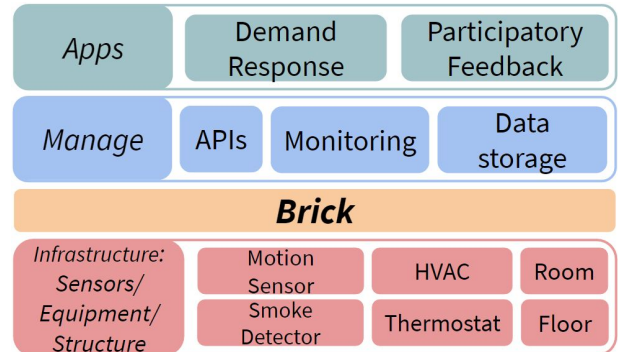


Metadata Schema for Buildings

What is Brick?

- ❑ Brick is a unified semantic representation of different resources in buildings and their systems.
- ❑ Brick enables software applications which are portable among buildings.
- ❑ In addition to modeling building components using tags, Brick can express higher-order abstractions such as classes and their relationships, as required for building applications.
- ❑ Brick is an ontology written in RDF and queryable via SPARQL.



Why Brick?

- ❑ **Coverage:** Brick can describe entities as well as the relationships commonly found in commercial buildings. The schema was validated with 6 buildings across different parts of the world showing 98% coverage of the entities and all the relationships required by numerous applications in the literature.
- ❑ **Extensibility:** Since classes are composed of tags, semantic reasoning of new classes is possible.
- ❑ **Flexibility:** Because classes are hierarchically defined, applications developers and building managers can express their data requirements and model their building components at different levels of abstraction, ensuring proper functionality.
- ❑ **Consistency:** Brick classes guarantee maximum interoperability by preventing inconsistent usages, such as different groupings of tags expressing the same concept.
- ❑ **Expressivity:** Canonical relationships allow Brick to express those required by various application categories such as fault diagnostics and occupancy-based controls.
- ❑ **Usability:** All the standard tools for ontologies, such as RDF and SPARQL technologies, can be leveraged to support storage, querying, composition and visualization of Brick models.

Resources



Official website: <https://brickschema.org>



User support and discussion: <https://groups.google.com/forum/#!forum/brickschema>



Development and RFC: <https://github.com/BuildSysUniformMetadata/Brick> (RFC at Issues)



Interactive visualization: <http://viewer.brickschema.org/>



Getting started examples (converting raw metadata to Brick + data analytics with Brick):
<https://github.com/BuildSysUniformMetadata/brick-tutorial-buildsys2017>



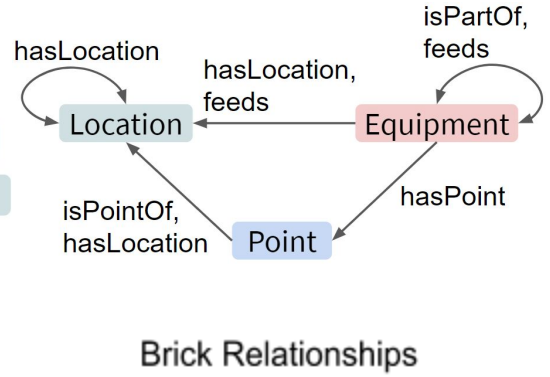
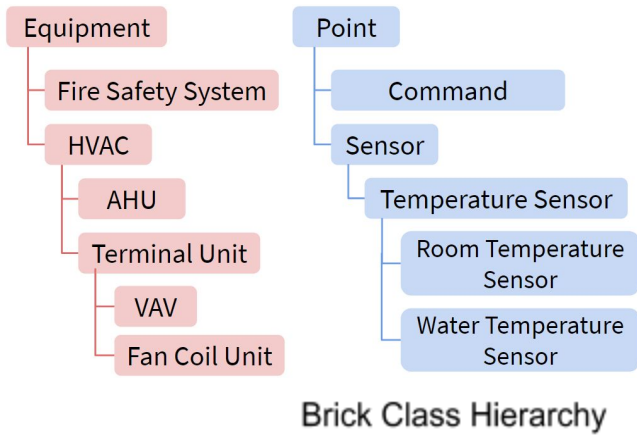
Brick-enabled Building Operating Systems: <http://buildingdepot.org/> <https://docs.xbos.io/>



