LDAC2020 - 8th Linked Data in Architecture and Construction Workshop

Smart buildings, integration between a maintenance management system and a SCADA

Tekniker | 19/06/2020

Tekniker
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Eduardo Gilabert
Iker Esnaola
Ricardo Romero
Francisco Javier Díez

Outline

- Tekniker
- Nierbimo Project
- Architecture solution
- Semantic techologies for integration
- Benefits
- Discussion

WHO WE ARE

R&D Centre
(not-for-profit Private Foundation)

Specialised in **Manufacturing**

Mission: **To enhance the positioning and competitiveness of our clients through technology transfer**

HISTORY

247
PROJECTS

30 YEARS
OF EXPERIENCE

H2020

25 %
LED PROJECTS

4,7 M€
H2020 ANNUAL
AVERAGE INCOME

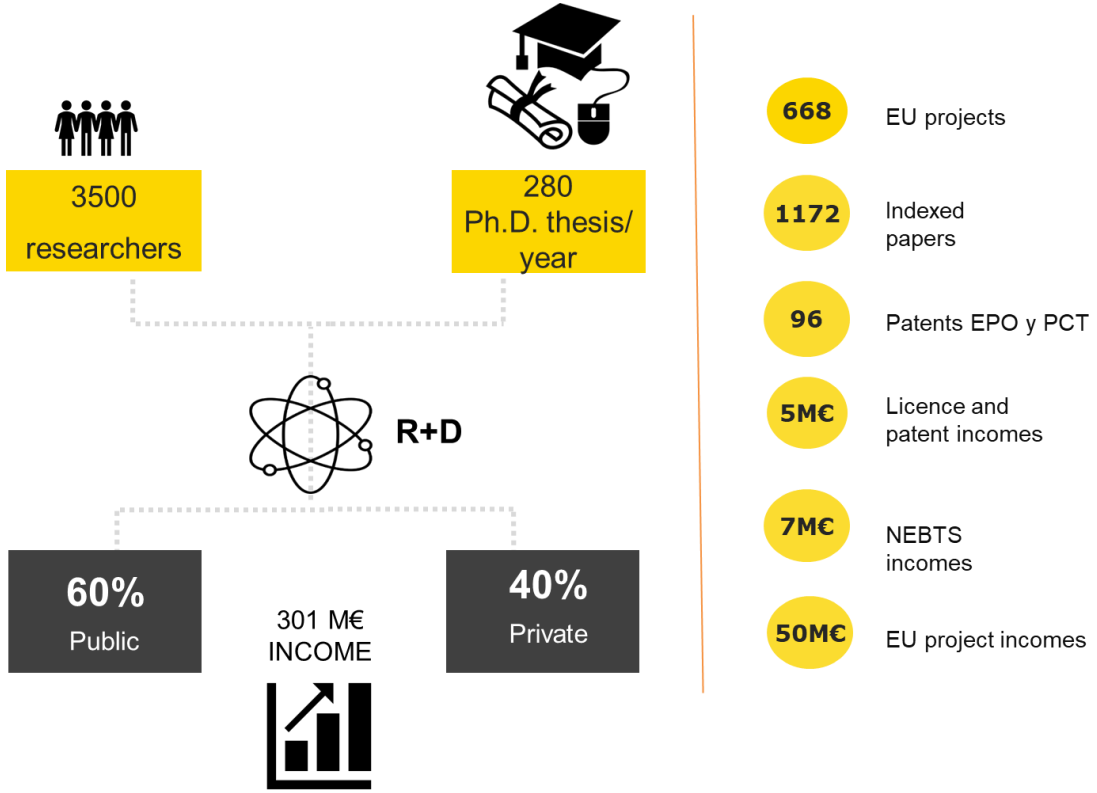
2018 DATA

About BRTA

BRTA is an **alliance** formed by:

- **12 technology centers** (Azterlan, Azti, Ceit, Cidetec, Gaiker, Ideko, Ikerlan, Lortek, Neiker, Tecnalia, Tekniker and Vicometch) and
- **4 collaborative research centers** (CIC BioGUNE, CIC NanoGUNE, CIC BiomaGUNE and CIC EnergiGUNE)

with the aim of developing advanced technological solutions for the Basque companies.

