



# INFORMATION TECHNOLOGY FOR OPTIMISED BUILDING OPERATION

## Abstract

**ITOBO** brings together a full spectrum of academic and industry partners to collaborate in the development of embedded systems addressing the 21st-century needs for the energy-efficient operation and sustainable maintenance of new and existing buildings.

We keep the "human in the loop" with flexible, reconfigurable wireless systems that help occupants optimise their environment rather than imposing an environment upon them.

We enable employers in the ICT and construction sector to create sustainable jobs in the knowledge society by delivering a paradigm shift in new business models for collaborative work.

## Objectives

**ITOBO** will contribute to improved asset management in Ireland and abroad while supplementing efforts to fulfil the Kyoto Protocol requirements. Our detailed work-plan culminates in field testing of operational systems.

These operational objectives for managing the built environment will in turn drive the development of enabling technology and basic ICT science. We expect that the fundamental science developed and the experience obtained in the domain of energy efficient building operation can be transferred and adapted to other sectors.

## Approach

**ITOBO** will make specific research contributions to ICT in:

**Ubiquitous sensing infrastructures:** by supporting seamless and dynamic end-to-end network composition and service operation through sensor and RFID hardware.

**Disruptive networking paradigms:** by enhancing the management of large-scale, complex networks, services, and mobile users through introducing new network and management approaches.

**Decision support systems:** the development of novel constraint-based preference models and optimisation algorithms that support the configuration, adaptation, and servicing of smart buildings and the networks that manage them.

**Dynamic, re-configurable service architectures:** by designing a system architecture that will support scale-free composition of service coalitions with managed operation across several administrative (e.g. tenant, owner, building-operator) and business domains (e.g. suppliers, network operators, facility managers).

## The Team

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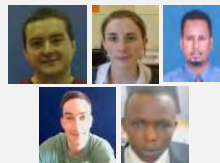
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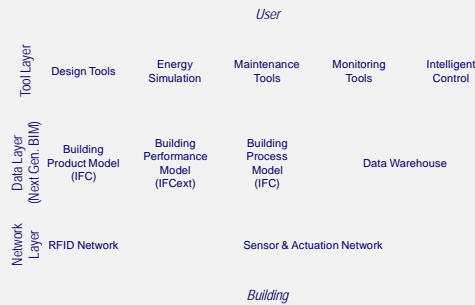
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## Modular Platform



**ITOBO** has developed a modular Hardware-Software-Platform which supports the installation of a holistic “end-to-end” building performance analysis solution; comprising of

- (1) Web-based data representation and analysis
- (2) A powerful Data-Management platform supporting BIM and Performance Monitoring in a holistic way
- (3) Wireless sensors of “indefinite lifetime” and a gateway box for wireless data transmission within and between buildings.

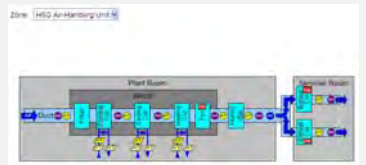
## Web-based Monitoring

**User Comfort**, e.g. temperature, CO2 humidity, etc.) can be transparently monitored.



**Data Aggregation** & other mathematical functions are available for analysis.

**Energy Demand & Performance** can be monitored on component level.

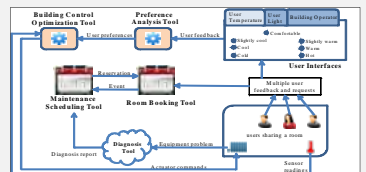


## Performance Analysis

**User Preferences** and weather data is analysed to inform Intelligent Building Control.

**A Performance Metrics** delivers detailed information how single components should perform optimally.

**Model-based Control & Diagnostics** takes the user preferences, weather data, and component-based performance specifications into consideration.

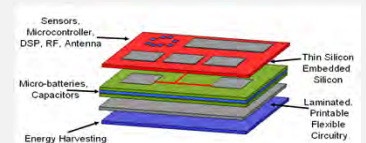
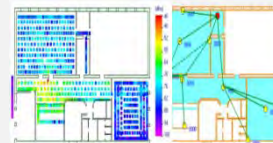


## Wireless Data Acquisition

**Building Energy Mote (BEM)** compiles up to 6 different data streams which can be (de)activated using software commands.

**The Design Support Tool** assists technical staff in the generation of layouts using existing floor plans.

**Energy Harvesting** in combination with intelligent embedded software ensures indefinite sensor life-time and 58 hours operation without any battery charging.



## Living Labs

**The Building of the Environmental Research Institute (2006)** is - due to its multiple micro co-generation capacities - a so called “Green Building” representing the ITOBO living laboratory. Demonstration focuses on:

- Understanding performance of integrated systems.
- Maximum installation density.
- Test integration concepts.

The building of the **Dept. of Civil & Environmental Engineering (1910)** is used as demonstrator for intelligent renovation strategies.

Demonstration focuses on:

- a strategy how to holistically document, monitor/, analyse, and upgrade in order to achieve intelligent control in combination with existing older systems.

The building of **CYLON Controls Ltd (~1990)** represented the ITOBO National Demonstrator. Work focused on Lighting Concepts

- To maximise performance of existing lighting systems.
- Develop novel control scenarios for “lighting on demand scenarios” considering presence detection, scheduling, and workflow analysis.

**The HSGzander Hotel & Training Center**, represents the ITOBO International Demonstrator.

- Work focuses on mechanically operated HVAC.
- Advanced monitoring & performance analysis.
- Minimum installation density for sensing and metering.
- Data Analysis and Data Mining.



ERI



CEE



CYLON HQ



HSGzander Training Center and Hotel