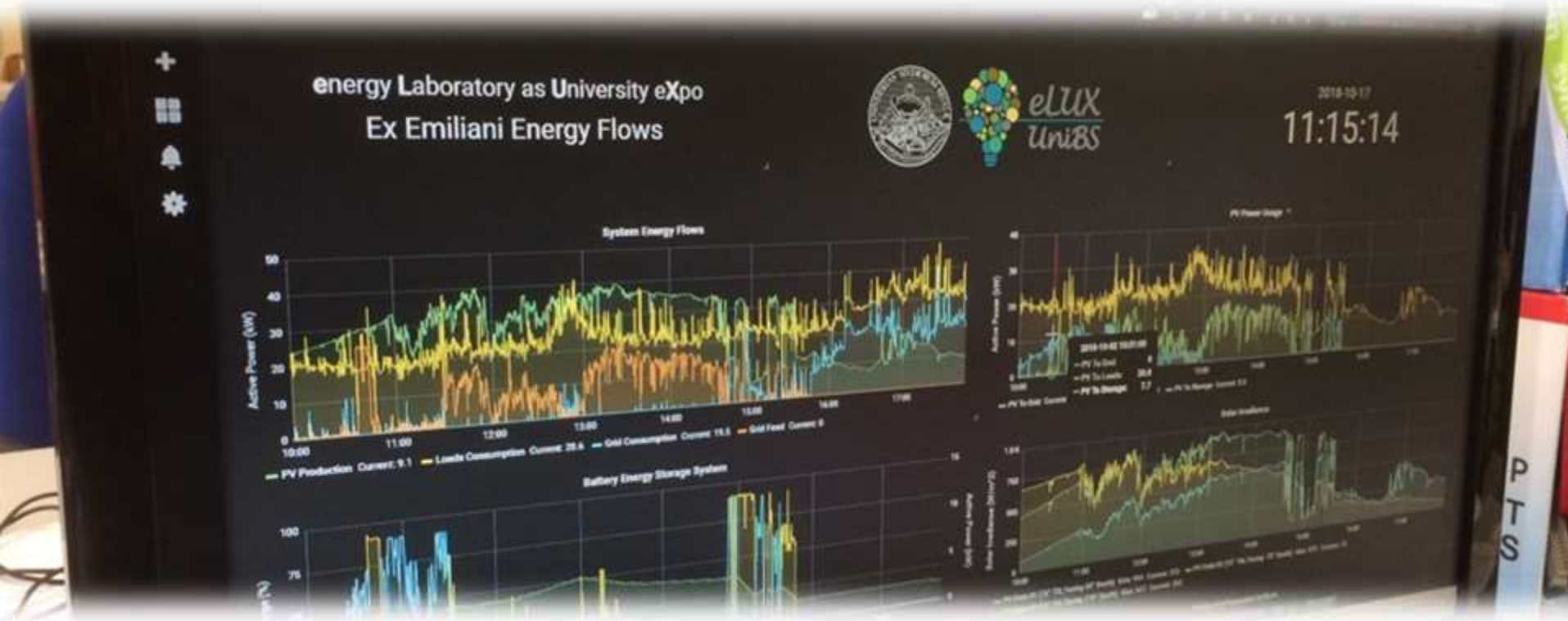


BIM based BMS for cognitive building: l'esperienza di eLux nello Smart Campus dell'Università degli Studi di Brescia