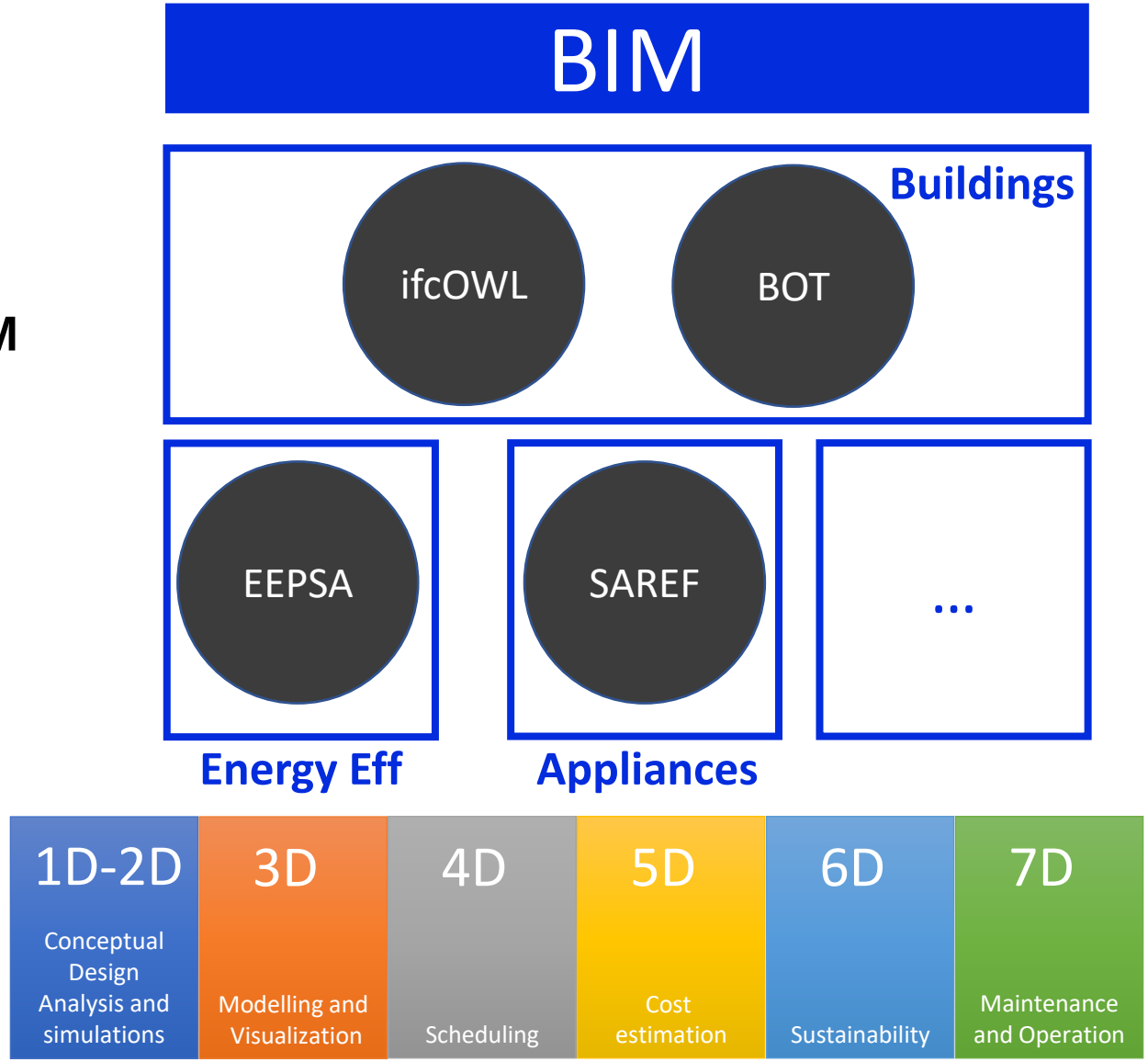


With the support of the **Basque Government**, the alliance seeks to promote collaboration among its centers; to strengthen the conditions to generate and transfer knowledge to companies, contributing to their competitiveness; and to spread the Basque scientific and technological capacity.

BIM Linked Data

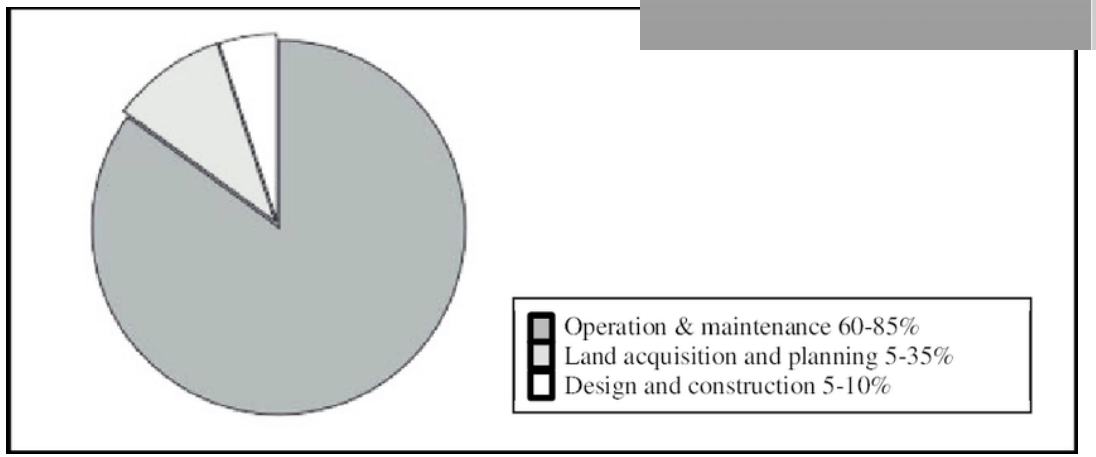
Our vision

- **BIM ≠ IFC**
- BIM provides the data structure for supporting the **whole building life cycle**
- **Linked Data allows the implementation of BIM as** federated databases
- **ifcOWL has operative problems**
- **BOT and SAREF limited coverage**
- **Tekniker has developed EEPSA** (Energy Efficiency Prediction Semantic Assistant) ontology supporting energy efficiency and thermal comfort.



