Energy-aware BIM Cloud Platform in a cost-effective building renovation context

Project Number: 820434

Digitalization Tools for Energy-Efficient Renovation Workshop

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *820434*

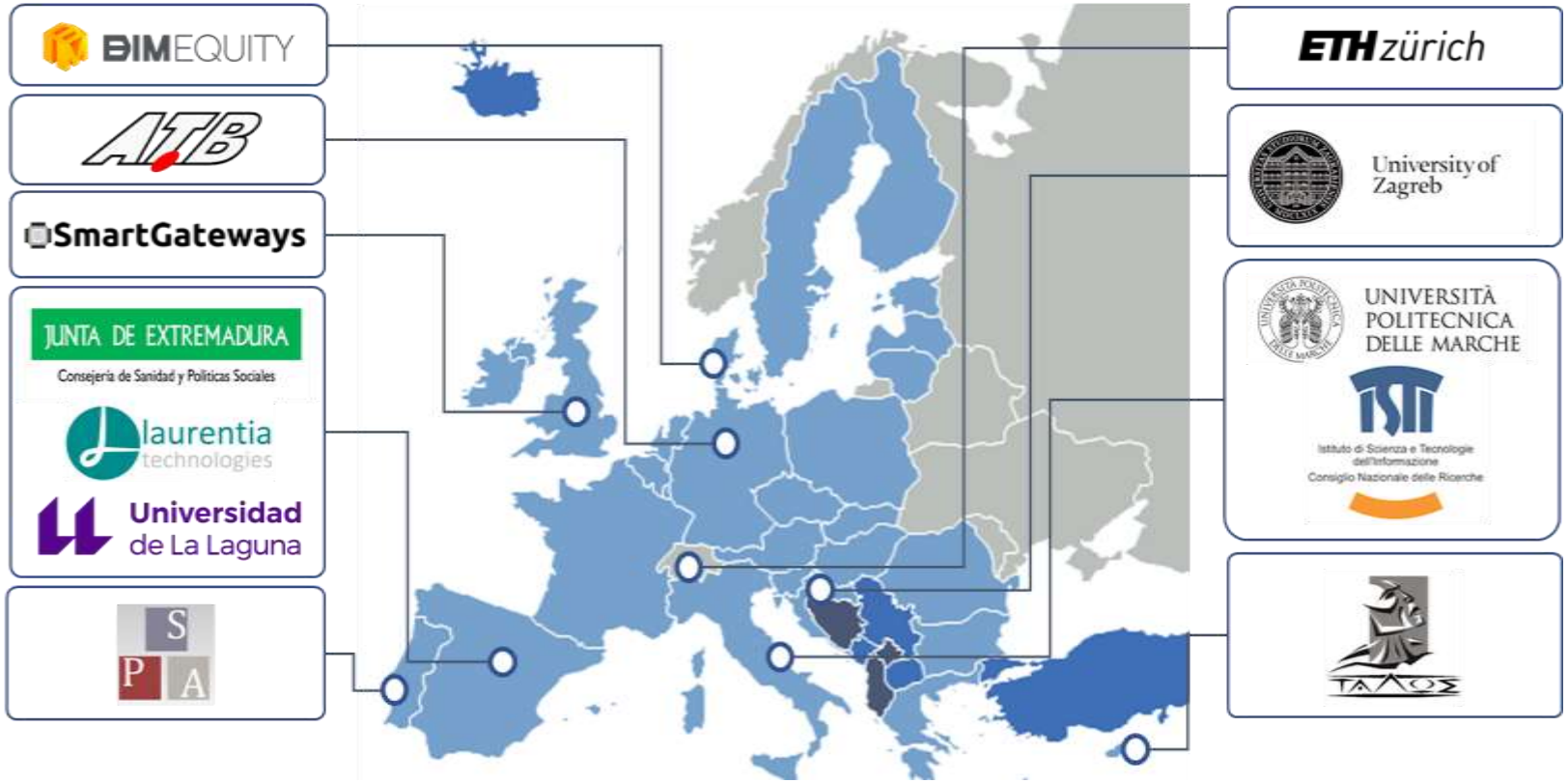
Some data about the project

H2020 **RIA Project** under *Industrial Sustainability* call, *Energy Efficient Buildings* (topic *LC-EEB-02-2018 Building information modelling adapted to efficient renovation*).

