



Self-assessment and optimization services

The SATO project aims to create a new energy self-assessment and optimisation platform, the SATO platform, that supports a self-assessment framework and multiple self-optimisation services that will contribute to lowering the energy consumption of buildings and increasing their energy flexibility, efficiency, and occupants' satisfaction. The Self-Assessment and Optimization (SA&O) services section of this platform is comprised of several automatic energy management services, interfaces, and applications that will enable interactive and automatic decision making in the SATO platform. The interfaces will serve as a means for interacting with relevant actors (depending on their roles) to raise awareness on the platform status, facilitate data visualization, receive actors' preferences or configurations, and provide an overview of the energy management building.

A service in the SATO project is considered a modular, self-contained, software functional unit that continuously performs a task, which provides value to diverse receivers and actors. In SATO, the Self-Assessment and Optimisation (SA&O) services are divided into two main categories. The first, the Self-Assessment service, provides means for other system components and third-party software to access the results from all self-assessments from all building pilots in the project.

The second, the Self-Optimisation service, executes optimization-based energy management services to make decisions and sends the corresponding suggestions to the appropriate actors or actuators to the corresponding devices in buildings. These self-optimisation services are subdivided into four categories that focus on:

- User Comfort: 4 services about thermal, air quality, visual, and acoustic user comfort.
- Flexibility: 4 services about the flexibility of the Building-as-a-Battery, appliances, electrical vehicles charge/discharge, and energy storage.
- Systems and energy-related Equipment and Building Components (EBCs): 2 services about the systems and EBCs and the SATO compare service.
- Aggregated control of the buildings: 2 services including one for partial aggregated control and one for whole building energy aggregated control.

Each of the mentioned services relies upon the results from a subset of the self-assessments, which in turn rely upon a subset of KPIs and sensors from buildings. The methodology for accomplishing the services' implementation is similar to the one applied on integrating the Self-Assessment Framework (SAF) into the SATO platform. The process starts by identifying the expected data flows, the software dependencies, and the intended services' features. Then, it generalises the aspects identified for each specific service. Summing up all these specific requirements, the SATO platform can select a software toolset that supports all services and can be configured for each specific case.



More specifically, a component called Self-Optimization Discovery will use the semantic components of the SATO platform (e.g., the Service Semantics) for exploring the hierarchical relationships between services, assessments, KPIs, and devices/sensors. These components include an ontology that will be proposed by SATO for the semantic interoperability. Additionally, the Self-Optimization Discovery will control the configuration and scheduling of the 12 self-optimization services developed in the project. Finally, a Container Management component (e.g., Docker Swarm) is responsible for the deployment, execution, monitoring, and recovery of these services (in case of failures).

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For additional information please contact:

Project Co-ordinator | FCIENCIAS.ID | Pedro M. Ferreira | pmf@ciencias.ulisboa.pt