Digital twin

- Building **real time monitoring**
- Discover the **GAP** between **theoretical** performance and **real performance**
- Very important in building **renovations**
- **Operation & Maintenance (7D)** is the most important information in BIM, 60-85% life cycle cost
- BIM model **integration with Enterprise systems:** CMMS, SCADA, ERP, …



Life cycle cost budget division of a building (Source: Hardin, 2009)

NiERBIMO

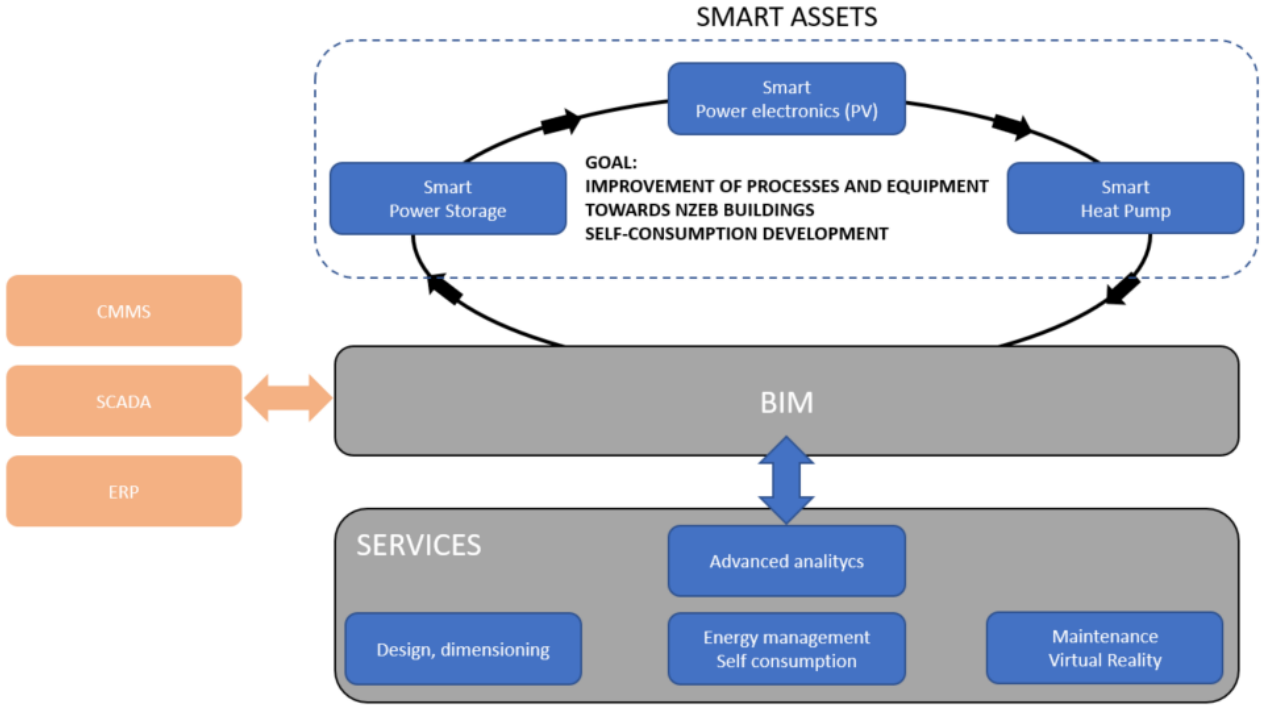
NZEB integrating Renewable Energy, BIM, facilities, maintenance and operation

Transformation of residential, industrial and commercial buildings into **Nearly Zero Energy Buildings**

- more efficient and sustainable use of the energy
- smarter operation and maintenance.

Development of software applications for **monitoring** and **optimization** of shared self-consumption facilities.

Development of **6th and 7th BIM** levels, providing tools that foster the **digital building development** in order to reach an improved **operation and maintenance efficiency**



