWARE Global Summit

From Data to Value

OPEN SOURCE
OPEN STANDARDS
OPEN COMMUNITY

Scalable Monitoring of Building Energy Systems Using Semantics

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RWTH Aachen

Vienna, Austria
12-13 June, 2023
#FIWARESummit

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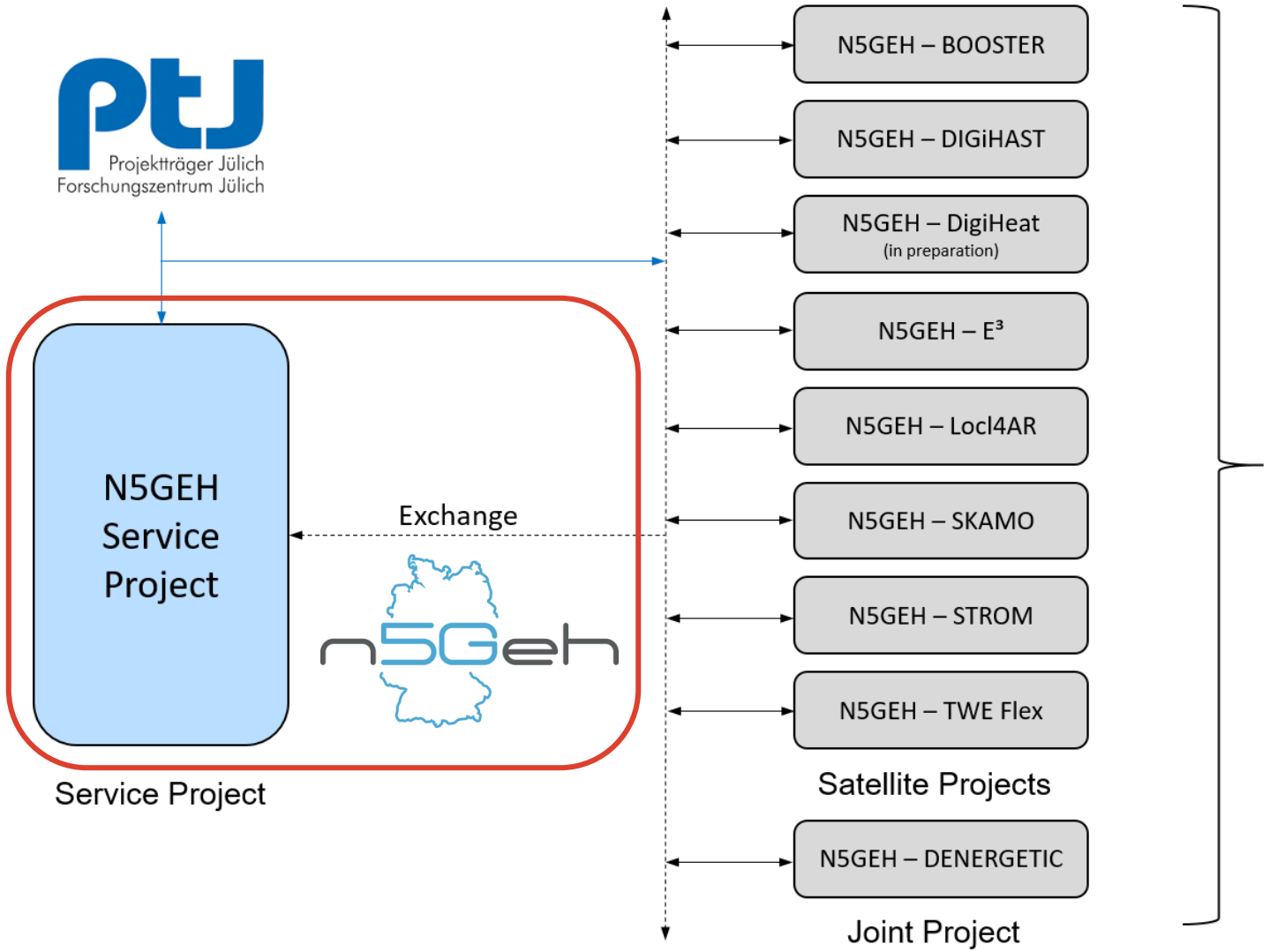
Open APIs for Open Minds

N5GEH - Service Project



Supported by:

Federal Ministry
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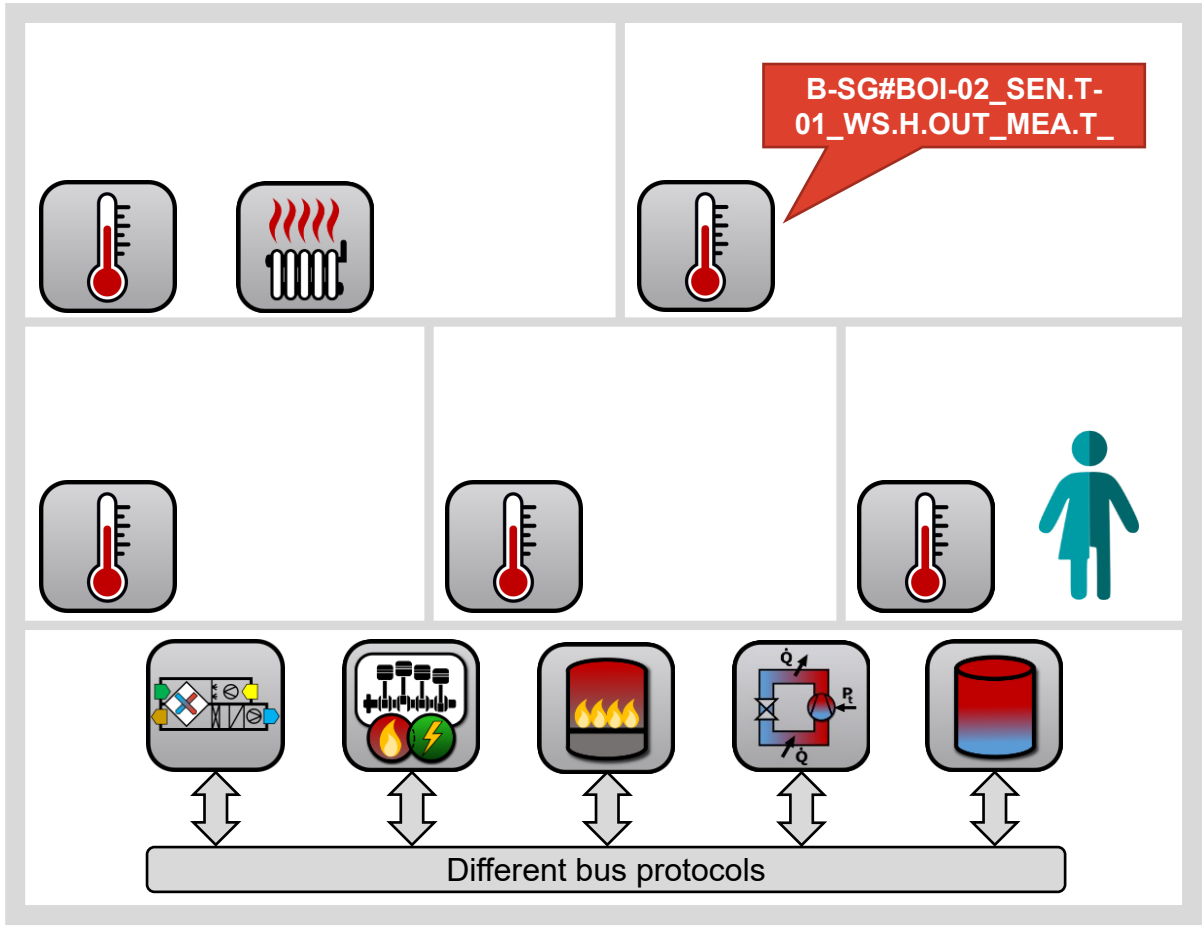
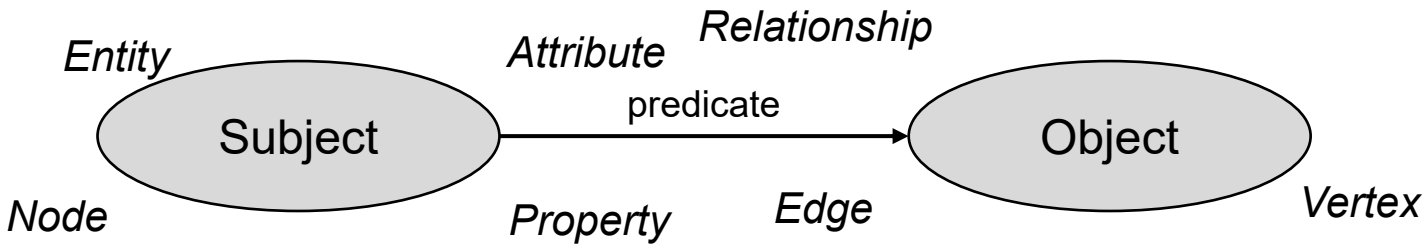
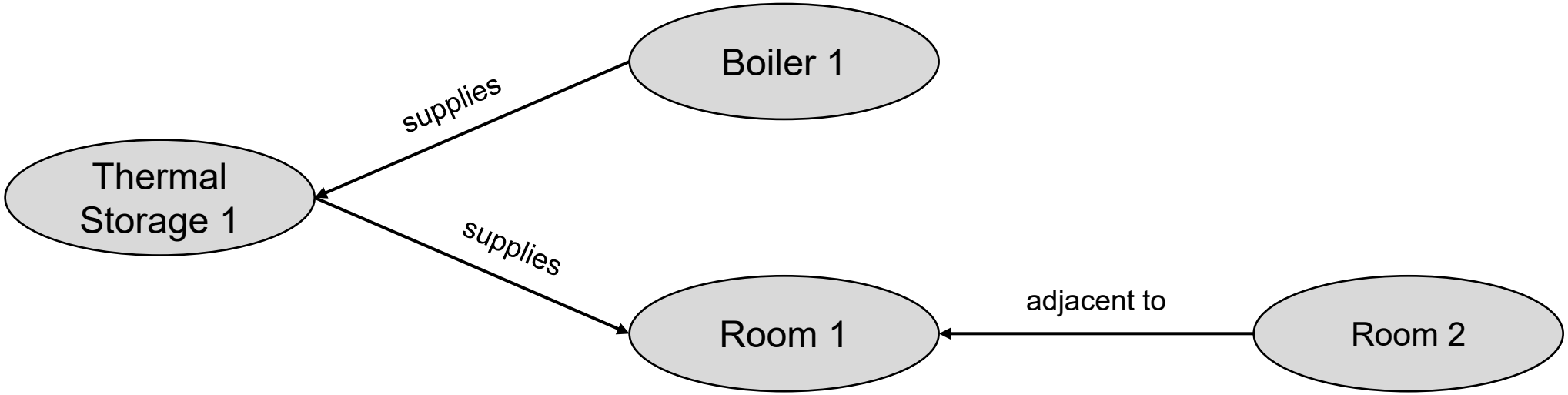
Motivation



- Modern Building Energy Systems (BES)
  - Are complex
  - Bear many sensors from different trades in **data silos** [1,2,3]
  - Are **unstructured** using **different naming schemes** most of the times [1,2,4]
  - Search for errors is time **consuming and costly** [1,2,5]

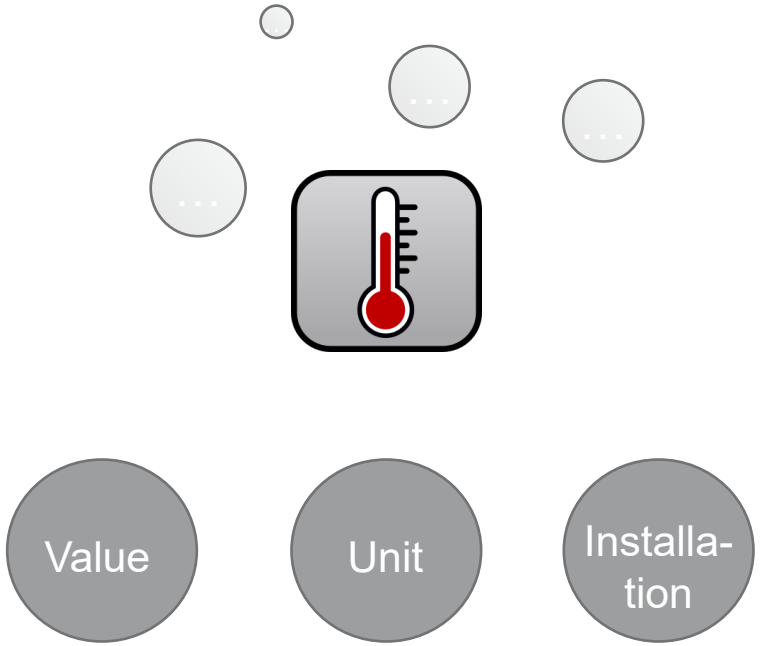
→ Make data **available** and **understandable**





Formal Knowledge

- **Ontologies** are used to represent knowledge in a certain domain and enable data exchange between processes and services
  - **Formalizing** a common **set of rules for that domain**
- Import of **json.schema** files based on ontologies




```json
{
    "properties": {
        "temperature": {
            "type": "number",
            "description": "The measured value from the sensor."
        },
        "unit": {
            "type": "string",
            "enum": ["Degrees Fahrenheit", "Degrees Celsius", "Kelvin"],
            "description": "Unit of the temperature value."
        },
        "installedAt": {
            "type": "string",
            "description": "Date and time the sensor was installed."
        },
        [...]
    },
    "required": [
        "id",
        "type",
        "temperature",
        "unit"
    ]
}
```