Ing. Paolo Bellagente, PhD



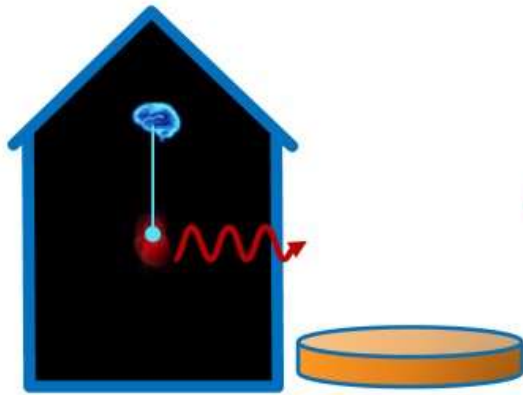
UNIVERSITY
OF BRESCIA



eLUX
UniBS

energy
Laboratory as
University
eXpo

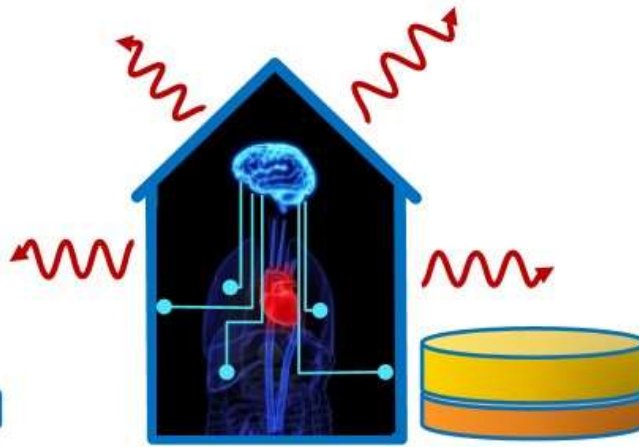
Automated Buildings Era (1980 – 2000)



Visualize KPI

- + Good for ratings
- + Allows identifying general issues
- Bad for identifying energy waste

Smart Buildings Era (2000 – 2020)



Analyze Energy Consumers

- + Understand consumption of rooms and central assets
- Only primary datapoints are analyzed

Cognitive Buildings (> 2020)

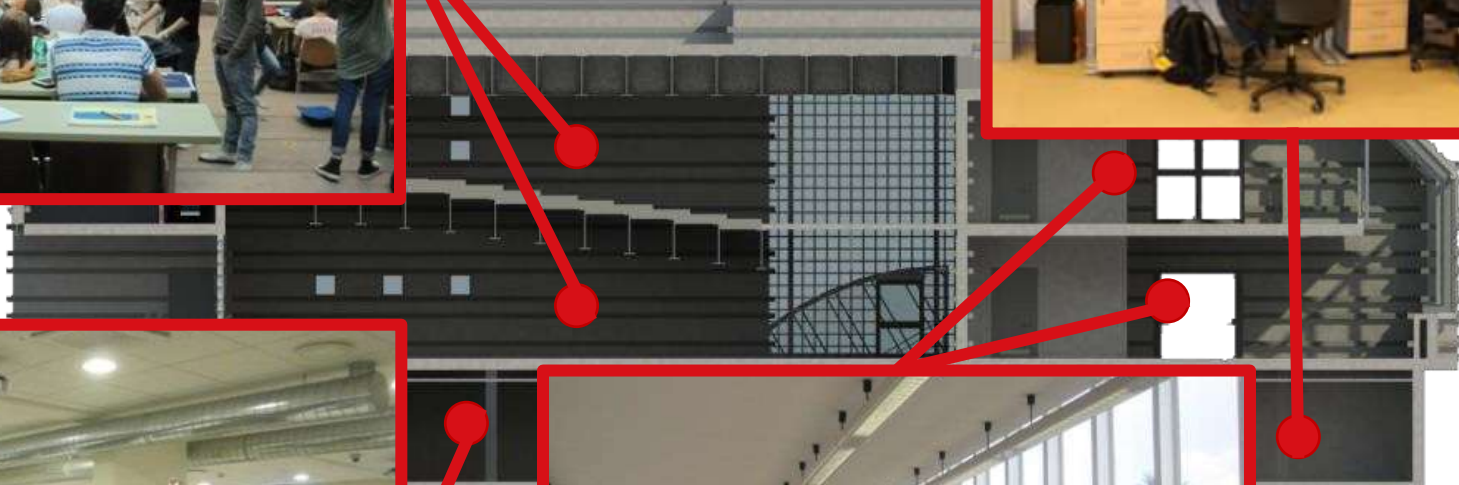


Learn Behaviour

- + Predictive control down to work places
- + Understand comfort preferences of users
- + Correlate context such as weather and meetings
- Many datapoints to analyze

IBM 2016







REALISED WITH FUNDS FROM:

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DI BRESCIA

PROJECT S.C.U.O.L.A.