Starts: January 1st, 2019

Duration: 42 months

Coordination: ATB Bremen



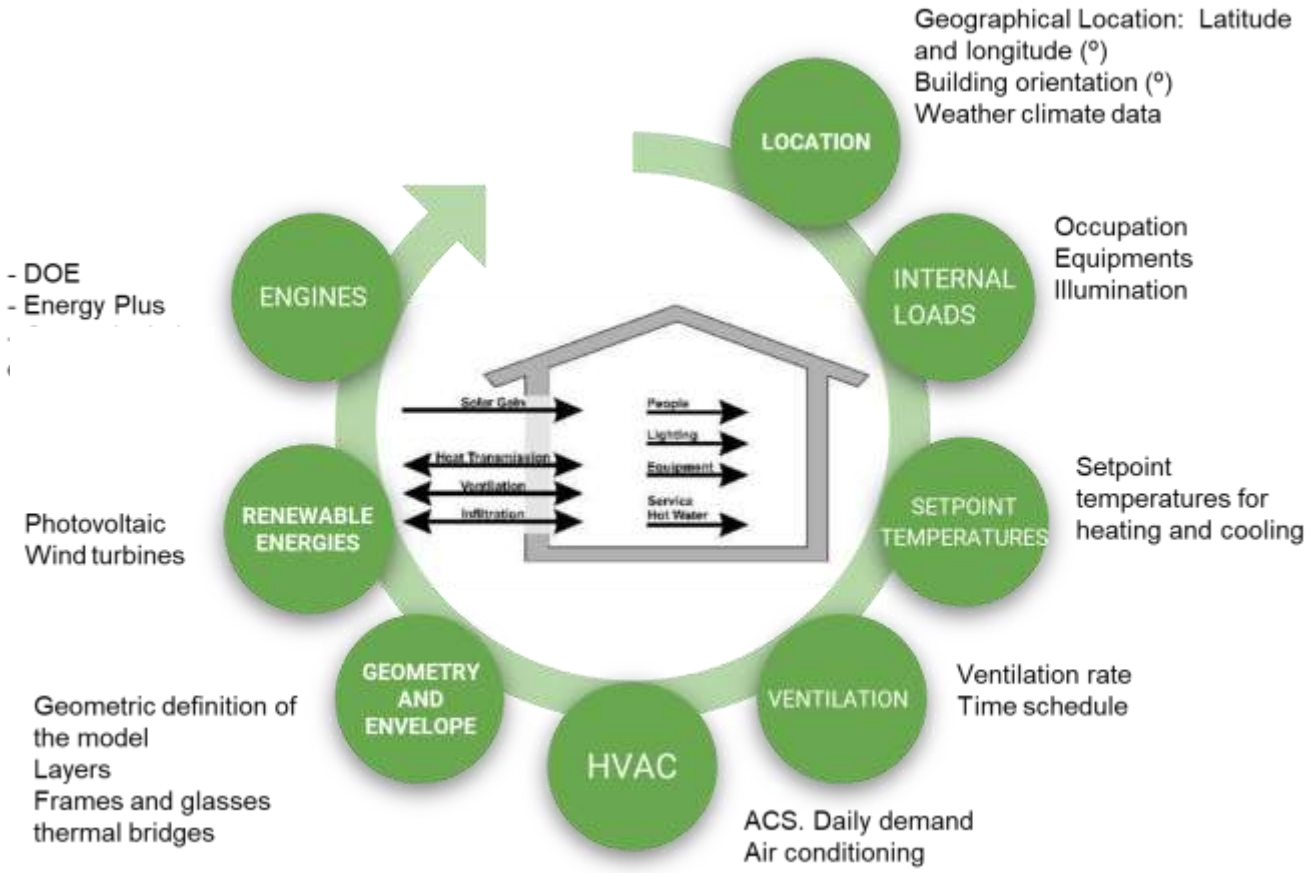
SUSTAINABLE PLACES

Main objective

To provide **effective and affordable BIM tools** that accelerate the whole renovation **life-cycle** (from data collection to project execution and commissioning/delivery), taking into consideration **energy efficiency and comfort** parameters, and involving all the **actors** in the process.