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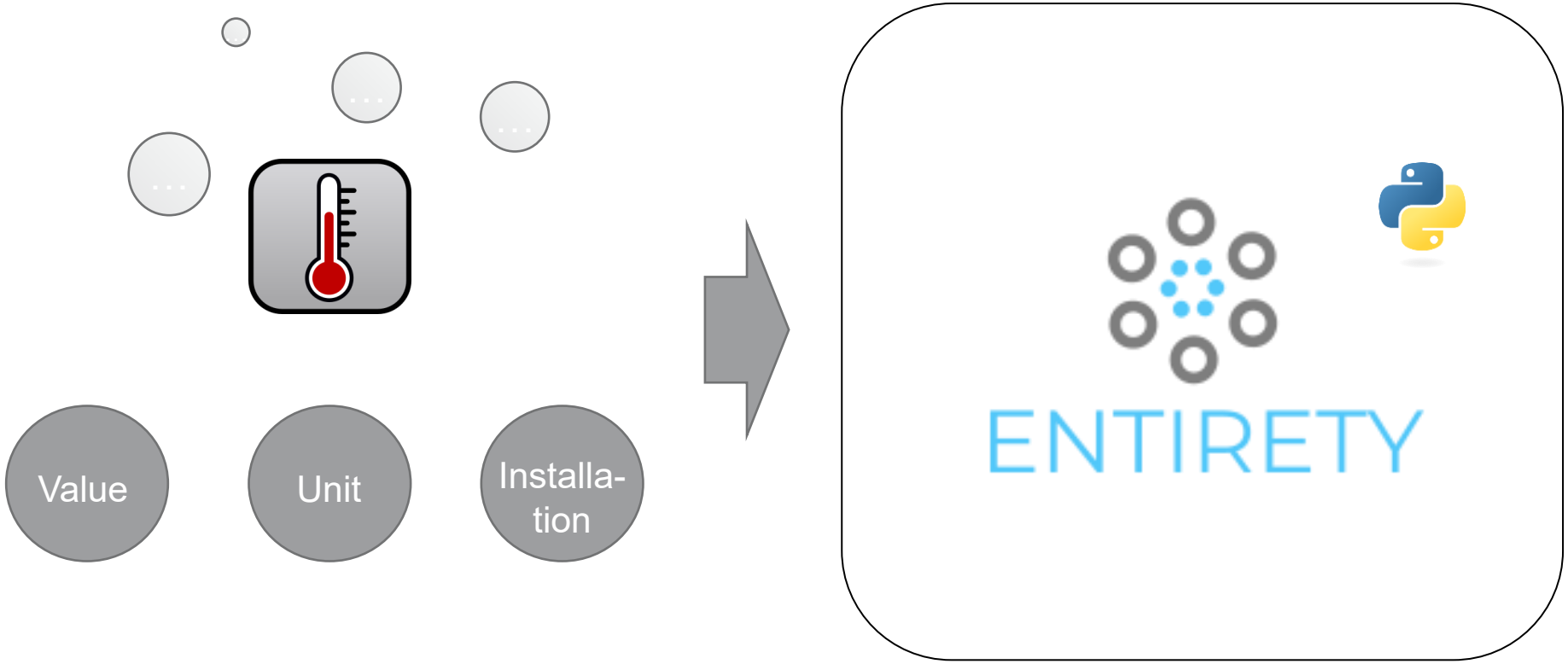
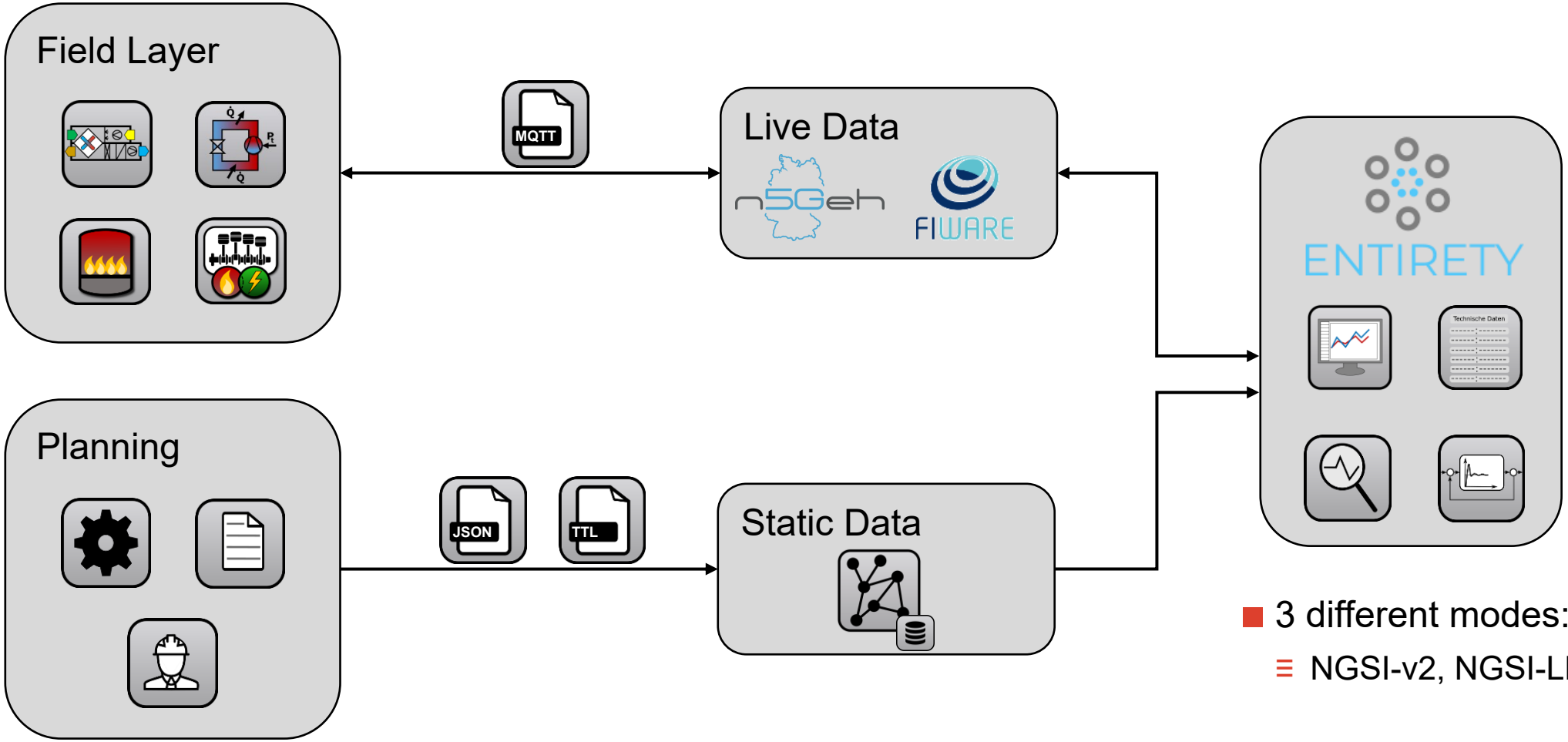
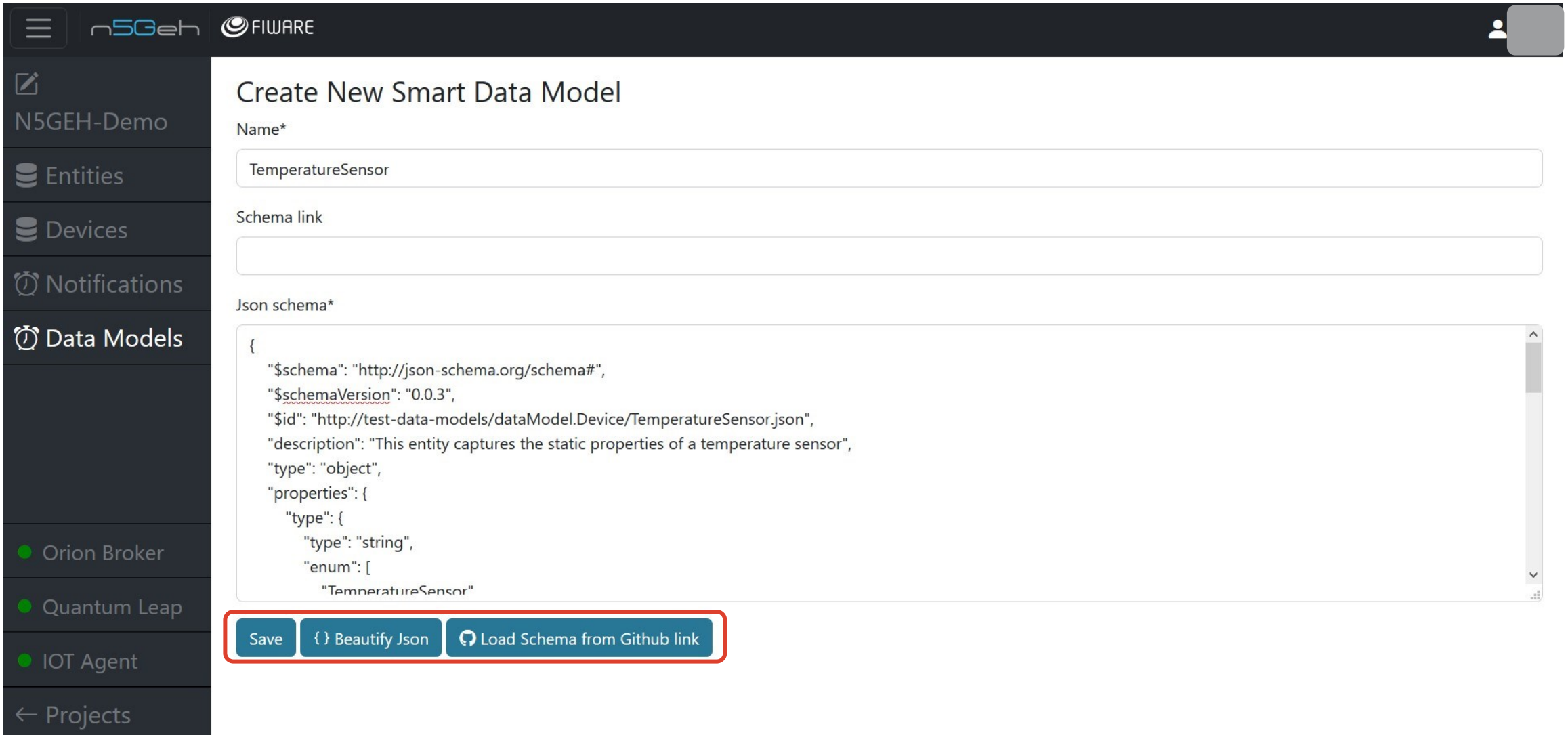