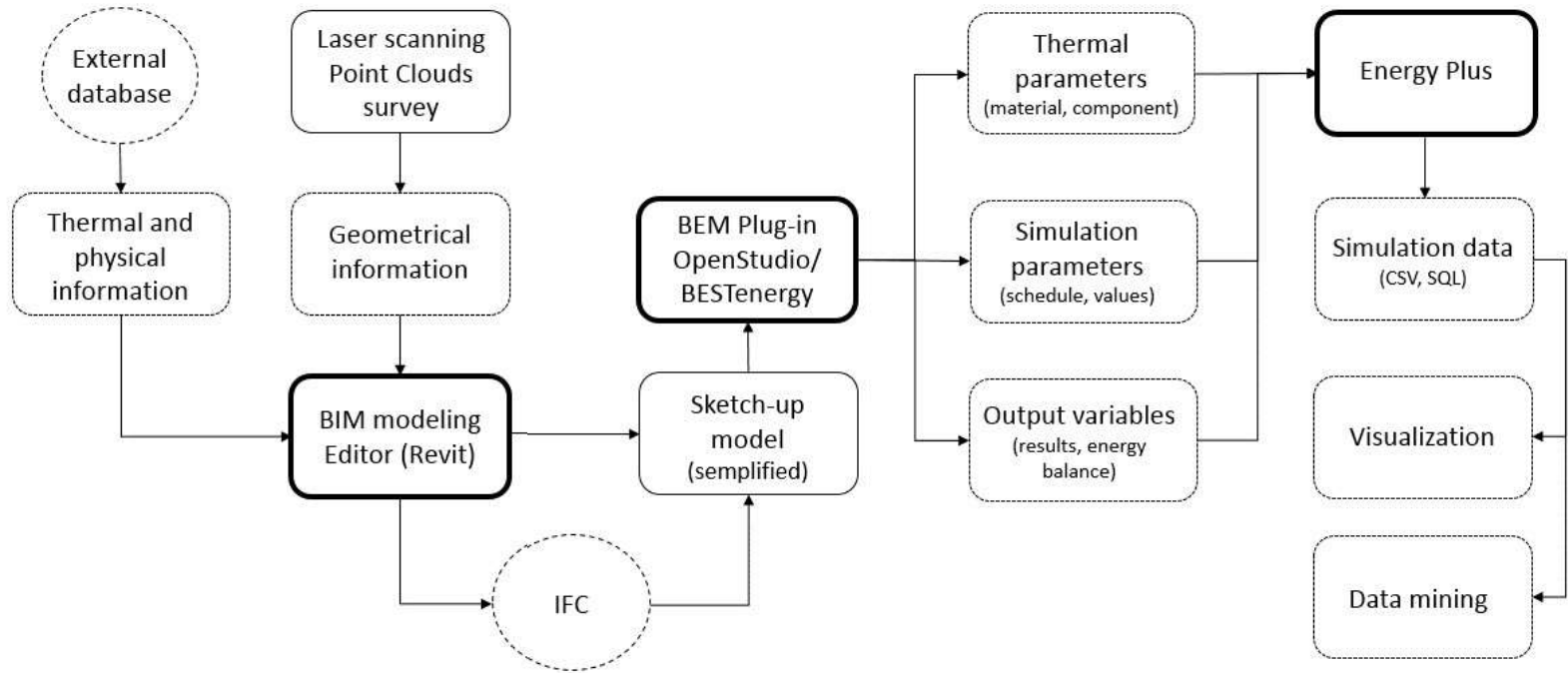
SMART CAMPUS AS URBAN OPEN LAB



SOME IMAGES COME FROM THE S.C.U.O.L.A. PROJECT PROMOTIONAL VIDEO, WE WOULD THANKS

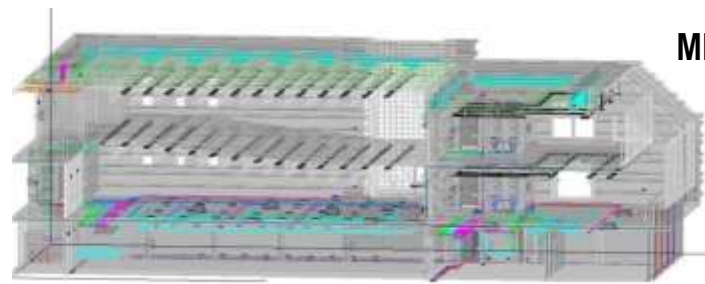


