



BUILDINGS' SMARTNESS

"Innovations for upgrading smartness of buildings" SEP. 6TH – SEP 9TH, 2022 NICE, FRANCE

SUSTAINABLEPLACES.EU





A workshop organised by:

S2022

NABLE

#SUSTAI



Workshop chairs: Karine Laffont-Eloire (DOWEL Innovation) and Nerea Gómez Morán (ECTP)





Welcome to the Smart Building Innovation Community

SUSTAINABLE PLACES 2022

Workshop content



9:05-9:15	Opening by the European Commission - Pierre-Antoine Vernon, CINEA
9:15-9:35	SmartBuilt4EU, the European Smart Buildings Innovation Community, Nerea Gomez - ECTP and Clémentine Coujard, DOWEL Innovation
9:35-10:30	Projects pitches and panel discussion Part#1: Upgrading smartness of existing buildings through innovations for legacy equipment
10:30-10:45	Coffee Break
10:45-11:35	Projects pitches and panel discussion Part#2: Smart operation and building dynamic optimisation
11:35-12:00	Collective and interactive session to reflect on Smart Building R&I priorities - VITO
12:00-12:15	Concluding keynote speech: Importance of data governance to meet the major current challenges of society - Emmanuel François - Fonds MAJ





The Smart Buildings community

Opening by Pierre-Antoine Vernon *CINEA*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.



Workshop 'Innovations for Upgrading the Smartness of Buildings'

Opening – EU support to make European buildings smarter



Pierre-Antoine Vernon Project Advisor, CINEA

Sustainable Places 2022 8 September 2022

Europeon Climate, Infrastructure and Environment Executive Agency

Support to the coordination of European smart buildings innovation community

> 2018

- > EPBD revision: (Energy-related) building smartness matters ! Smart readiness indicator
- Mapping of EU-funded smart building projects: 64 projects granted € 450 million under 35 topics to tackle common challenges: engaging building occupants, connecting/controlling systems, optimising energy management, making a viable business case...
- Call for proposals to:
 - Map out the European smart buildings innovation community, e.g. main innovators, lessons learned, success stories and potential market developments.
 - > Identify the main initiatives, media and events in Europe to promote building smartness
 - Promote the SRI and support its implementation
 - Suggest priorities for EU support to research, innovation and market uptake





The EU Smart Building Innovation Platform – SMARTBUILT4EU (Horizon 2020)

- Started in October 2020, tackling all challenges to the smart buildings innovation community
- > Achievements:
 - Database of members of the Smart Building Innovation Community
 - Factsheets on smartness upgrades for a set of representative buildings
 - > Co-benefits of smart buildings deserving more investigation and promotion
 - > Working Groups on major issues, resulting in White Papers
 - Future Research and Innovation priorities





H2020 Energy Efficiency LIFE Clean Energy Transition

- Break market barriers, change market and regulatory fundamentals
- Improve governance and capacities/skills at all levels
- Mobilise investment and improve access to finance
- Innovative approaches to support directly the uptake and implementation of EU legislation, targets and initiatives, with real impact on the ground





The sub-programme Clean Energy Transition



- Key programme for EU clean energy policy implementation and fill the gaps between energy efficiency and renewables policy development and implementation
- Predecessor programmes: Intelligent Energy Europe and Horizon 2020 Energy Efficiency
- 2021-2027 budget of almost €1 bn





LIFE-2021-CET-SMARTREADY: Creating the conditions for a global improvement of smart readiness of European buildings

- More effective and ambitious implementation of the SRI in national legislations
- Faster and more comprehensive up-take of the SRI in the market
- Increased share of buildings with smart features, including residential buildings, through financial incentives and deployment of safe and practical technical solutions and packages
- Increased user acceptance of smart devices towards privacy, security and trust
- Improved understanding of the operation and behaviour of buildings, technical building systems and appliances
- 4 projects selected, start date in autumn 2022: will need close cooperation with the DG Energy's SRI support contract and SRI platform, with SmartBuilt4EU





Energy performance and Smart Readiness of buildings

LIFE-2022-CET-BUILDPERFORM

Type of action: Other Action Grants - CSA (95%) Typical EU contribution: up to EUR 2 million

- EPCs and SRI core elements of EU buildings policies, but need to improve uptake, design and implementation across Member States, cost-efficiency, training of auditors, etc.
- Objectives: make EPCs and SRIs more useful, create synergies between them, improve methodologies for calculation or assessment, make them matter more in investment decisions
- Scope A: Supporting Member States and their implementing bodies : adaptation to national context, policy design impact assessment, stakeholder consultations, building data collection, EPC-SRI coordination, SRI implementation support, EPC implementation improvements
- Scope B Supporting the market up-take of EPCs and of the SRI : Integrated EPC-SRI data collection and/or certification, training building auditors, promote improvements for building valuation, awareness raising, trust-building, stakeholder engagement for increased uptake
- Impacts: better user acceptance, coherence between tools and methodologies, better assessment procedures, more comprehensive and faster up-take of EPCs and SRI in the market





