

Highly Innovative building control Tools Tackling the energy performance GAP

Purpose

Differences between expected and actual energy consumptions in buildings arise from issues arising from the design, construction, commissioning and operation. This **Energy Performance GAP**, which often exceeds 50% of the overall energy consumption, has detrimental implications for the achievement of EU energy targets.

The objective of the HIT2GAP project is:

- to reduce the energy performance gap between predicted and actual building performance, focusing on the **operational phase of buildings**
- to propose a **new paradigm** for the development of **energy management platforms in buildings**, integrating existing expertise and resources
- to provide a **smart, open platform** associated with **added-value modules based on analytics** of data collected in the building.

Funded by the European Union under the Horizon 2020 research and innovation programme, HIT2GAP is active from September 2015 to August 2019.

Main Activities

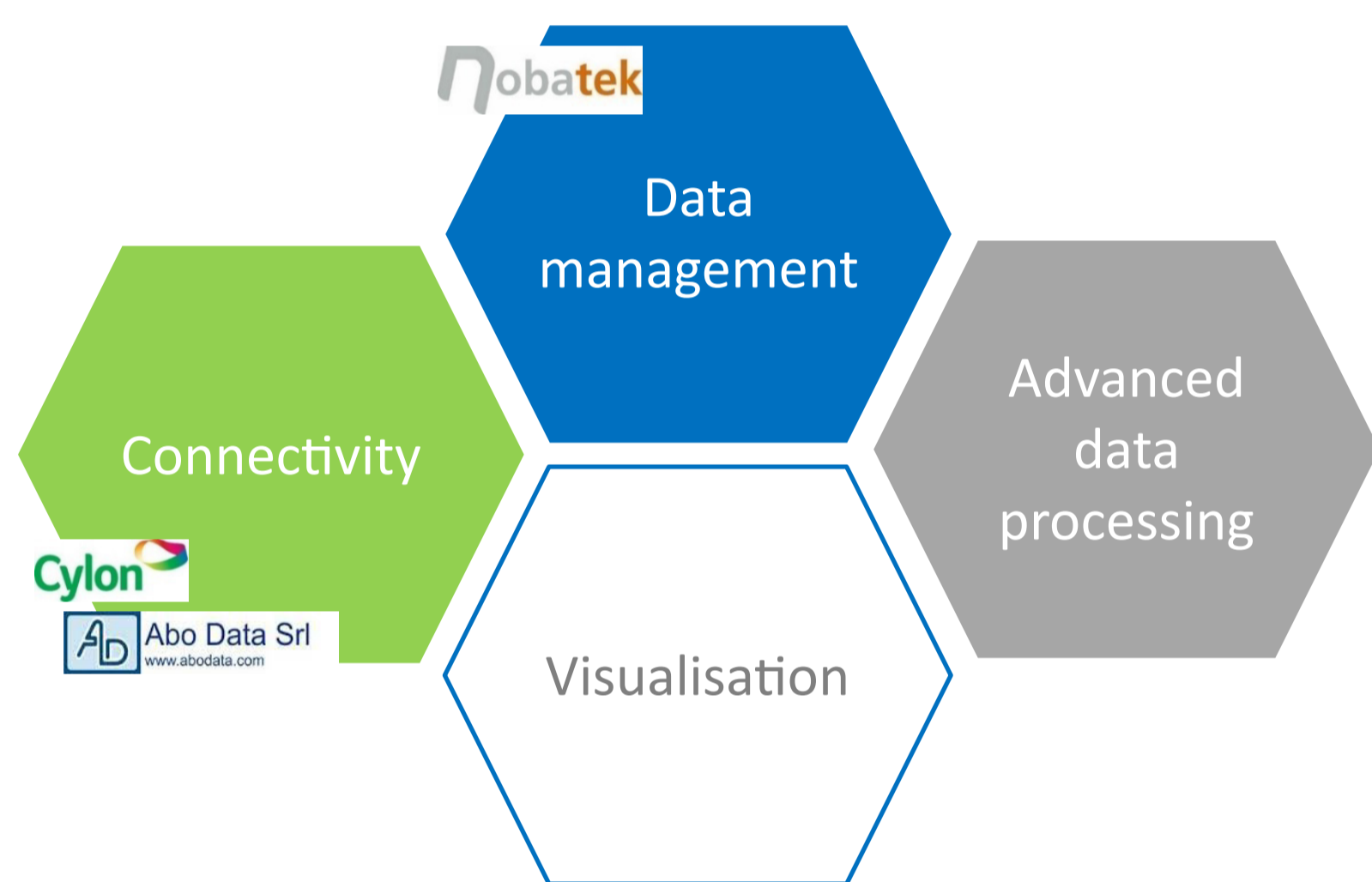
The project's main activities are:

- **Development of a modular, extensible and open data platform** to collect, clean and store information about a building and deliver these data to application modules
- **Development of modules based on DMKD** (Data Mining and Knowledge Discovery) methods to explore data and extract knowledge about building operation
- **Development of modules based on a modelling approach** to predict energy requirements, detect abnormal behaviour and optimise control strategies
- **Development of user-friendly and tailored display modules** for particular audiences to present data coming from advanced analysis of data, and to raise awareness for a building's occupants about the impact of their behaviour on energy performance
- **Demonstration of the developed solution** in four pilot sites and evaluation of the impact and savings achieved using this solution.

Project Partners



Services Delivered



Basis functionalities of the platform

- **Data structuring:** data model based on ontologies covering the whole building
- **Data pre-processing, consolidation and alerts:** conversion, detection of outliers and missing data, extrapolation
- **Data storage:** MONDAS (FISE) and HDF5 (Hierarchical Data format)
- **Load Forecasting:** based on historical data, this functionality is useful to support different energy management activities as energy budget control (monthly forecasting), demand response (short-term forecasting, such as hourly predictions) and performance measure and verification protocols (IPMVP, ISO 50015:2014).
- **Model calibration:** automatic calibration of a simulation model based on data input-output pairs for multiple simulation cases corresponding to judicious input parameter perturbation
- **Provision of data to the apps:** web services.

Advanced data analysis

- **Fault Detection and diagnosis module** (PCA and DMKD based): enhanced monitoring capabilities that evaluate the building behaviour with respect to normal operation and detect faults
- **Energy Management module:** support to the management of all the opportunities, plans, actions, communication and documents needed for ISO 50001 in a workflow-based solution.

User Behaviour modelling

Information directly acquired from the occupants via **monitoring devices** and **questionnaires**. **User behaviour models** combined with building information are used to generate a dynamic, adaptable and holistic recommendation and decision support system.