Semantic-Based Monitoring Using Entirety - Architecture



- 3 different modes:
  - NGSI-v2, NGSI-LD, RDF

Entirety: Data Model App



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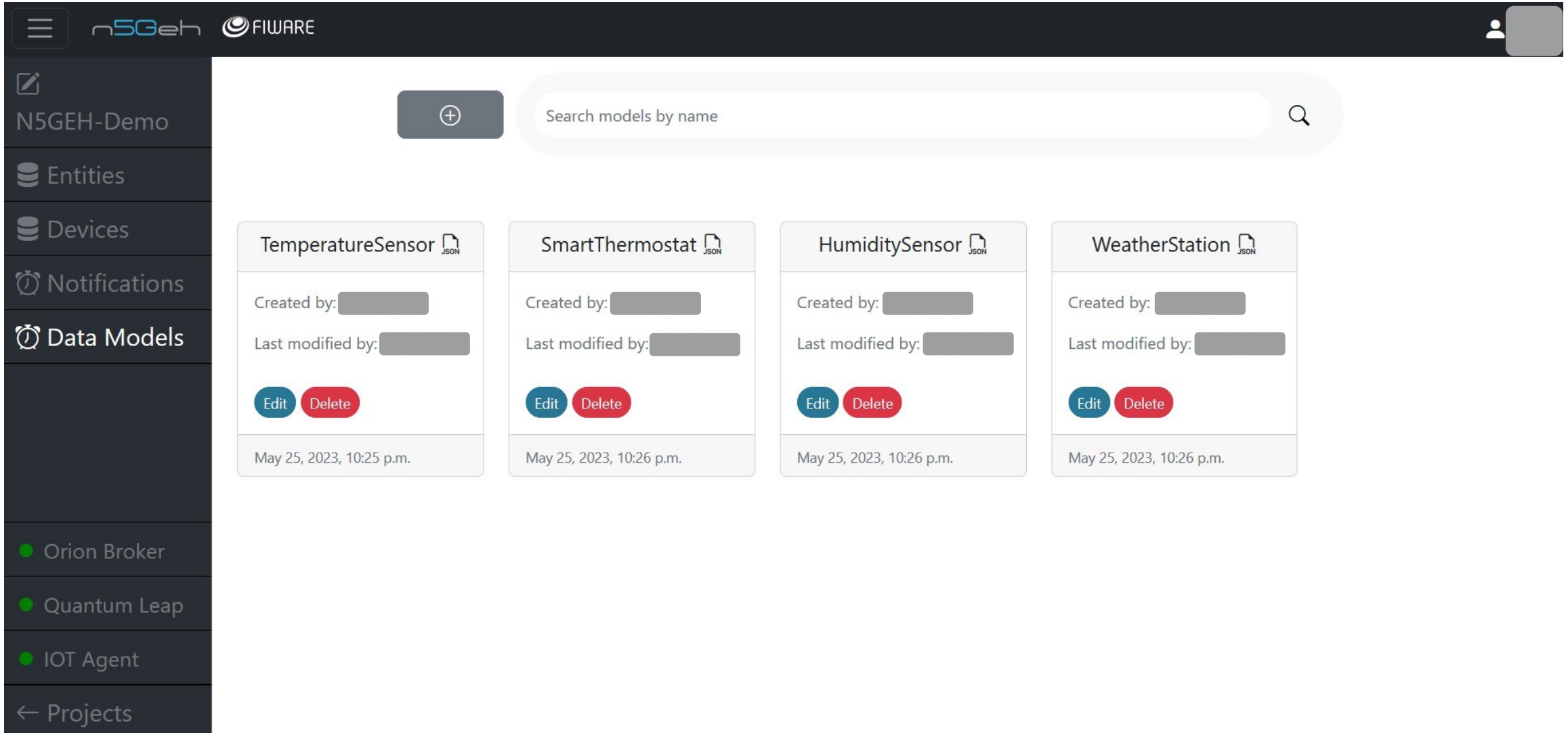