LIFE CET Call 2022

- Deadline 16 November 2022
- EUR 98m available for grants



- 18 policy-driven, prescriptive funding topics with detailed guidance
- Recordings of detailed Info Sessions available here: https://www.youtube.com/playlist?list=PLKuLiQigqrClpLvXhql06nJSyWCZ1Su7P
- Most topics: Minimum of 3 (eligible) entities from 3 different eligible countries (EU Member States, EEA, LIFE associated countries)
- 95% co-funding rate (no infrastructure cost, mostly labour)
- Apply electronically via the EC's Funding & Tender opportunities portal

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/life2027





30 years of bringing green ideas to LIFE

Keep in touch with us

Any questions on LIFE Clean Energy Transition call topics? Email us on: CINEA-LIFE-CET@ec.europa.eu



https://cinea.ec.europa.eu/life_en









The Smart Buildings community

Presentation of SmartBuilt4EU, Nerea Gomez, ECTP



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.



Our objective: Support the coordination of the European smart buildings innovation community

From 1/10/2020 to 31/03/2023



Main objectives & activities





InterConnect

Connecting Smart Homes, Buildings and Grids

interConnect is the name of the project that oather

I European entities to develop and demonstrate

igital homes and buildings with the electricity secto

advanced solutions for connecting and conv

The main goal? Bringing efficient energy me

ithin reach of the end-users by interoperable

Examples of promotion activities

- Webinars in collaboration with Build UP, Leonardo ENERGY, ...
- Workshops Back-to-back with large events

Smart Built4EU

March 2021

Smart Buildings

EU-funded Innovations

 Projects and technology brochures: promotion of Smart Building (EU-funded) projects & their outcomes

domOS

Operating System for Smart Services in Buildings

domOS defines quidelines for an open secure privacy

uildings IoT platforms and applications operated by

lifferent parties can be integrated seamlessly thanks

iomenclatures (e.g. SAREF). Compliant services for

perability standards (e.g. W3C) and to com

rgy efficiency, prosumers feedback and flexibility

enabled, multi-service for ecosystem for smart

are developed and demonstrated

Interface Reg 2000 Description Point date Reg 2000 Description

1st projects brochure available <u>here</u>.

2nd projects brochure available <u>here</u>.

1st technologies brochure available <u>here</u>.





Contribution to the promotion of the SRI

Smart Built4E

- Build on SRI developments and findings: support its adoption & uptake across Europe
- Address the lack of clarity in the marketplace about the benefits of smart services/technologies
- Develop:
 - o Co-benefit indicators associated to SB
 - Technology solution packages for SB with a performance assessment (SRI + co-benefits) -> Demonstrate the added value of SB; Promote a business case; Foster market uptake.
 - $\circ~$ Training material and workshops on the SRI & practical testing

t			Off	Office		
		onice				
		Heating, DHW and cooling	Ventilation and dynamic envelope	Flexible operation and smart grid readiness	Reporting information	
	ckage 1: fficiency	Individual room controllers and BACS communication	Variable air flow control based on air quality sensors (CO2) + sensors in exhaust air for HR	Management of HVAC systems: Individual setting following a predefined time schedule including fixed	Generation: actual values (heating, DHW, cooling and ventilation)	
	Work pa Energy E	Variable speed pump and temperature control depending on the load	Night cooling	-	Central reporting for sub- metered energy use	
		Occupancy detection and control for indoor lighting	Manual shading control	-	Faults/alarms detection	



Heating, DHW and cooling	Flexible operation and smart grid readiness	Reporting information
Individual room thermostat control	Management of HVAC systems: Individual setting following a predefined time schedule including fixed preconditioning phases	Generation: actual values (e.g. temperatures, energy usage)
Distribution: Variable speed pump control	Smart appliances management	Central reporting for energy use
Generation: Constant temperature control	Battery storage Logic: Improve self-consumption	Faults detection

R&I roadmap



- Development of a Research, Innovation and Policy roadmap
 - Support the EC and MS gaining a better understanding of the state of play of the SBIC needs
 - Identify & tailor key priorities for EU support to research, innovation & market uptake in smart buildings
- SRIA for smart buildings
 - Specify how the identified R&I priorities can be implemented and fostered within an EU R&I framework
 - Give a view where to put efforts in the EU R&I agenda (HEu and other EU initiatives)
 - Policy recommendations.
- Increase the implementation potential and chances for success of the priority actions, through the synergies SB4EU's larger framework of EU and international initiatives



Join our community!



Join our "Smart Buildings Innovation Community" and actively contribute to the SmartBuilt4EU project's activities!