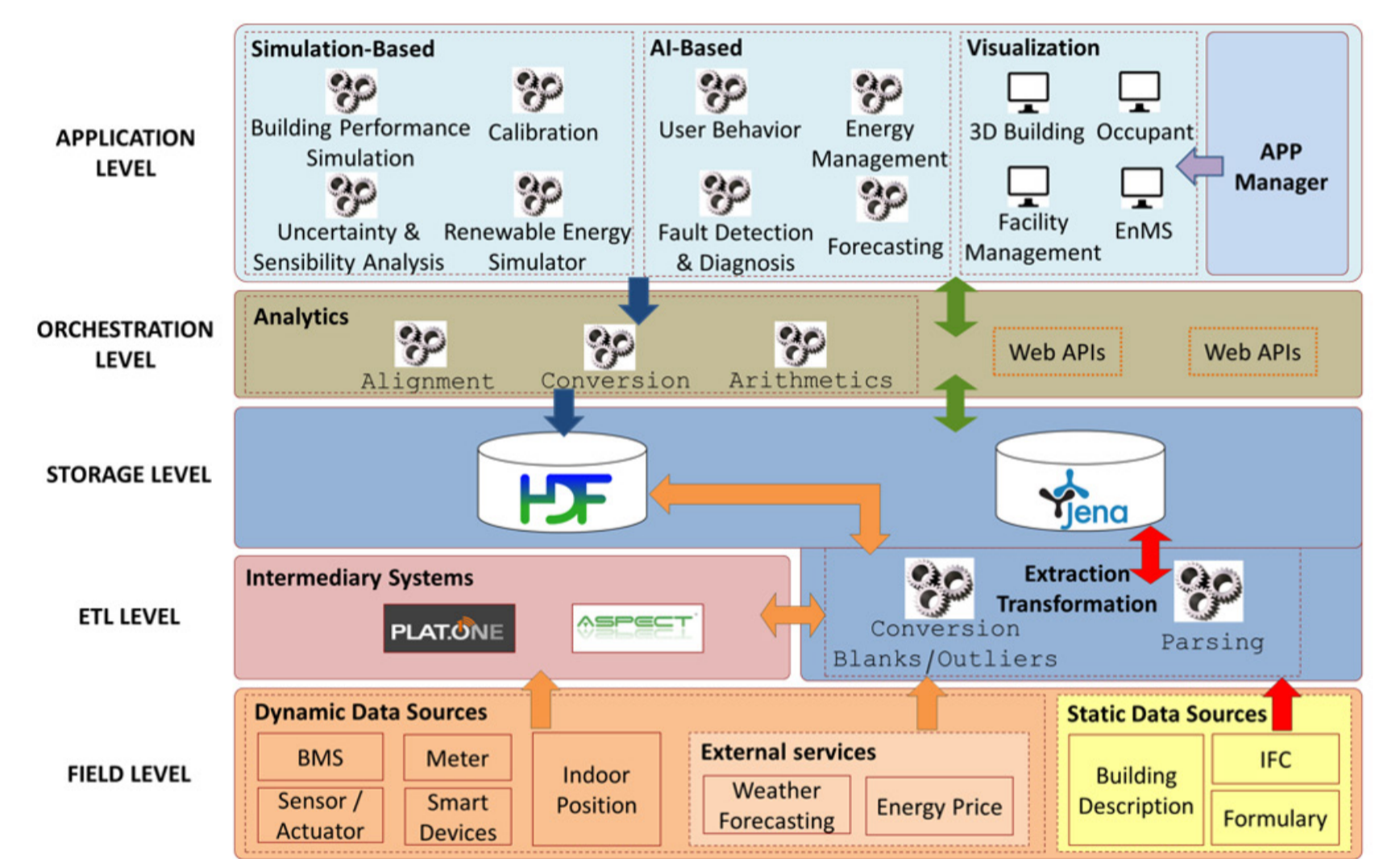
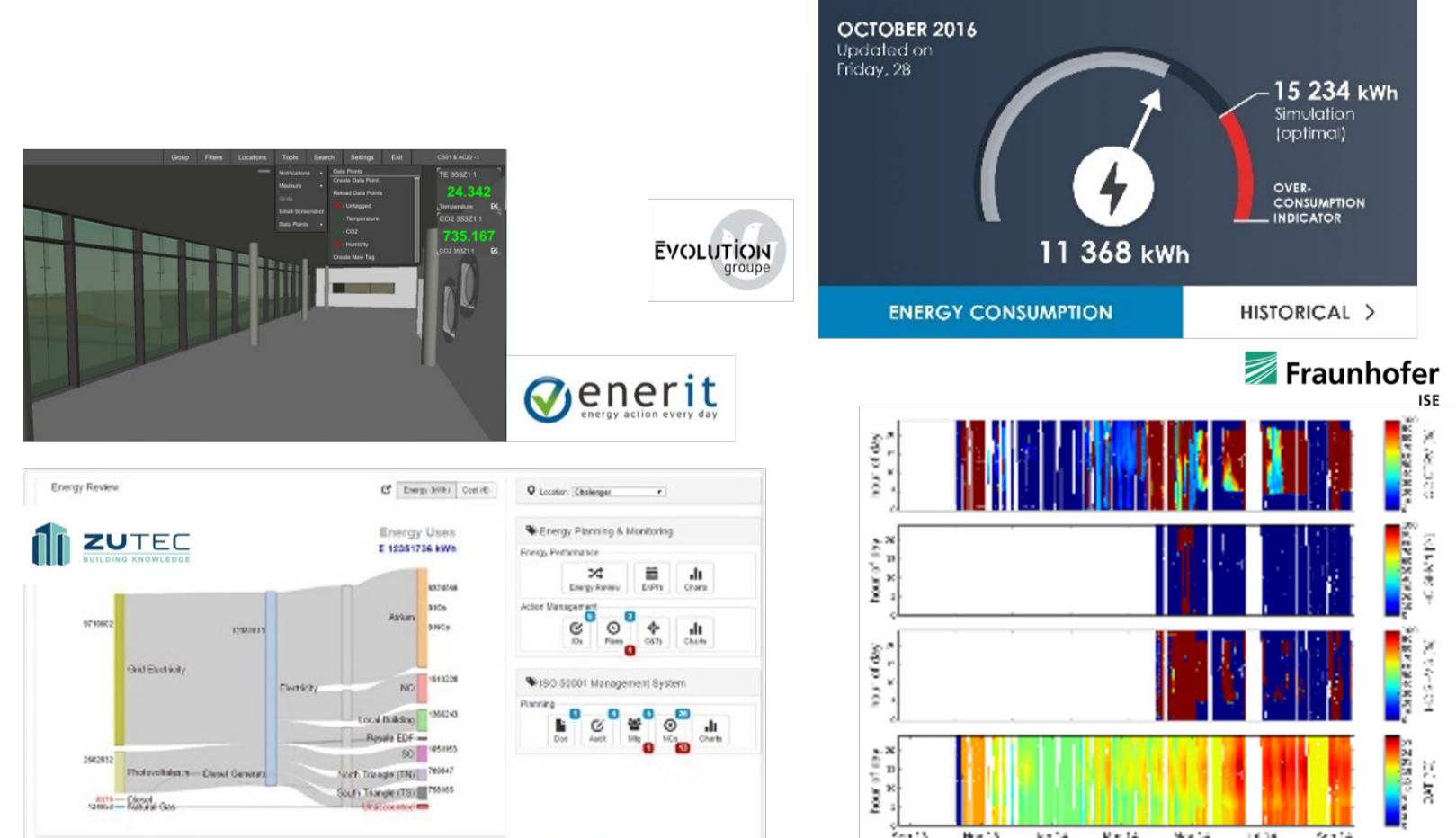
Building Performance Simulation services