Brick-specialized triple-store: <https://hoddb.org/>

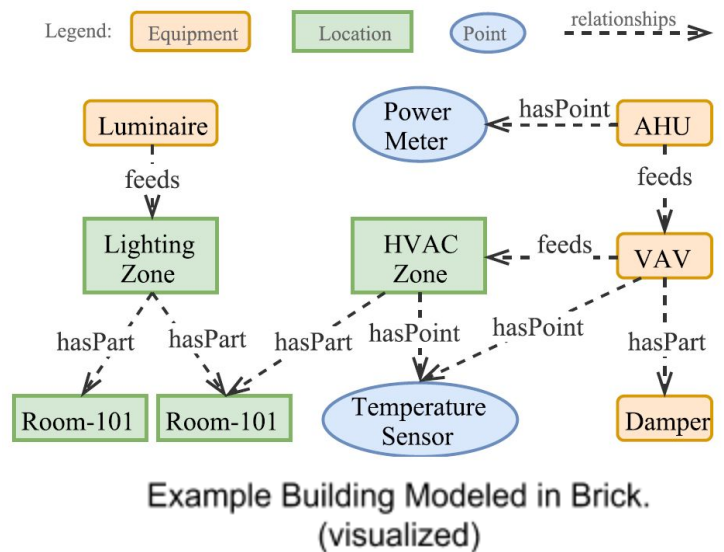
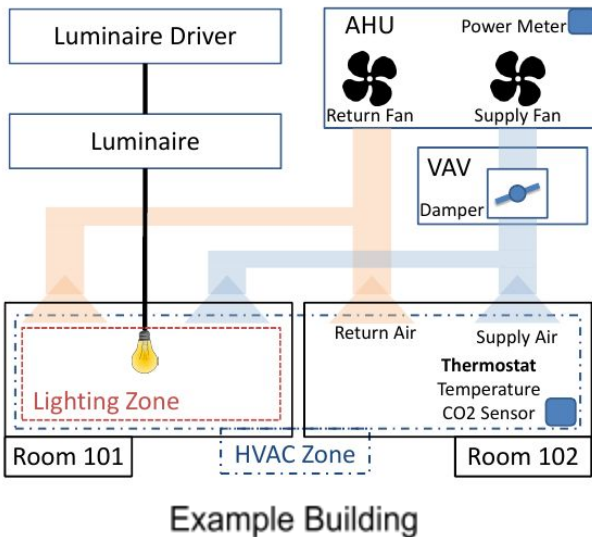
Brick at a Glance

Entities in buildings are represented as nodes in the Brick model. Each entity is an instance of a certain class and can have relationships with others. The classes are defined under an extensible hierarchy for flexible usage and we designed canonical relationships from existing applications found in the literature.



Example Building

In buildings, infrastructure components and spaces are physically or conceptually connected with each other. Their properties and/or behavior are measured by sensors and controlled by actuators. In this example building, we have an Air Handling Unit (AHU) providing air to a Variable Air Volume (VAV) box that control a thermal zone composed of two rooms. One of the rooms has a controlled luminaire for lighting too. Each entity is instantiated under a class as shown in the right figure. The bottom figure shows an example query on this simple model.



```

SELECT ?room ?sensor WHERE {
  ?sensor rdf:type/rdfs:subClassOf+ brick:Temperature_Sensor .
  ?sensor bf:hasLocation ?room .
  ?room rdf:type/rdfs:subClassOf+ brick:Room .
}
  
```

Example Query

Comparison with Haystack

Brick	Haystack
6 ported buildings, 8 ported applications, publicly available	Limited public reference implementations
Supports SPARQL queries that traverse Brick graph	Restrictive query mechanism cannot traverse relationships
Captures relationships within and across building subsystems	Can link entities, but does not classify these relationships
Hierarchical classes	Flat tag structure

Getting Involved

Brick was initiated by researchers from seven different institutions in 2015. Brick is open-source software and is available under the BSD license. The primary forum for Brick discussion is:

<https://groups.google.com/forum/#!forum/brickschema>. We welcome all forms of collaboration:

- Represent your buildings with Brick and share your results
- Develop applications with Brick so that others can use them
- Integrate Brick with your company's systems
- Expand Brick vocabularies to meet your new requirements

brickschema.org