Click on the <u>Registration page</u> or use the QR code:



- Contact: contact@smartbuilt4eu.eu
- Project website: <u>https://smartbuilt4eu.eu</u>





Overview of the activities and results of SB4EU Task Forces

Clémentine Coujard, Dowel Innovation





- Task Forces' objective and process
- Topics covered
- Contributors
- Content of White Papers and use in further project activities



- **Objective of the task forces:** identify transversal issues and solutions for smart buildings and enable efficient sharing of good practices between projects and experts
- Four task forces:

Task Force 1: Interactions with users End-user awareness, acceptance and feedback	Task Force 2: Efficient building operationInteroperability, cost optimisation and resources efficiency
Task Force 3: Interactions with the external environment	Task Force 4: cross cutting Data, security, business & finance, education
Provide flexibility to the (power, DH&C) networks	



Principles:

- Voluntary-based participation
- Each task force addresses one topic per semester, paced by 3 online workshops
- The outcome of the collective work is formalised into a public White Paper



Process:

Online workshops









Task Force 1: Interactions with users

- **A. End user acceptance and attractiveness**: solutions to improve end-user acceptance and adoption of smart building functionalities
- **B.** Occupant-centric building for enhanced quality of life: integrating smart solutions for enhanced well-being, inclusiveness and health of occupants
- **C. Responsive end user**: tools and strategies to give operational feedback to the end-user (vs awareness) leading to behavioural changes









Task Force 2: Efficient building operation

- A. Interoperability among building components & systems
- **B. Optimised building costs:** Integrating tools for optimised costs over full life cycle (incl. BIM, digital twin, predictive maintenance, AI, weather forecast, predictive control)
- **C. Smartness to reduce building's environmental impacts:** Resource efficiency; Environmental impact management; Integration of renewable energies (incl. DC building)









Task Force 3: Interactions with the external environment

- **A. Providing flexibility to power grids:** data interoperability to provide flexibility to the electricity grid
- **B. Smart building as enabler of new energy practices and communities:** Smart buildings & electromobility; Local Energy communities, Energy efficiency
- **C. Data driven indicators for smart buildings:** SRI and use of real-time data for performance indicators

✓ published

✓ published



Task Force 4 : Crosscutting issues

- A. Financing and business models: New services, financing & business models (incl. Building as a Service), integration of new technologies (Blockchain)
 - ✓ published

✓ published

- **B. Data governance, security and privacy:** Cyber-security; Data privacy & protection
- **C. Education:** Integration of IT & user-centric dimensions in curricula of academic and vocational education





Who participated?

SmartBuilt4EU
consortiumExpert BoardVolunteers

190+ persons in total

Analysis of contributors' profiles for White Paper 1A





Task Force participants/ EU projects (non exhaustive!)





Big thanks to our Co-Chairs!









Cristian Pozza eurac research



Natalie Samovitch







ENERCOUTIM



Sami Kazi

VTT





Sylvain Kubicki

LIST 🥏









Genest











JINESCTEC



Olivier

Trialog



Joanna **SYRDA**

ASM

research solutions strategy

Athanase

75 Dowel innovation

Vafeas



José Antonio **Chica Páez** tecnal:a



Lukas Engelen 🧩 vito

Further use of the White Papers









The Smart Buildings community

Introduction of project pitches Karine Laffont-Eloire, DOWEL Innovation



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.



Part #1: Upgrading smartness of existing buildings through innovations for legacy equipment



Dominique Gabioud, HES-SO



PHOENIX Dimitra Georgakaki, Ubitech



Nuno Mateus, EDP



Amin Moazami, NTNU

Part #2: Smart operation and building dynamic optimisation



Guilherme Graça & Pedro M. Ferreira, Faculdade de Ciências da Universidade de Lisboa



Michal Pomianowski, AAU



Niall Byrne, IES

iBEC ME







Sam Ramadori, CEO of BRAINBOX A).


Upgrading smartness of existing buildings through innovations for legacy equipment

domOS

OPERATING SYSTEM FOR SMART SERVICES IN BUILDINGS



Project, Results, Lessons

Sustainable Places 2'022 Nice Sept 6th – 9th 2022 Workshop "Innovations for upgrading smartness of buildings"

Dominique Gabioud (dominique.gabioud@hevs.ch)

HES-SO, Sion, Switzerland



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894240. Context

- **Digitalization** of (small) buildings is developing, but in an uncoordinated way
 - Mainly silo solutions provided by • appliance manufacturers
- Networking solutions for appliances are heterogeneous
 - and will remain...

Various...

- protocols
- security mechanisms
- operation model
- naming approaches

Needs

- **Energy management** for buildings requires choreography of multiple appliances
 - Heat pump, PV inverter, EV charger...
- There are needs beyond energy management:

Energy dashboard, energy performance assessment, preventive maintenance, non-energy services...

domOS

The project

Objective

- Design, prototype and test a mediation layer enabling:
 - the integration of any in-building communicating appliances / devices, and
 - the deployment of applications interacting with appliances / devices, if permitted
- The mediation layer:
 - is based on legacy and emerging IoT standards
 - can be implemented on multiple existing platforms

A service stems from the interaction of an application with field appliances / devices



domOS

The project

SERVICES: ORCHESTRATION OF SMART READY

COMBINATION OF THEREOF

Solution

- Participating buildings dispose of a digital nameplate called a Building Description (BD)
 - BDs uses a uniform naming concept defined in the domOS Core Ontology (dCO)
 - BDs allows **semantics level interoperability** between field and applications
- Connected appliances / devices dispose of a digital description document called a Thing Description (TD)
 - TDs enables a syntax level interoperability between field and applications
 - TDs follow the W3C Web of Thing (WoT) standard
- Thanks to **BDs**, applications know **WHAT** they can access
- Thanks to TDs, applications know HOW to perform accesses



domOS for SRI 2.0?