- **ModSCO (Model-Supported Control):** implementation of Reduced Order Models to assess HVAC performance of buildings by offering simulation capabilities of users/stakeholders in order to analyse and optimise HVAC control strategies in a targeted zone of a building.
- **Building Performance Simulator, ESP-r:** identifies locations within the building where indoor environmental quality may fall below levels prescribed in international standards. It supports decision making by facility managers regarding user's complaints and potential solutions.
- **Gap Reasoner:** based on uncertainty and sensitivity analyses of building performance simulation. Major influences on the energy consumption are listed, which show possible reasons for an existing energy performance gap and provide energy managers an orientation to improve the building energy efficiency.
- **REnSIM:** supports the user in the management of the energy arising from renewable sources and the effective integration of this into the installation. It leads to maximisation in the profitability of the installation and the early detection of losses and malfunctions. REnSIM provides computation for three types of renewable systems (Solar Thermal System: Hot Water, Space Heating and Photovoltaic System).

Display modules

Adapting visualisation interfaces to cater for specific user needs, to ensure effective delivery and presentation of information to different groups of end-users:

- **3D visualisation,** based on BIM model of the building
- **Facility manager interface**
- **Building occupants interface**
- **Energy manager interface.**



Who is targeted?

Main end-users/customer segments :

- Building Owner, Estate Manager
- Energy Manager / Facility Manager / Maintenance Manager (EPC, awareness raising of occupants)
- ESCo /Facility Management organisations
- Energy Efficiency Consultant/ Professional (e.g. engineers, designers)
- BMS providers (to enrich the existing offer).

Contributors segments (win-win strategy):

- External developers
- Actors in the value chain associated with monitoring and measurement of building energy performance.

Contact Details

Project coordinator:
Pascale BRASSIER
NOBATEK/INEF4
pbrassiernobatek.com

Find us on



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Demonstration Sites