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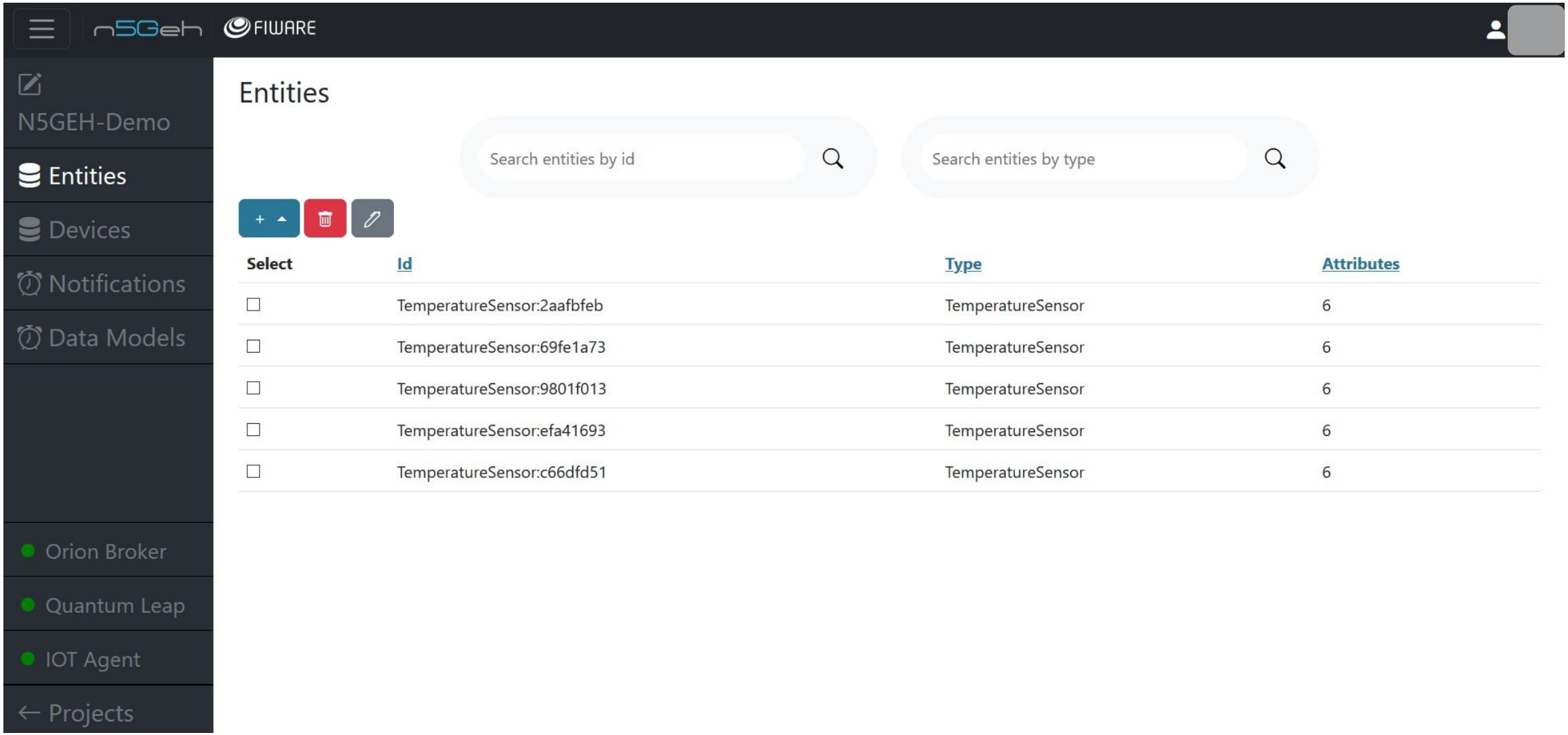