 The current SRI ("SRI 1.0") is a score calculated on the basis of the availability of monitored and controlled elements in buildings

• Limitations:

- There is no machine-readable version of the SRI certificate
 - Beyond the "famous" xlsx file
- The SRI certificate does not say anything on how to monitor / control the processes
- A future, fully digital SRI ("SRI 2.0")?
 - A BD describes the infrastructure in buildings
 - xlsx file "semantified" using the dCO
 - TDs describe how to access monitoring / control points



actions, and events Applications deal with Thing,

Added values

"communication details"

The dCO

common

language

as a

Don't

about

care

1.

Applications can "understand" the building topology and associate things' properties, actions and events with it

and not with model specific messages / packets

Applications can access "Things" in a

Property, Action and Event objects

A Thing is modelled as a collection of properties,

syntactically coherent manner



- What is **positive**:
 - We experiment it, and it works with multiple IoT platforms and multiple building topologies
 - Existing solutions were reused, when possible
 - Appliance abstraction is based on W3C standard (WoT)
 - The dCO takes over concepts of existing vocabularies like SAREF
- What is **less positive**:
 - There is **no TD repository** for models of energy appliances
 - WoT spread is limited in general; WoT is basically not used in smart buildings
 - System integrators have to craft TDs
 - The dCO is (still) a confidential language
 - The interest of a language increases with the number of "speakers"

- Industrialisation of energy services requires interoperability
- Interoperability requires standards
- How to start-up standards?





www.domos-project.eu



domosproject





domOS

Dominique Gabioud, project coordinator

HES-SO, www.hes-so.ch, www.hevs.ch





Adapt & Play Holistic Cost Effective and user-friendly Innovations with high replicability to upgrade smartness of existing buildings with legacy equipment

Sustainable Places 2022 - SmartBuilt4EU workshop

Dimitra Georgakaki, ESAD team, Ubitech





This project has received funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under grant agreement no 893079.



PHOENIX

12 partners & 5 pilot sites

PHOENIX: Adapt-&-**P**lay **H**olistic c**O**st-**E**ffective and user-frie**N**dly Innovations with high replicability to upgrade smartness of e**X**isting buildings with legacy equipment Key stakeholders are building occupants, building managers, ESCOS & Aggregators

Main objectives

- Seamless and secure integration of devices and systems to a unified data platform
- 2. Creation of building knowledge & increase of building automation and intelligence
- 3. Provision of cost-effective energy and non-energy services
- 4. Creation of new business models and exploitation strategies
- 5. Increase of people awareness towards smart buildings

Innovations & unique selling point - Digitalization of Energy: IoT Big Data Platforms



PHOENIX



- New service offerings for real-time management and control of buildings towards ensuring that the level of building smartness is increased.
- Increase of building smartness on the basis of SRI by taking into account the actual (and in real time) measurements from the building environment further combined with advanced analytics in order to extract the accurate knowledge for the optimal decision making (data-driven approach).
- A suite of different energy and non-energy services made available to different stakeholders enabling the promotion of different business use cases.



Provision of a customized web-based platform that combines descriptive and advanced predictive energy analytics and charts according to the chosen "smart area" that the user wishes to navigate.







- There is room for improvement in the automated calculation of SRI instead of just using the traditional xlsx file provided by the eu.
- Smart energy and non-energy services (based on AI/ML) can be treated as a bundle of services that target the building occupants and help them improve their energy behavior through a constant human-building interaction.
- Visualization dashboards that can be customized by users provide a friendly and intuitive way to increase user engagement and adoption of smart building technologies.



Next steps and actions:

- Data integration from all the pilot sites to the dashboard (ongoing action)
- Services integration and refinements with the dashboard (ongoing action)
- Feedback of users/testers to refine the services (following an agile process)





Adapt & Play Holistic Cost Effective and user-friendly Innovations

with high replicability to upgrade smartness of existing buildings with legacy equipment

THANK YOU!

Contact details:

Dimitra Georgakaki, Ubitech dgeorgakaki@ubitech.eu





This project has received funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under grant agreement no 893079.





Workshop: Innovations for upgrading the Smartness of Buildings



This project has recieved funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no. 101023666.

Nuno Mateus - Project Coordinator 08/09/2022

Key Facts & Motivation

Upgrading the smartness of existing buildings



- Coordinator: EDP NEW
- Start: September 2021
- End: August 2024
- Duration: 3 years
- EU budget: 4 M€
- 11 Partners from 8 countries
- 5 Pilots





... REMAIN A DEAD END FOR THE ENERGY TRANSITION.