Energy Efficiency Models

To design a **Building Energy Efficiency (EE) model** that observes the climatological diversity of European countries and their regulations



Comfort Models

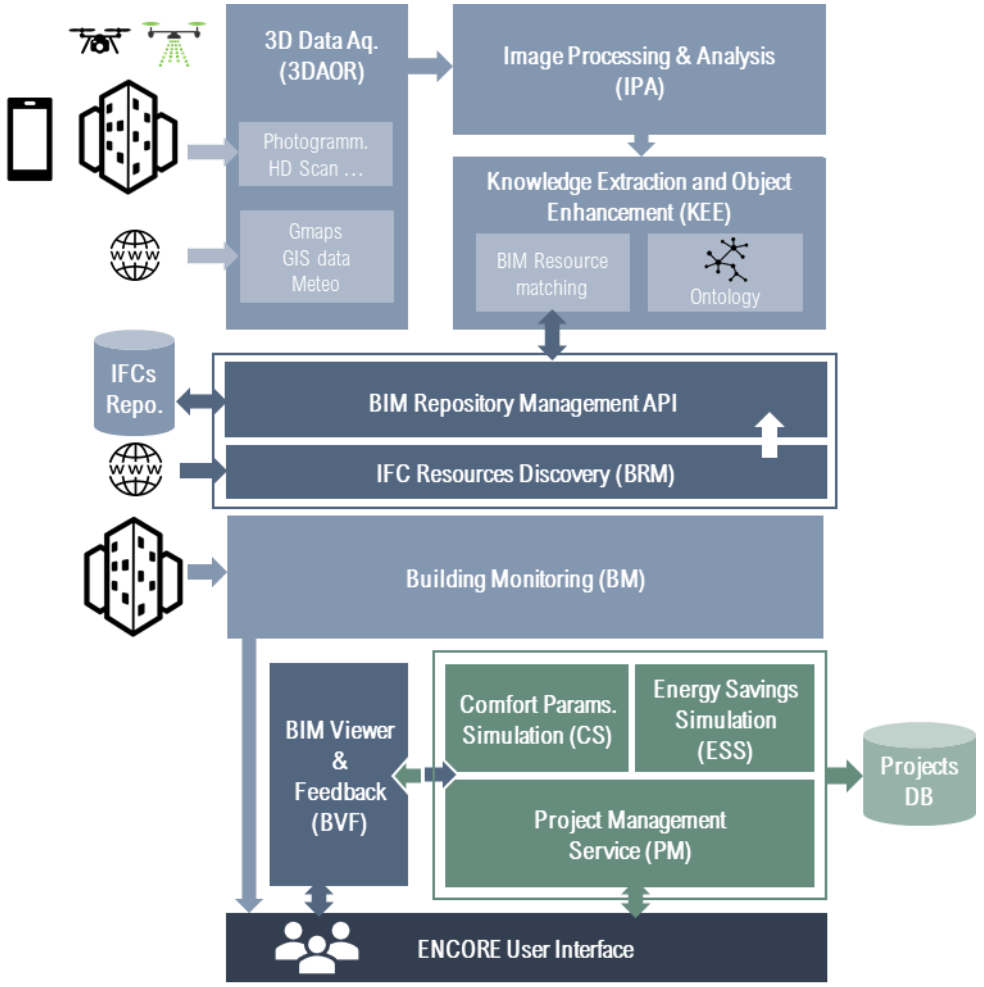
To design a **Comfort model** that observes the climatological diversity of European countries and their regulations (indoor air quality, thermal comfort, acoustical comfort, visual comfort, energy efficiency and HVAC system control)

- **Comfort** is *"that condition of mind that expresses satisfaction with the environment and is assessed by subjective evaluation".*
- Subjective evaluation = Involvement of real dwellers.
- The **Adaptive Comfort Models** applied to climate data representing various climatic zones, selected according to updated **Köppen-Geiger** classification.