Use cases

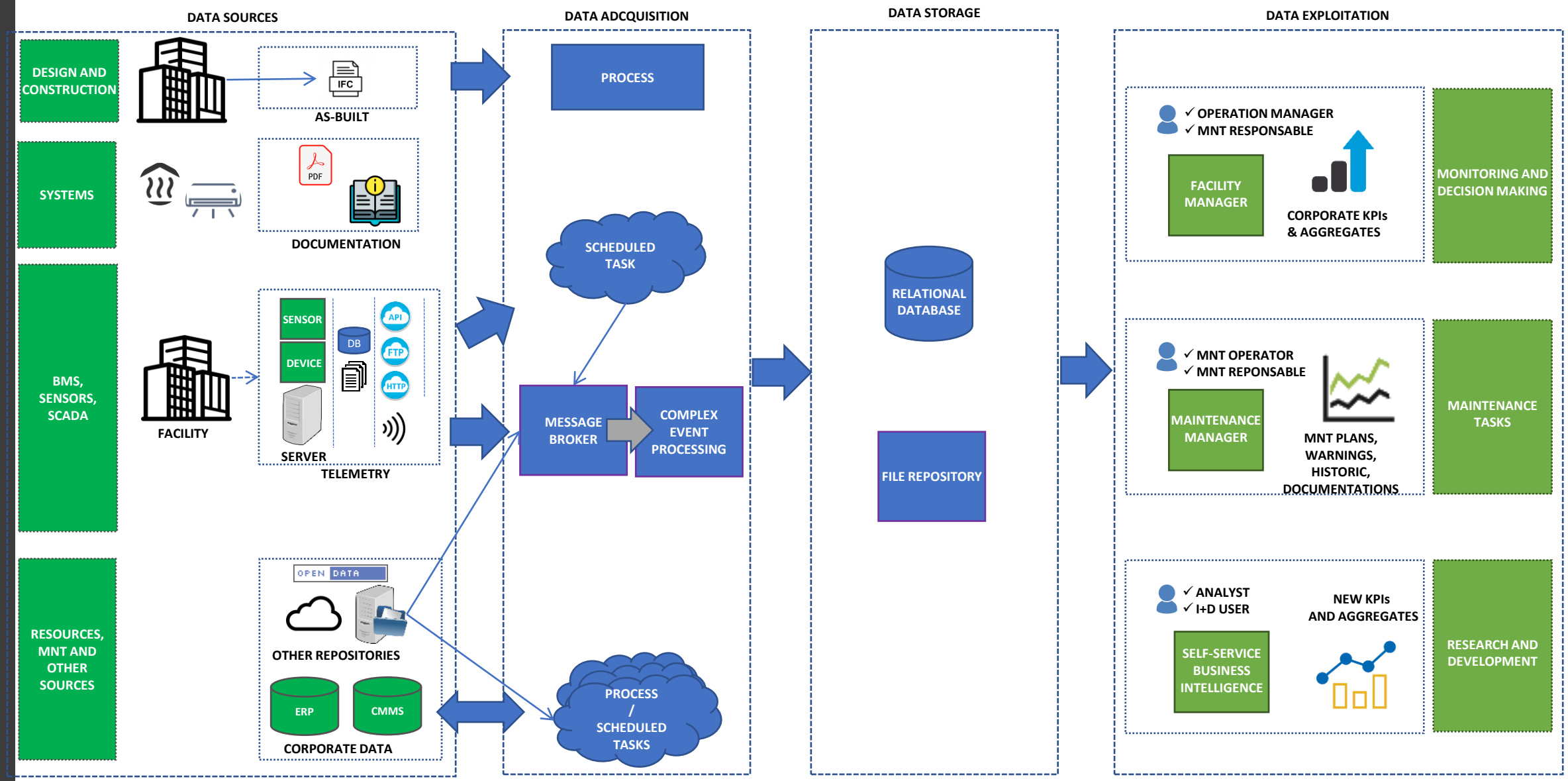
BEURKO

- Building community: 1240 housing
- thermal installations are centralized in a room of boilers located below the community park
- each block has a substation for the distribution of the thermal energy
- estimate capacity in energy generation and storage