... TRANSFORM TO AN INTERCONNECTED, ACTIVE ELEMENT OF THE ENERGY SYSTEM.



Smart2B Key Exploitable Results





Seamless connection with legacy equipment

Smart2B creates a **smart building system**, consisting of **platform**, **services** and the active participation of Citizens Energy Communities (CECs).

Smart2B solution main challenge, however, resides in its **device management system**, that allows the seamless connection of complex and heterogeneous building energy systems including notyet-connected devices, thus enhancing **interoperability**.

Smart2B



Smart2B Innovations



Devices and building interfaces

Allow for seamless connection of complex and heterogeneous building energy systems comprising not-yet-connected devices, smart appliances and upgraded legacy appliances as well as IoT interfaces and gateways

Platform & APIs

A community-enabled smart readiness platform that serves as the middle layer of the Smart2B system that enables seamless integration, knowledge extraction and control

Management & transversal services

AI and machine learning algorithms are used to analyze and prepare the building and user data collected from the Smart2B devices, consolidating and optimizing the various Smart2B objectives through newly developed, modular APIs



User interaction, client engagement & social innovation

Involves and engages the multiple stakeholders (occupants, building managers, communities, system operators) through mobile apps and web-based applications as well as gamification





Smart2B Innovations



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Smart2B







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Smart2B Services









EDP | 7

Smart2B Innovations



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Smart2B



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Smart2B User Interface







Lessons learnt & next steps









THANK YOU FOR YOUR TIME

www.smart2b-project.eu



This project has recieved funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no. 101023666.









@ enerbrain*

For an intelligent use of energy











Innovations for upgrading the smartness of buildings

Sustainable Places Conference

8 September 2022





This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101033683. This presentation reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains.





• 14 partners

from 6 European countries

 4 Years June 2021-May 2025







Objectives

- We create a CI-based energy flexible network that ensures low-cost installation and maximum data security.
- We use **cost-effective components** to make our system **compatible across Europe**.
- We will **test our system in 14 buildings** across the EU to prove its efficiency and adaptability to different climate zones
- We will achieve more accurate and non-invasive environmental monitoring through sensors focusing on user needs
- We design a smart, user-centric and user-friendly platform to improve building management and maximize energy saving.

COLLECTIEF

Our solutions

- COLLECTIEF project upgrades the smartness of existing buildings to a higher level and creates a collaborative network of a large number of buildings providing grid flexibility while still ensuring the quality of service to the end customer.
- COLLECTIEF methodology connects buildings, household appliances, and energy systems with a minimum need for data transfer and storage.
- COLLECTIEF uses low-cost and open source components with cost-effective equipment available on the market such as smart plugs and smart thermostats.
- COLLECTIEF enables our homes to adapt their operation to our needs and to be part of a collective effort for energy saving by larger numbers of buildings



COLLECTIEF

COLLECTiEF components

The COLLECTIEF system includes **two intelligent node types** interfacing each other to guarantee seamless integration:

- a Cluster Node for DSM and energy service integration which communicates the energy flexibility needed to the Edge Nodes;
- an Edge Node which communicates the flexibility needed to the appliances installed in the building. Using machine learning techniques, the system will learn about the user preferences gradually and suggest optimized schedules.





COLLECTiEF unique selling point



The SRI assesses how smart a building is in terms of:

- 1. responding to the needs of the **occupant** (e.g. health, comfort, well-being, etc.)
- 2. using energy **efficient** control strategies
- interacting with energy grids (energy **flexibility** / demand response and system integration)

COLLECTIEF

The benefits

Upgrade the smartness level of existing buildings:

16% On average reduce the primary energy use

> 0.2-3 €/m² annual energy cost savings

15% Increase user satisfaction





24% Increase the demand flexibility



Lessons learned: Genius in Simplicity!

- Simplicity in communication
 - Internal
 - External
- Simplicity in the solutions
 - Architecture
 - Algorithms
 - Control logics
- Simplicity in the installation
 - Monitoring
 - Integration



COLLECTIEF





research and innovation programme under Grant Agreement No 101033683
THANK YOU!

Get in touch Amin Moazami Project Coordinator, NTNU amin.moazami@ntnu.no

info@collectief-project.eu www.collectief-project.eu



Applied Energy
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A Guide for authors Track your paper
 ✓
 A Order journal

Joint Special Issue on "Enhancing energy flexibility and climate resilience of urban energy systems"

Deadline: End of 2022! Contact: <u>vahid.nik@byggtek.lth.se</u>





This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101033683. This presentation reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains.

Panel discussion



Solution States Stat

Please come back at 10:45 !



Smart operation and building dynamic optimisation



Sustainable places 2022

Project overview

Self Assessment Towards Optimization of Building Energy



 \odot

9

This project receives funding in the European Commission's Horizon 2020 Research Programme under Grant Agreement Number 957128

Who we are

16 partners across7 European countries

Funding ~7M€ over 48 months (Oct. 2020 → Sept. 2024)

Pilots 9 pilots, 15 use cases

Challenge

Building stock unable to properly **assess and optimize** whole building energy consumption



What's our objective?