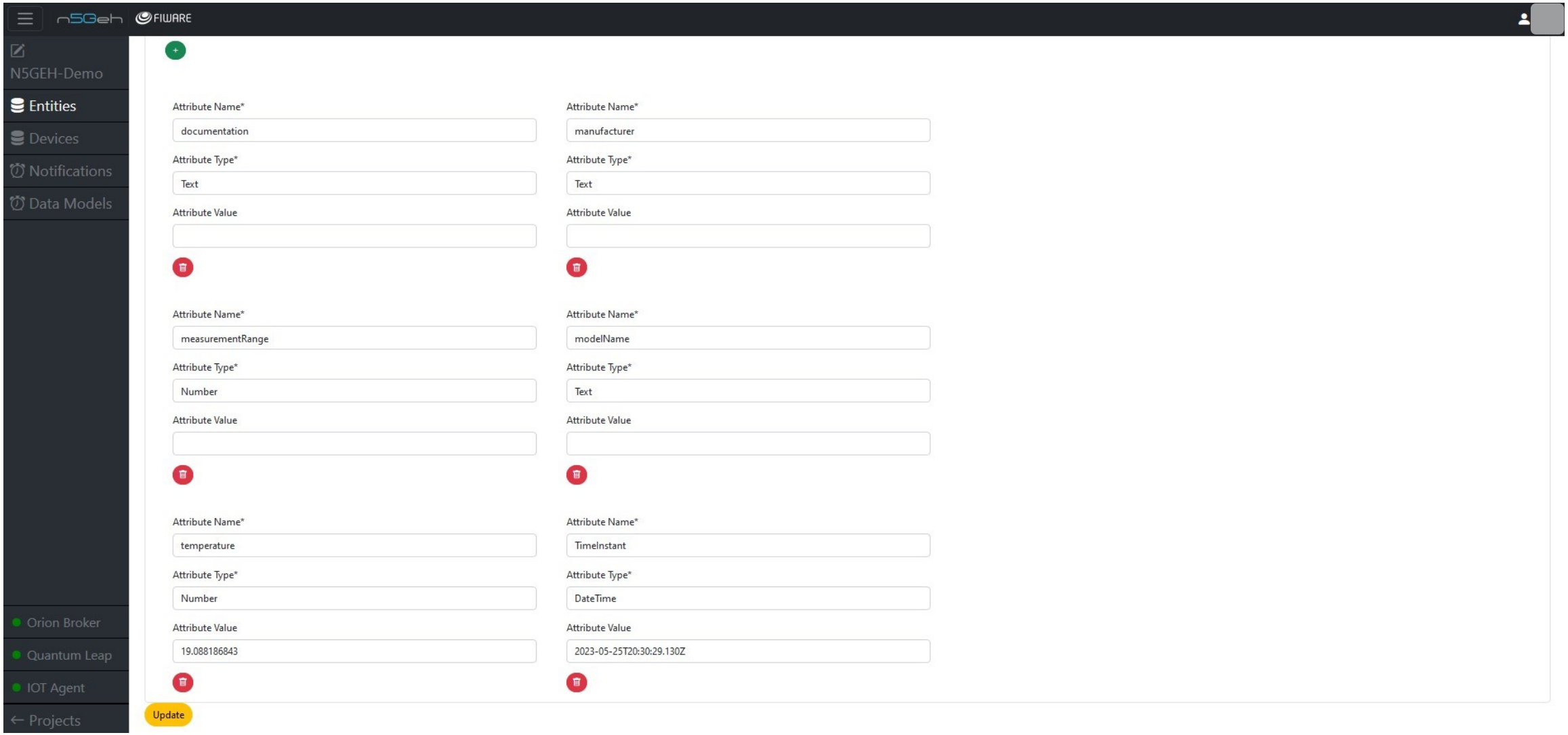
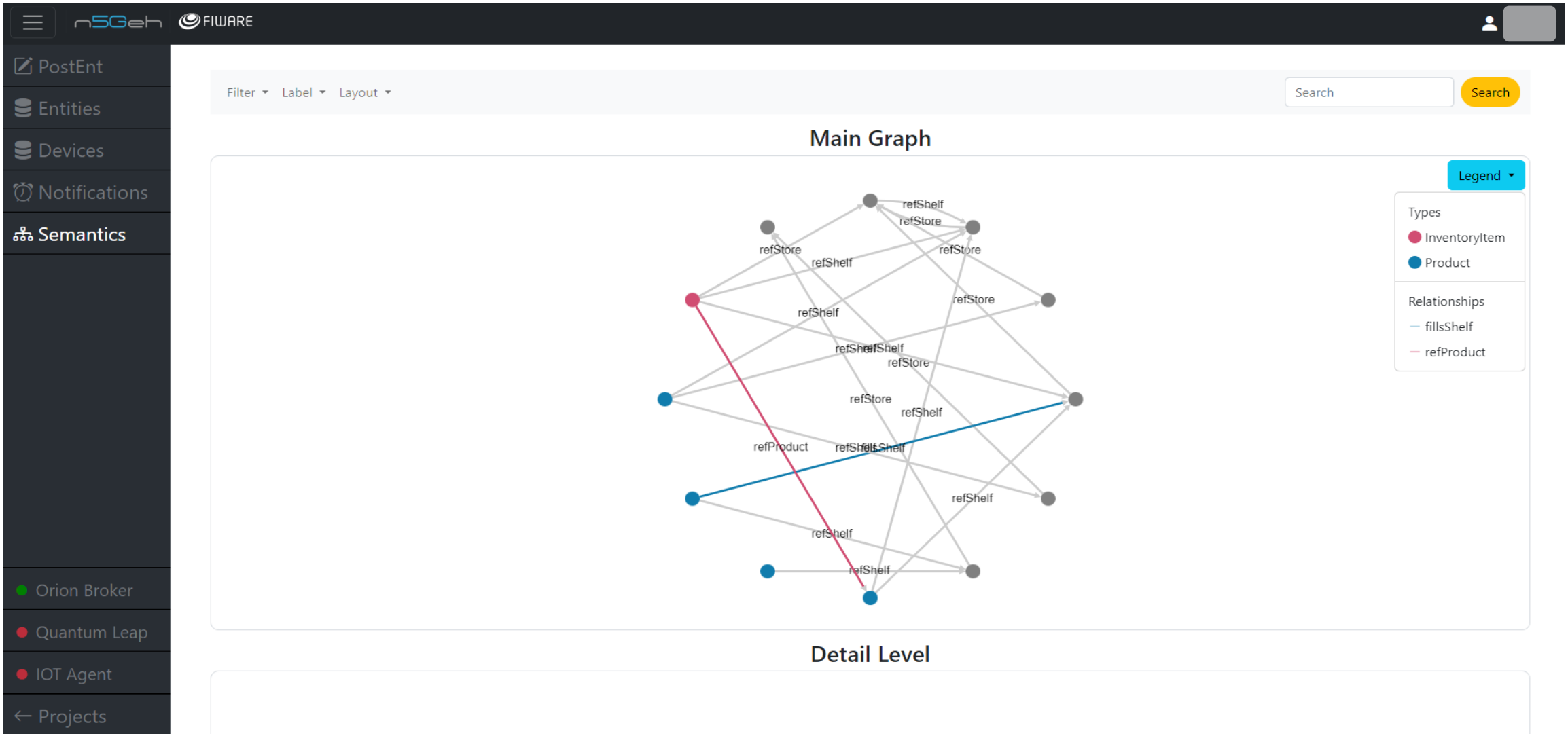