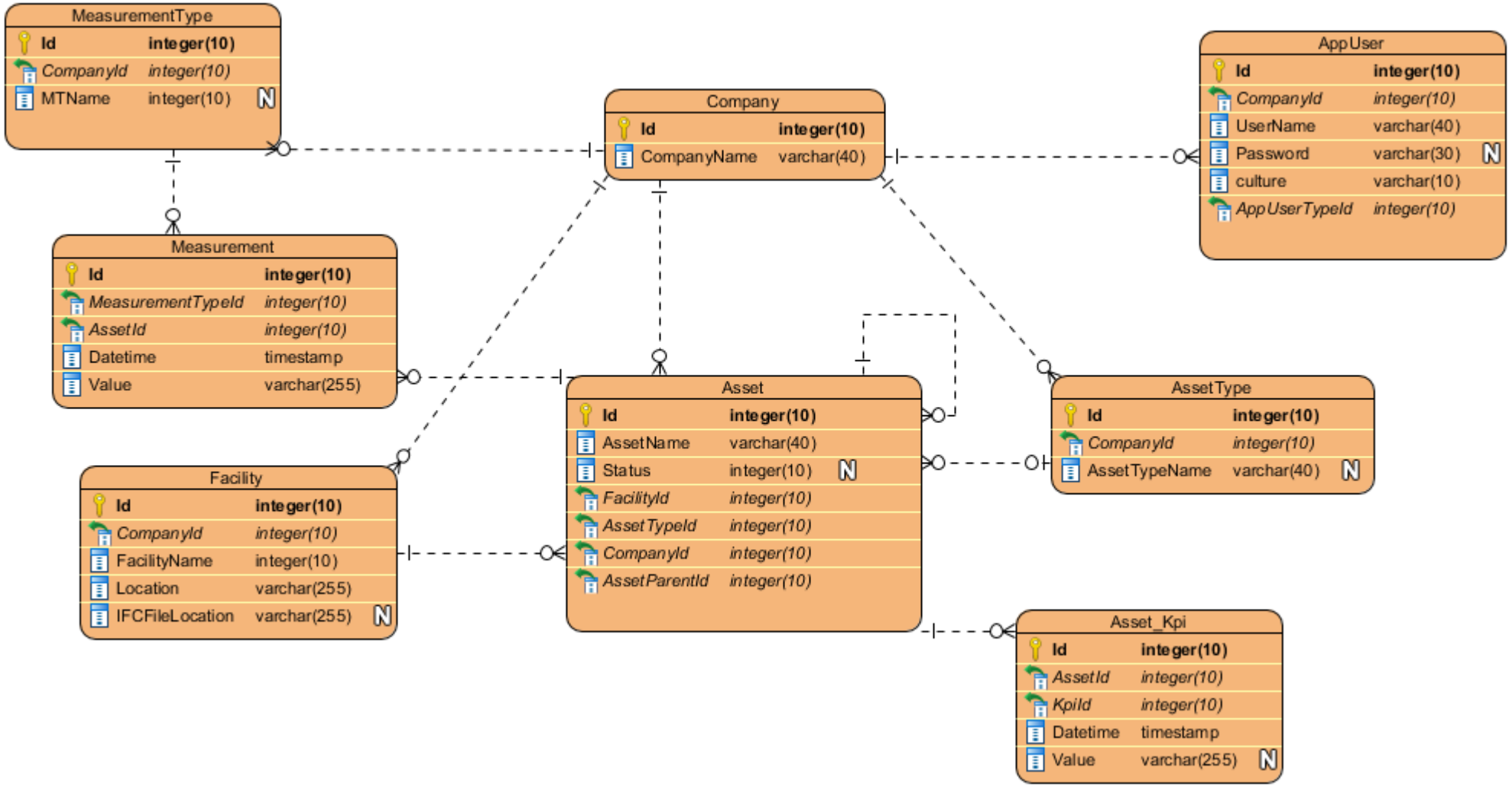
KUKULLAGA

- Industrial building of railway workshops and garages, provided by Euskotren.
- Deployment of sensors and advanced wireless communications systems
- Self-generation of energy for the workshop, through batteries storage and renewable energy.
- Deep Learning for pattern identification and correlations for the continuous optimization of operations