Create

an IT platform for automated selfassessment and optimization of building's energy,

capable of Assessment of real-life building energy use and energy consuming equipment operation



Al enabled assessment framework

Three **types of assessment** (P,F,R)

Assessments based in measurements in **standard** and **actual** conditions

Results compared with **historical** and **energy label** baselines



Al enabled services framework

Four classes of services:

- Aggregated control
- User comfort
- Flexibility
- Building Systems and Components



IoT integration, interoperability, and process automation platform

Seamless data and systems integration through Semantic-based interoperability

Automated discovery

of assessments and services, based on semantically annotated models of building components



Lessons learnt & good practices

It is very hard to setup pilots that are on the edge of building capabilities.

Significant untapped potential for data visualization in BIM

Building energy systems and components are **not IOT enabled or open (big problem)**.

There is a need to identify a small set of KPIs that users understand



Future

Take the SATO Services and Assessments ecosystem to:

- Design phase
- Energy refurbishment (for diagnosis and efficient operation)

Security and privacy:

- End-to-end data protection and privacy preservation
- Certification & compliance

Project spin-off (commercial)





This project receives funding in the European Commission's Horizon 2020 Research Programme under Grant Agreement Number 957128



Thank you!

PRELUDE project

Michal Pomianowski, Aalborg University

Prescient building Operation utilizing Real-Time data for Energy Dynamic Optimization



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement N° **958345**



SUSTAINABLE

Why projects like PRELUDE – objectives

Focus on:

- realizing energy efficiency
- data-driven building assessment
- data-transferability
- different building smartness inclusion (no automation, low automation, high automation)
- adaptable solution (modularity)



Concept





What is FusiX?







FusiX's role in PRELUDE

Integrate technology enablers in a multi-simulation platform:

- Act as middleware
- Aggregate data from various technological level buildings
- Integrate simulation and forecasting technologies
- Enhance intelligence
- Schedule and run simulations based on the collected/forecasted information
- Provide feedback to the users or directly to the buildings via controlling signals



1.	PRELUDE metadata & multi-simulation platform
2.	Weather and insolation models
3.	Dynamic energy balance forecasting
4.	Indoor-outdoor condition model
5.	Dynamic and Free Running Building Energy simulation tool
6.	Occupancy and behavioural models
7.	Comfort monitoring solution based on Fiber Optic Sensors
8.	Predictive maintenance module
9.	Energy Efficiency-Comfort optimization module
10.	Data driven control of proactive buildings
11.	Graphical User Interface (based on En-Power)
12.	EPIQRweb
13.	Optimal RES selector
14.	Smart heat meter data analyzer for district heating networks
15.	Advance M&V service
16.	VRE integration strategy

Technology enablers



PRELUDE service

Л	BUC 1	Residential and non-residential building enenrgy profile, (near) real-time monitoring for occupants and building /facility manager
	BUC 2	Building predictive maintenance for building/facility managers
	BUC 3	Facilitate control of building energy systems to aggregators (of demand response, RES, etc.)
	BUC 4	Residential building renovation roadmap

Solution to current BUCs



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Technology enablers



PRELUDE service

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Solution to current BUCs



Demonstration







Key conclusions so far

- Challenge: Middleware has to be able to communicate with different IoT commercial solutions (protocols) the first establishment is challenging (both building and middleware).
- Promises: middleware relieves technology enablers from the burden of adapting their algorithms to a particular building.
- Buildings require flexible assessment solutions both considering inputs and outputs.
- Connection of a single building/apartment seems to be unfeasible unless fixed requirements are imposed to address energy services such as PRELUDE.
- Technology enablers heavily depend on data availability (still observed mismatch between what buildings have available and technology requirements, however, we can see a massive change towards data availability).



Thank you mzp@build.aau.dk

https://prelude-project.eu/



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement N° 958345

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AALBORG UNIVERSITY



Auto-DAN

Deploying <u>Augmented intelligence solutions in EU</u> buildings using <u>Data analytics</u>, an interoperable hardware/software <u>Architecture and a N</u>ovel selfenergy assessment methodology.