Entirety: Data Model App



Entirety: Data Model Visualization



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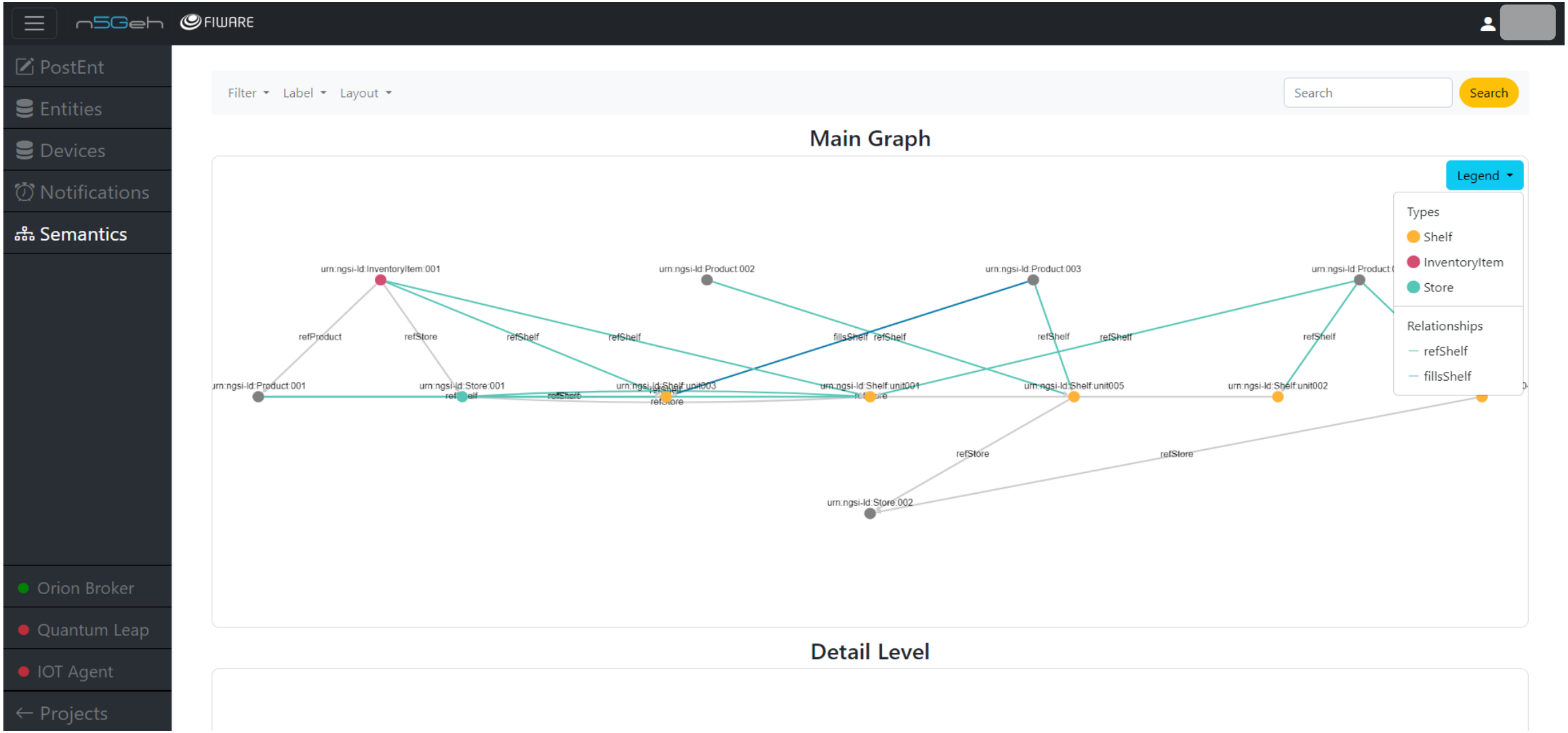

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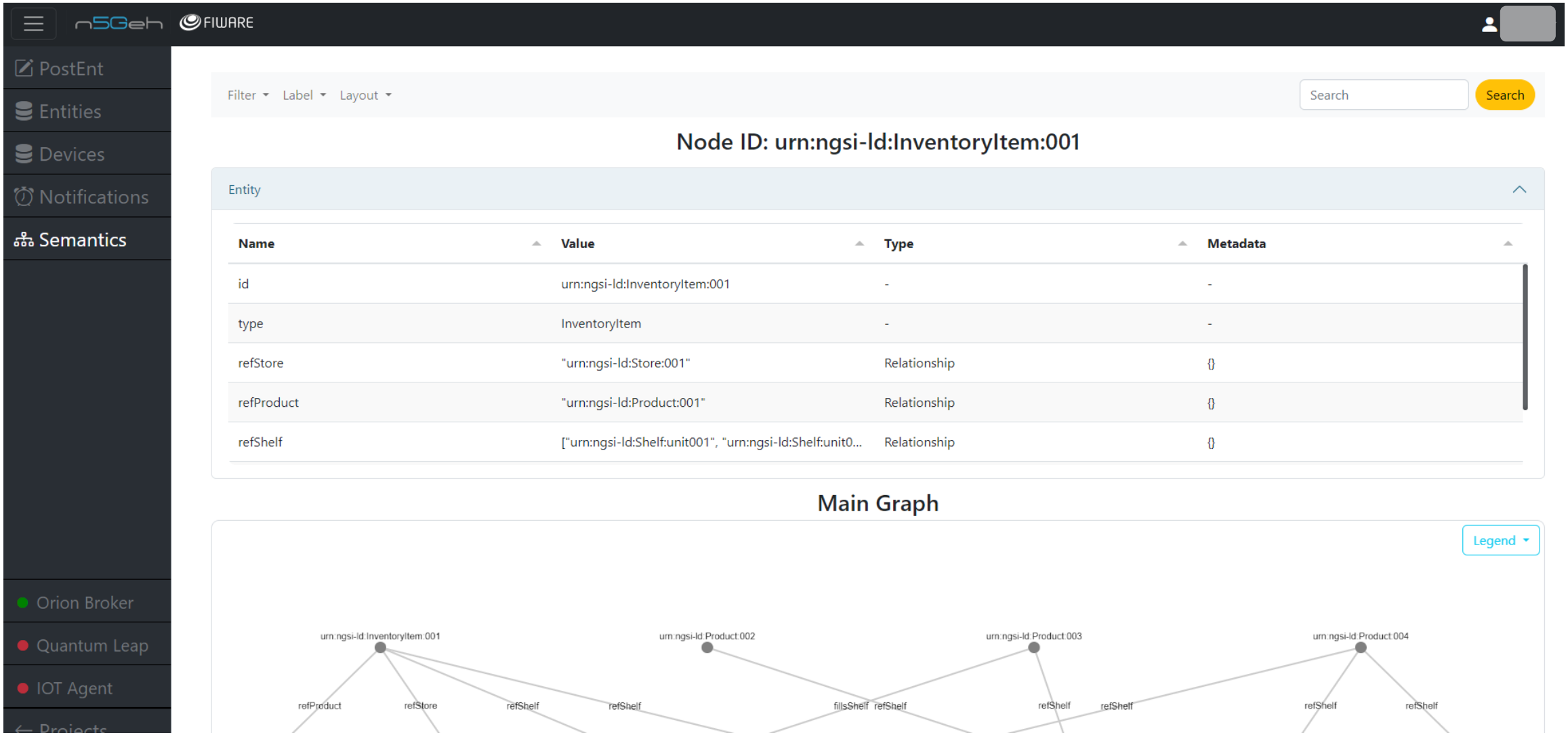