BIM Cloud-based solution

To design a **BIM Cloud-based solution** with features/services for all the stakeholders in the renovation life cycle of small or large projects:

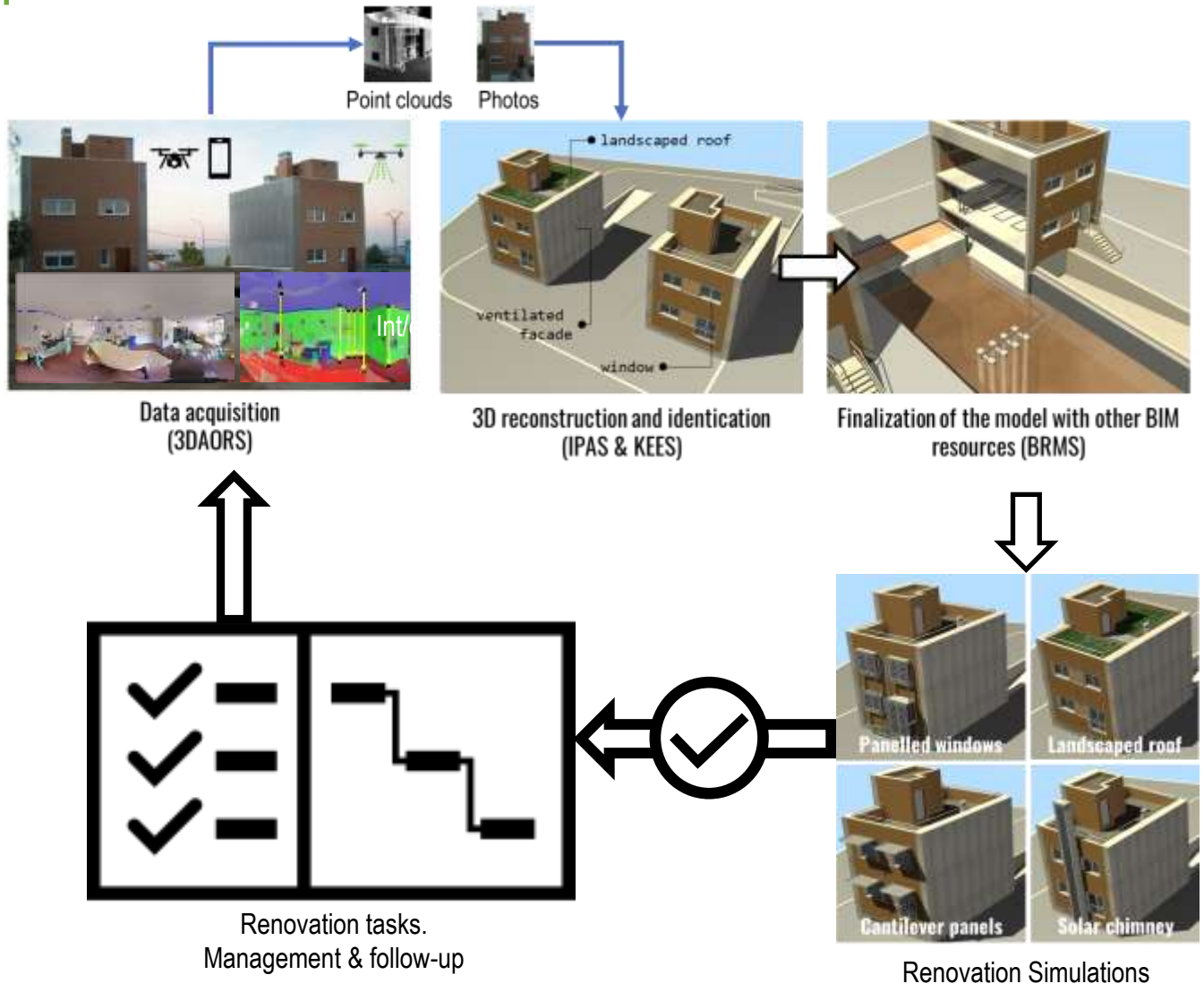
- Data acquisition/surveying with LiDAR, photogrammetry (interior/exterior).
- Automatic semantic segmentation and classification.
- Automated/assisted generation of models.
- Enhancement of models with BIM resources.
- EE & Comfort simulations.
- End-users' feed-back with AR/MR.
- Automated generation of tasks for construction crews.
- Continuous monitoring of facilities.