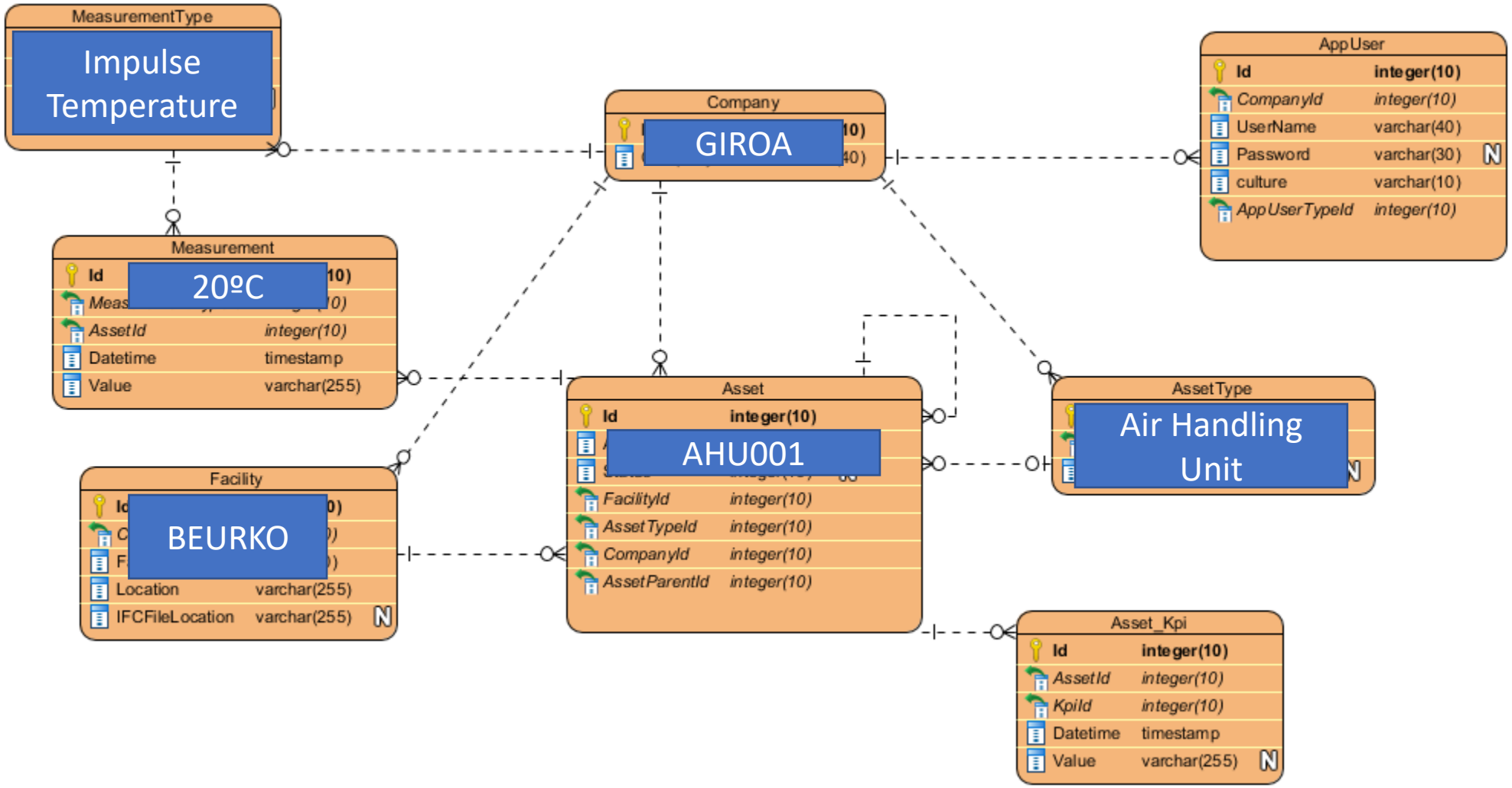
IoT Cloud Platform Architecture



CMMS data model

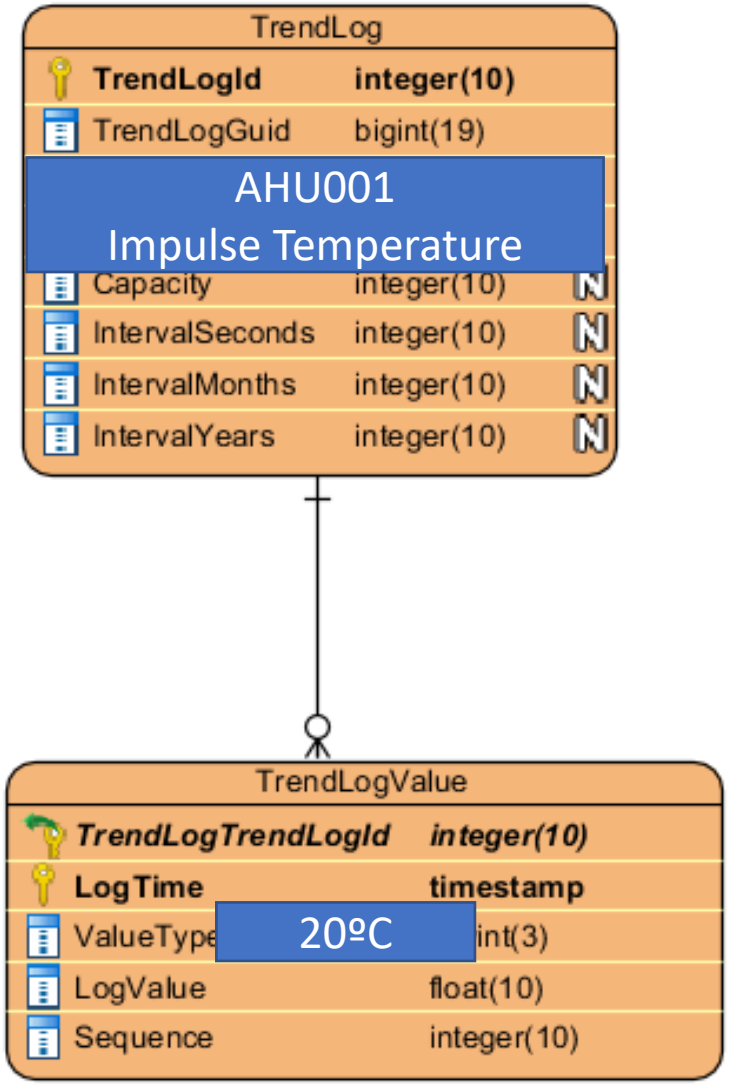


CMMS data model

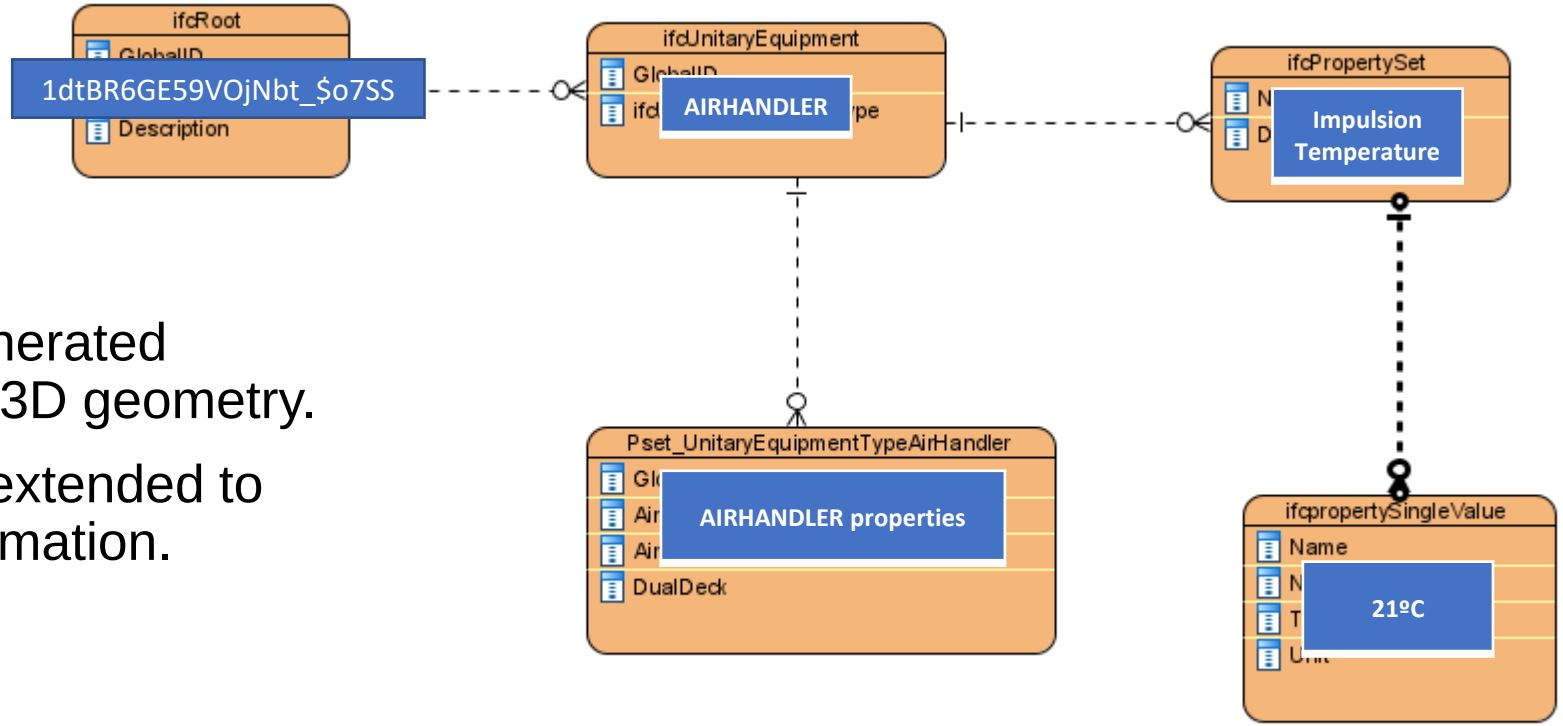


SCADA data model

- SCADA example TAC Vista
- Measurement Id = TrendLogId
- Asset identifier and measurement type is embedded in the Name of the TrendLog
  - Example “LNS-BUSES-**AHU001**-FC_P2-FC P2 ESC1 01-LOG.**TEMP_IMPULSE**”
- **How to ensure the coherence of the data?**