> Dr. Niall Byrne Head of R&D – IES R&D niall.byrne@iesve.com







Auto-DAN: Key Facts & Figures



- 48 Month Project (currently in M24)
- €5,675,186 Total Costs (€4,415,246 provided by EU)
- 12 Partners across 4 Countries with 6 Demonstration Sites
- https://www.autodan-project.eu/







Auto-DAN: Demonstration Sites





O Cualann A-Rated Homes, Dublin, Ireland



Delta Ecpoc Cooperative, Milan, Italy



Palazzo Terragni, Lissone, Italy



Residencia Camino de Santiago, Burgos, Spain



VideBURGOS Foundation, Burgos, Spain



Greenogue & Aerodrome Business Park, Dublin, Ireland



Auto-DAN: Key Project Objectives





1. Create a flexible, smart hardware infrastructure that can be applied to all small-to-medium sized buildings

2. Develop an interoperable software architecture that can provide all the analytical capabilities needed to self-assess & self-optimize buildings in the EU





3. Deliver Augmented Intelligence (Aul) solutions to enable buildings and their users to become self-optimising

4. Create a live self-energy assessment method that incorporates operational monitoring, appliance/system performance and smart capabilities that will improve the accuracy of current energy assessment procedures





5. Accelerate investment in sustainable energy by EU companies (3rd Parties) & their clients.



Auto-DAN: The Auto-DAN Platform

SUSTAINABLE PLACES









Auto-DAN: Smart Hardware Infrastructure





Smart IoT Meter

USTAINABLE



Smart Appliances



Advanced Monitoring



Smart Plugs



Traffic Light



Auto-DAN: Interoperable Software Architecture







NOLE CRAPH INCLUSION INCLUSION

Digital Twin Technology

SUSTAINABLE PLACES

Digital Occupancy Model



Auto-DAN: "Live" Audit

SUSTAINABLE





This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement no 101000169



Auto-DAN: Augmented Intelligence Dashboards

SUSTAINABLE

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Auto-DAN: Upcoming Work

- Installation of Hardware Solutions in Demo Sites
- Ongoing Development & Testing of Digital Occupancy Model
- Testing & Validation of User Dashboards
- Development & Testing of Live-Audit KPIs



Source: https://medium.com/quantumblack/operating-at-the-boundaries-augmented-intelligence-43e73684067d





Auto-DAN

https://www.autodan-project.eu/

Dr. Niall Byrne Head of R&D – IES R&D niall.byrne@iesve.com



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BECSME

Intelligent Building Energy Assets Control for Comfort, Energy and Flexibility Optimisation

Dimitris Ntimos, IES R&D project manager, coordinator of iBECOME



iBECOME wants to demonstrate a combination of novel technologies for:

Reducing bills in a building or facility through energy savings and demand response while...

...improving occupant wellbeing and optimising comfort...

...by leveraging IoT, data analytics and the efficient control of a building...

...while enabling additional services such as EV charging optimisation...





The iBECOME virtual Building Management System (Software-as-a-Service)

Agreement no 894617



Services

IRELAND

iBECOME monitoring and control optimisation



Demonstration





Country Crest, Ireland

Food Processing Facility

Helix Building, Glasgow

Office

ASP della Carnia, Italy

Care Home

World Trade Center, Grenoble

Business Center

Comparison between iBECOME heating controller and standard methods tested in simulation



The energy-comfort optimisation solution was found to provide 25% lower energy costs than the max comfort scenario without comfort disruption.







Helix Building: SRI before and after

Current



Estimated after full iBECOME solution



DOMAIN SCORES



DOMAIN SCORES



IRELAND



Our targets for iBECOME vBMS

Reduce the energy use and energy bills in a facility by 15%

Reduce Comfort complaints by 20% and improve Indoor Air Quality by 10%

Improve the smart readiness of buildings by 10% (SRI)

Track, prevent and reduce equipment and operational faults by 20%

Improve wellness by 20%

Generate revenue by energy savings to invest in further Energy Conservation Measures



Stay Tuned!



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@ibecome-project



This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement no 894617







ENER • G I



RESEARCH

MANUFACTURING

IRISH







Pioneering Gridware Technology

VIOTAS











The Smart Buildings community

Jointly developing a strategic research and innovation agenda for EU Stijn Verbeke & Paulina Rodriguez Fiscal, VITO



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.

10 Key priorities for EU R&I on smart buildings



• INTEROPERABILITY IN BUILDINGS	PRIO1: Standardisation for interoperable products and services in a building: develop unified ontologies, semantics and interoperability standards
• INTEROPERABILITY FOR GRID FLEXIBILITY	PRIO2: Standards and business models for connecting smart buildings to the external environment: data exchange between multiple buildings and with energy grids, assessment methods and standardised protocols for energy flexibility
• INNOVATIVE BUISINESS MODELS	PRIO3: Innovation in products and related business models for smart buildings. E.g. servitisation (comfort-as-a-service), adaptable and expandable automation and control systems, common marketplaces for smart solutions, upgrading legacy equipment, energy performance contracting with performance guarantees
• TESTING FACILITIES AND LIVING LABS	PRIO4: Testing facilities, benchmarking and living labs for integrated analysis and demonstration of smart buildings: develop proper benchmarking, common case studies (real buildings and their digital twins), common datasets, regulatory sandboxes, advanced testing facilities and standardised testing protocols to support research and market validation
CO-BENEFITS	PRIO5: Better understanding of co-benefits (health, comfort, well-being, productivity increase,) and empowering the users of smart buildings: common KPIs, evaluation methods, datasets, benchmarks, user-centric design methods
LIFE CYCLE ENVIRONMENTAL • IMPACTS	PRIO6: Advances in products and services to improve life cycle environmental impacts of smart buildings (repairability, circularity, dismantling and upcycling of components, lower resource consumption, reduce energy consumption of sensors and actuators, electronic waste management,)
MAKING BETTER USE OF THE DATA •	PRIO7: Making better use of the data: Data-driven performance assessment, digital twins for optimisation of operation and fault- detection of smart buildings, continuous commissioning, data-driven design methods
SUPPORTING INCREASED PUBLIC • AWARENESS	PRIO8: R&I for supporting increased public awareness, end-user acceptance and training of workforce to support mass adoption of smart building technologies
• DATAPRIVACY AND CYBERSECURITY	PRIO9: Dataprivacy and cybersecurity in smart buildings: improving new and legacy equipment, monitoring performance, towards certification of individual products and integrated systems
• SUPPORT POLICY DEVELOPMENTS	PRIO10: R&I to support policy developments: Improve regulations (EU and national) and policy initiatives (logbook, SRI, green public procurement for smart buildings,) on smart buildings