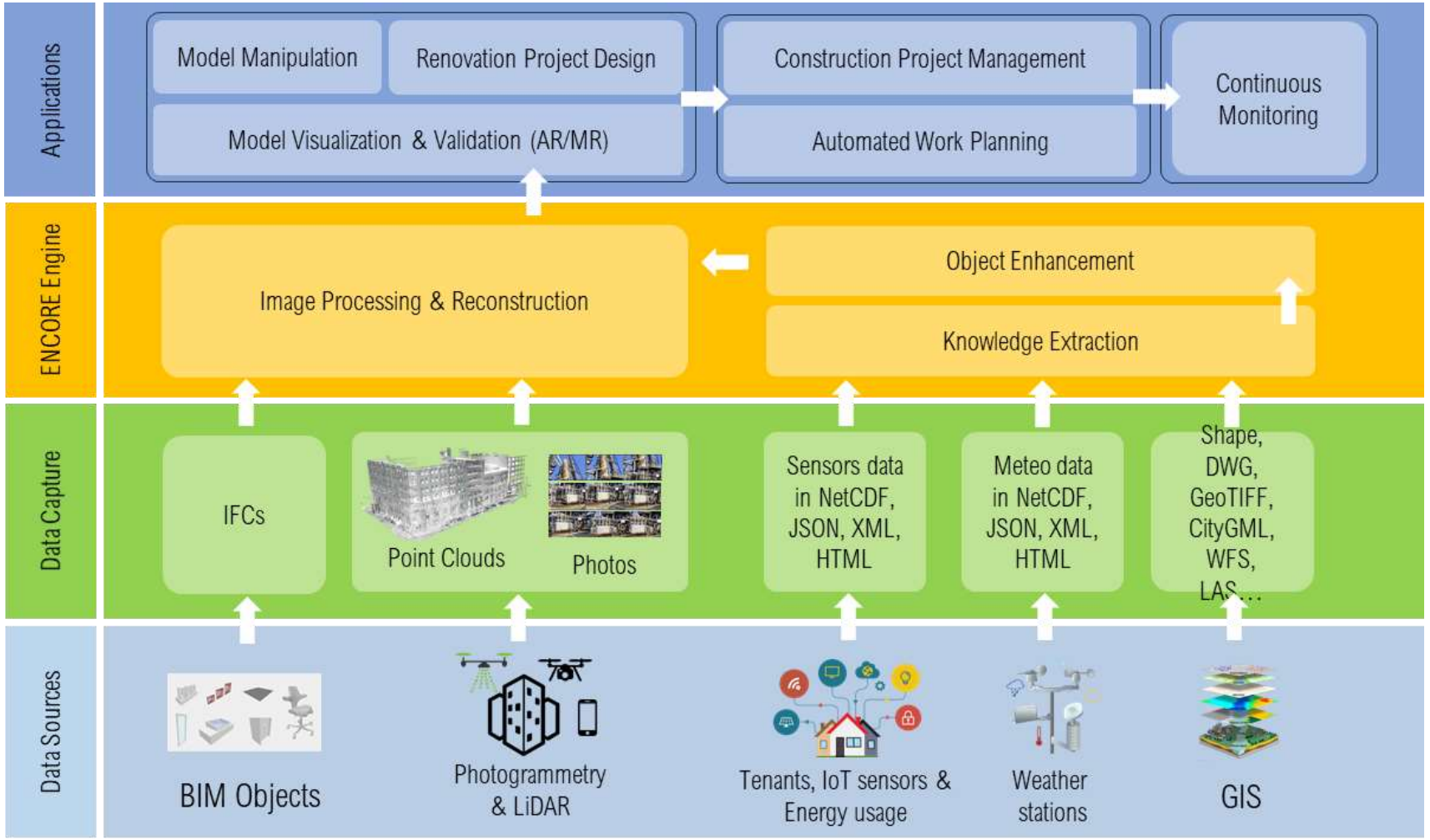
Pilot Validation

To **validate** the new renovation life-cycle and the platform in experimental pilots.

To **assess** them in real life conditions in social dwellings of Extremadura (Spain), obtaining feedback from real dwellers.