IFC Data Model

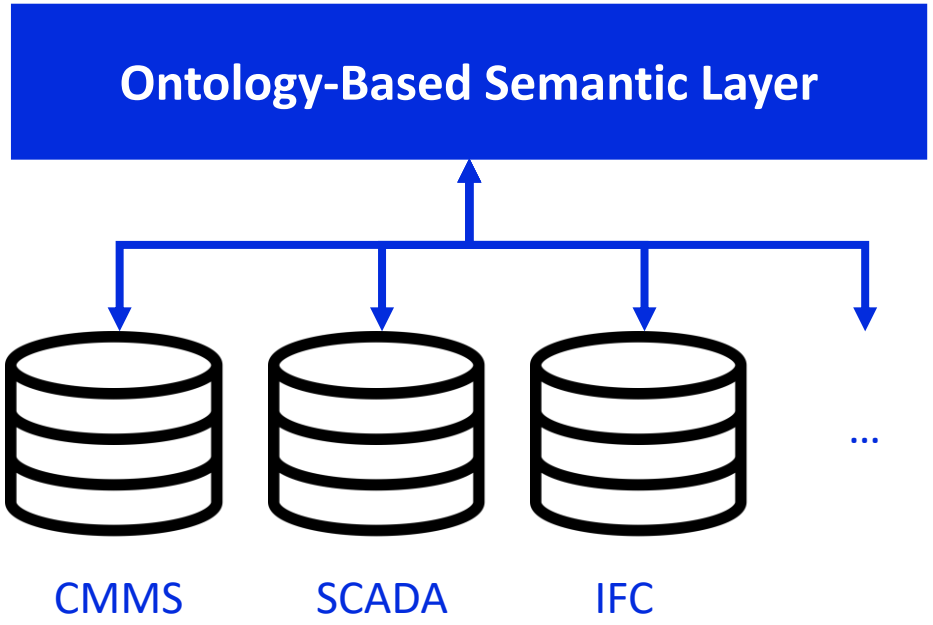


IFC GlobalID: auto-generated during IFC export from 3D geometry.

Exported IFC must be extended to support Operation information.

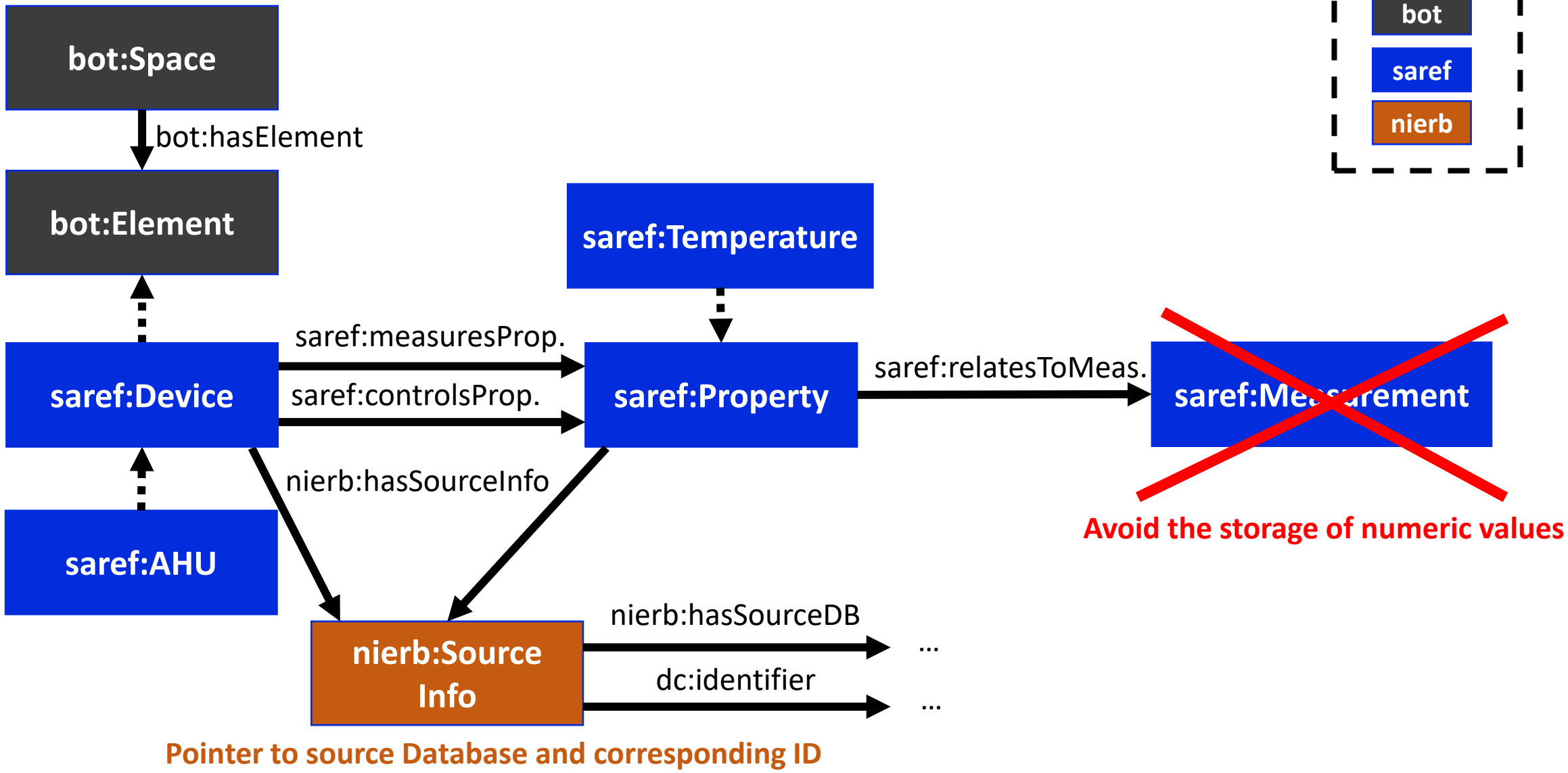
Other ways to export related information?