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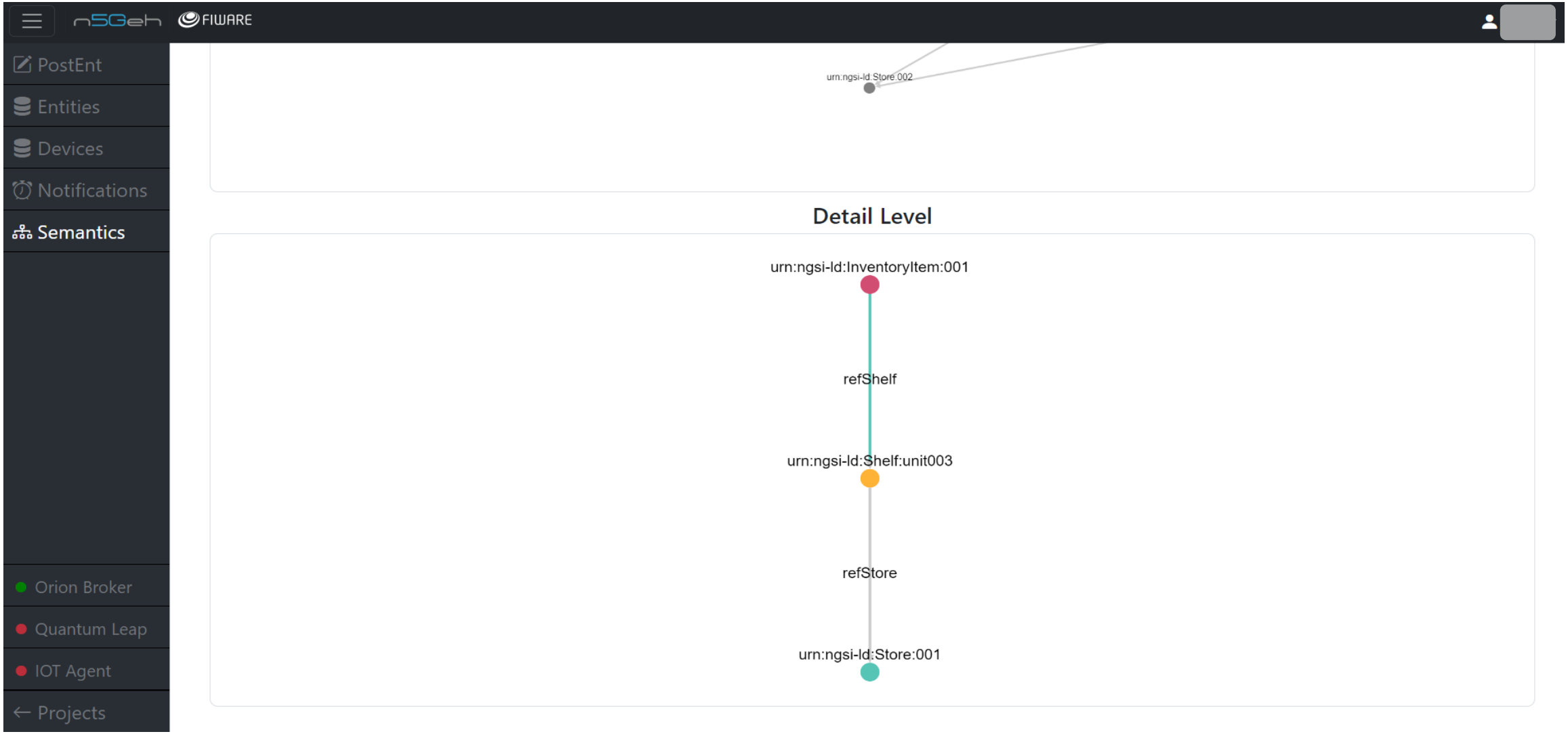
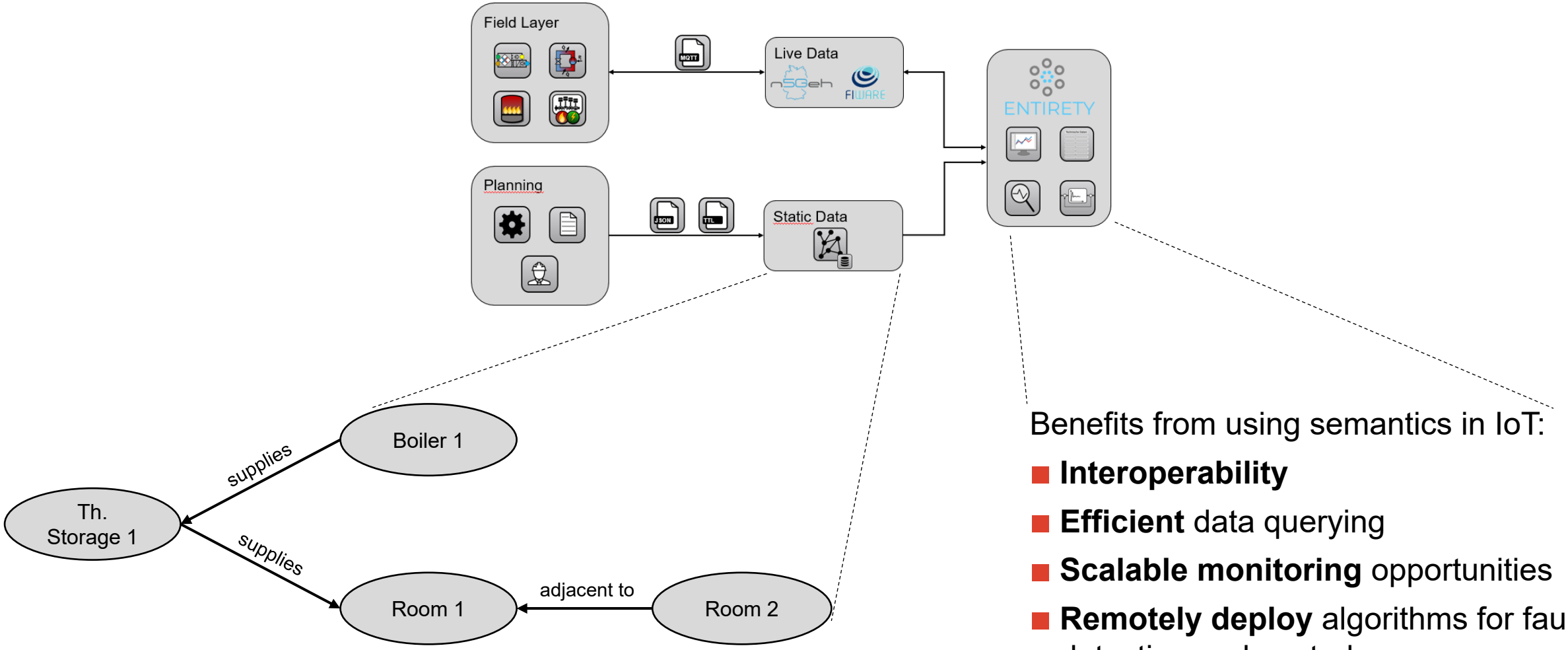


Summary



Benefits from using semantics in IoT:

- **Interoperability**
- **Efficient** data querying
- **Scalable monitoring** opportunities
- **Remotely deploy** algorithms for fault detection and controls

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Thanks!

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References

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[5]: Fierro et al. “Application-Driven Creation of Building Metadata Models with Semantic Sufficiency”. (October 2022). https://home.gtf.fyi/papers/fierro2022application.pdf