Architecture



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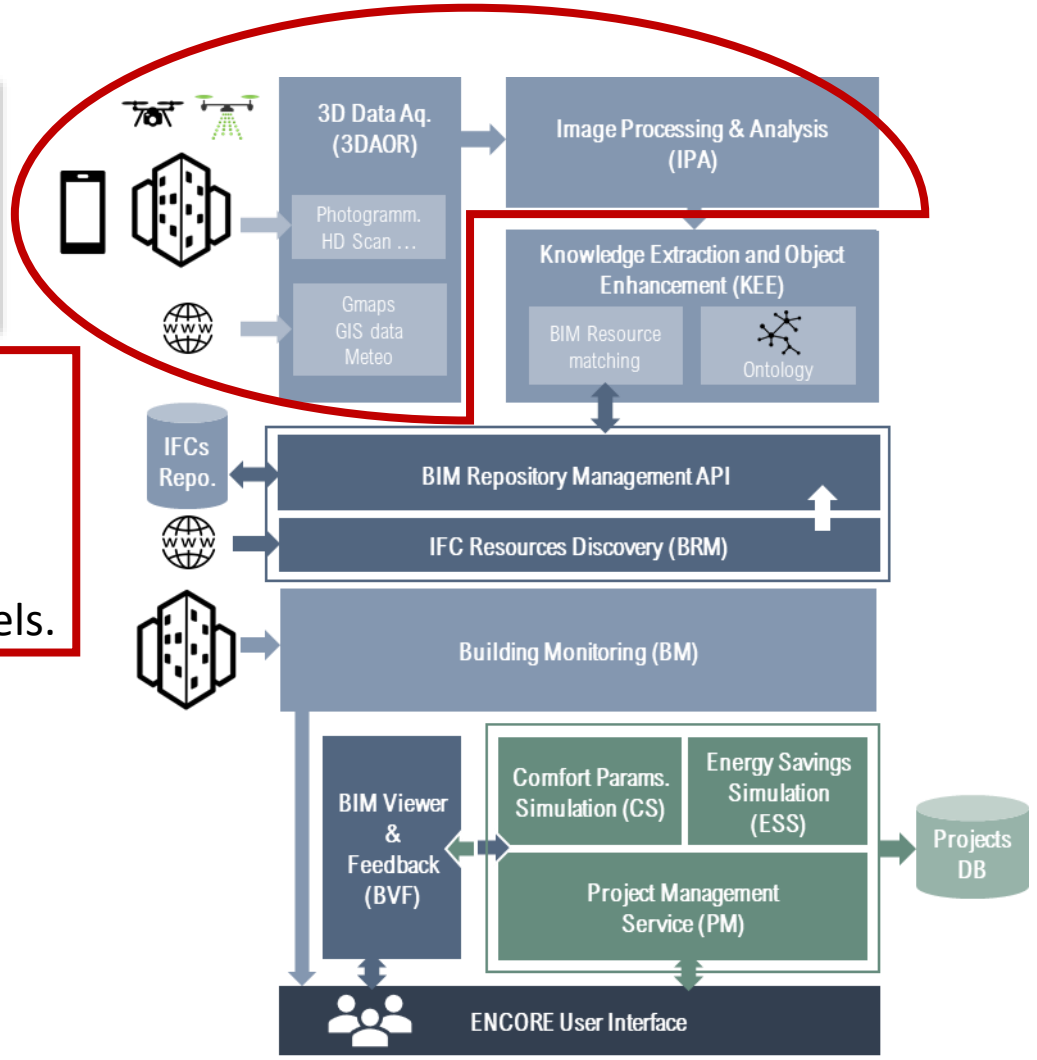


3D Data Acquisition
Unmanned Aerial Vehicle (UAV)

- T-motors U8 Lite Kv150 12S with 22-inch carbon propellers
- autopilot Pixhawk 2.0
- maximal take-off weight is 12 kg with 2 kg of payload
- Intel NUC i7/16GB computer running Ubuntu 18.04 LTS and ROS melodic
- ZED Mini stereo camera
- Smartek visual camera
- Velodyne VLP-16 Puck Lite 3D lidar
- Intel Neural Compute Stick 2
- two LiPo 12S 14000 mAh batteries
- 30 minutes of flight time.

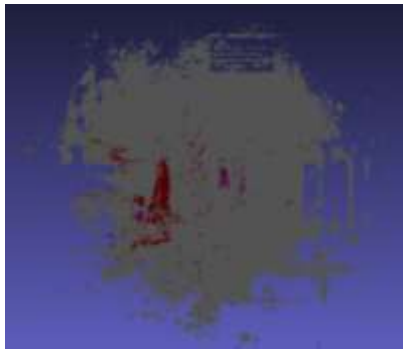
Experimental results

Mission execution by 1 UAV

Image Processing and Reconstruction Service

Data Input from UAVs

DAS (2D)



DAS (3D)