Semantic Interoperability



- Abstraction from underlying data models
- Avoid storing everything in a single database for performance issues
- Ontology-based representation
- Unified way of accessing information

Semantic Interoperability



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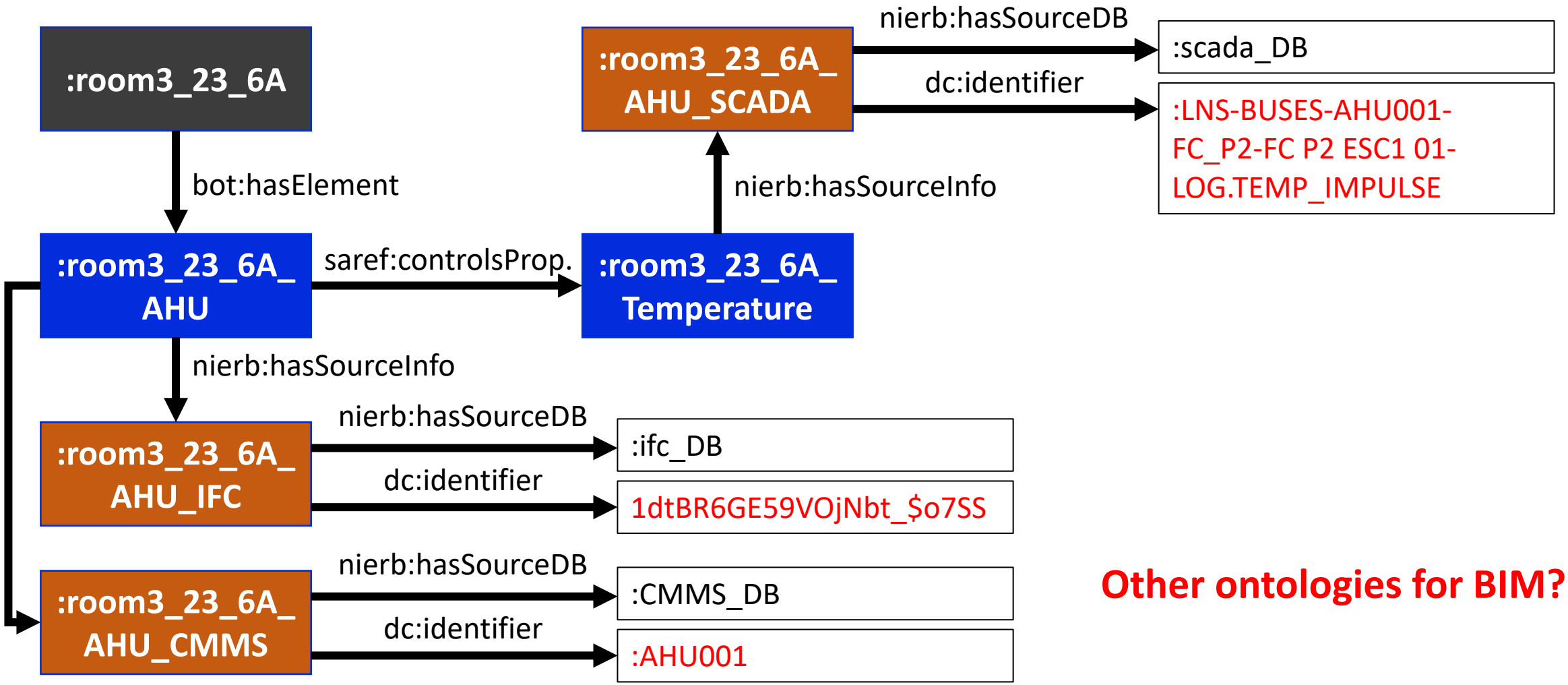

Other ontologies for BIM?

Benefits

- Heterogeneous systems integration
- Avoid a centralized database development
- Scalable and extensible solution
- Interoperability with other systems provided by the ontology

Discussion

- Other ontologies for BIM?
- How to use the shared IDs?
- Other ways to export related information?
- Other ways to ensure the coherence of the data?

Tekniker
Parke Teknologikoa
C/ Iñaki Goenaga, 5
20600 Eibar (Gipuzkoa)
Tel: +34 943 20 67 44