Help us to validate / finetune the 10 R&I priorities

https://ec.europa.eu/eusurvey/runner/SB4EUsurvey2022





Please, go to www.menti.com and use the code





The Smart Buildings community

Importance of data governance to meet the major current challenges of society -*Emmanuel François - Fonds MAJ*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.

Data Governance & Governance of our society

fonds MAJ

JSTAINABLE

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Sustainable Spaces 2022 – Nice

Towards a hyper connected world

EVERY CITIZEN

EVERY BUILDING

EVERY MOBILITY

EVERY TERRITORY, EQUIPMENT & INFRASTRUCTURE

Digital an opportunity to support changes Digital at the heart of every transition...



6 challenges for coming years





Digital & Data governance at the heart of our society

We have entered the **digital age**

This is real change in our society. A **civilizational change.** As important as that which followed the invention of writing 5000 Years ago.

Digital is ubiquitous. It has become an integral part of our society.

Digital is at the origin of a change in human activities (Hybrid) as well as the governance of the society (Pyramidal / Neuronal – Silo / Transversal)

Data has become an extension of the human person or any object on earth.

The Web 3.0 and the Digital Twin / Metavers will accelerate this change by establishing direct interaction between the physical world and the digital world based on new codes & rules if there are...



Observation & Recommendation

Digital is ubiquitous

=> Establish an authentic digital culture for all citizens

Data is a resource in itself and is the fuel of a new economy

=> Data should be considered as a common good

IA is becoming an integral part of any decision-making process

=> Guarantee transparency on the algorithms and apply a code of ethics of the stakeholders from the decision to the applications

Traceability is unavoidable and is a prerequisite for a society more responsible because more enlightened

- => Build new legal and regulatory frameworks preserving individual freedom
- => Ensure local shared governance of Data with secure and controlled access



Smart Building / Smart City : Importance of a Data Governance

Observation:

- Data are mainly stored in verticals / Services (Energy, Water, Spaces, Security, ...)
- Cross-referencing and contextualizing the data bring value
- Service Providers have (unique) access to the data to their own profit
- Owner or user have no access or less access to their data

Recommendation:

- => Data need to be stored locally : OS or Data Hub with shared governance
- => Access need to be contracted (time, type of data,...) according to level of services



Smart Building / Smart City : Example of Energy

Observation

- Energy X 10 => Cost / m2 : 3 € to 30 € / m2 ! Energy + Rent = 60 € / m2
- Value of the Building directly linked to its ability to optimize resources (Risk for Asset Manager)
- Access to data and ability to take action is crucial
- Difficulty to collect every Energy data of a building / District and take action accordingly
- Difficulty in carrying out differentiated actions because lack of detailed information on uses
- Energy meters are not sufficient to enable smart monitoring and demand response
- Importance to control Energy data of every stakeholders and cross-reference it with usages

Recommendation

- => Data need to be stored locally and contextualized (Building Operating System)
- => Governance of data need to be organized with involvement of every stakeholders
- => Open and interoperable system will enable differentiated action



The Smart Building revolution





Sustainable Spaces 2022

The Smart City revolution



AN URBAN BRAIN IN THE CITY TO SUPPORT MULTIPLE SERVICES



An OS in the City... to the benefit of new usages





Recommendation and conclusion

- Build a local storage of data and metadata with interconnection of all OS for macro approach.
- Build Mini Data Center instead of Mega Data Center (rather chapels as cathedrals) to support this local storage. New building in the city embodying Data Management of the local community.
- Organize local data governance combining every stakeholders : Digital Assembly (ecclesia)
- Mandate a Digital Trusted Party ("Digital Druid" !) responsible of data security and confidentiality as well as system resilience. It can be the condominium trustee /property manager for a building or the mayor for a city.
- Provide every citizen with digital identity that he could master allowing him a full digital and social existence. (Controlled traceability for responsible and enlightened citizens because informed)



Thank you for your attention



Sustainable Places 2022







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