FOR THE KIND CONCESSION

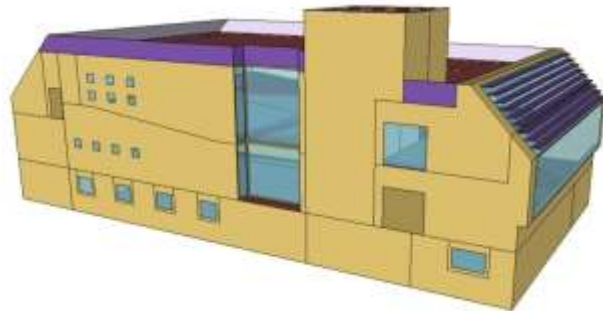




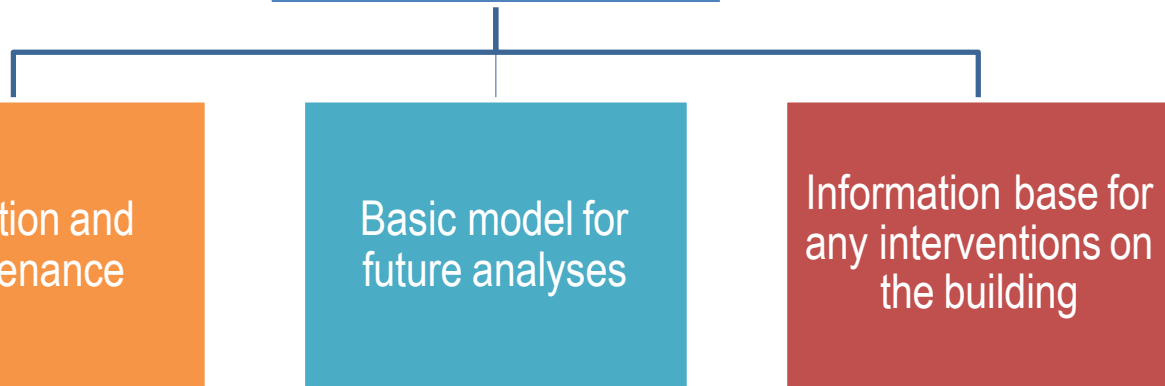
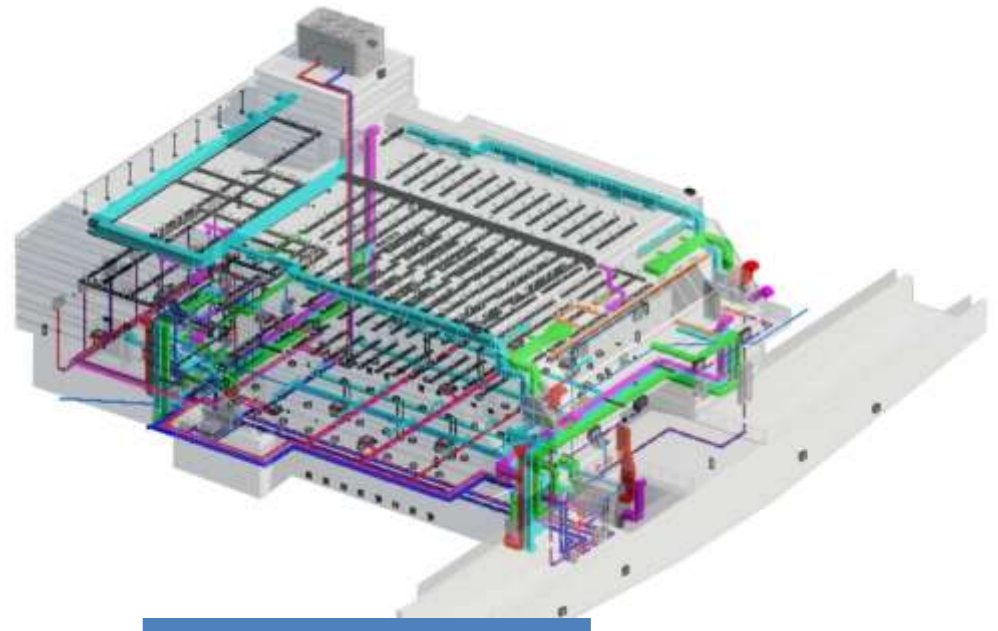
Architectural / Structural
model

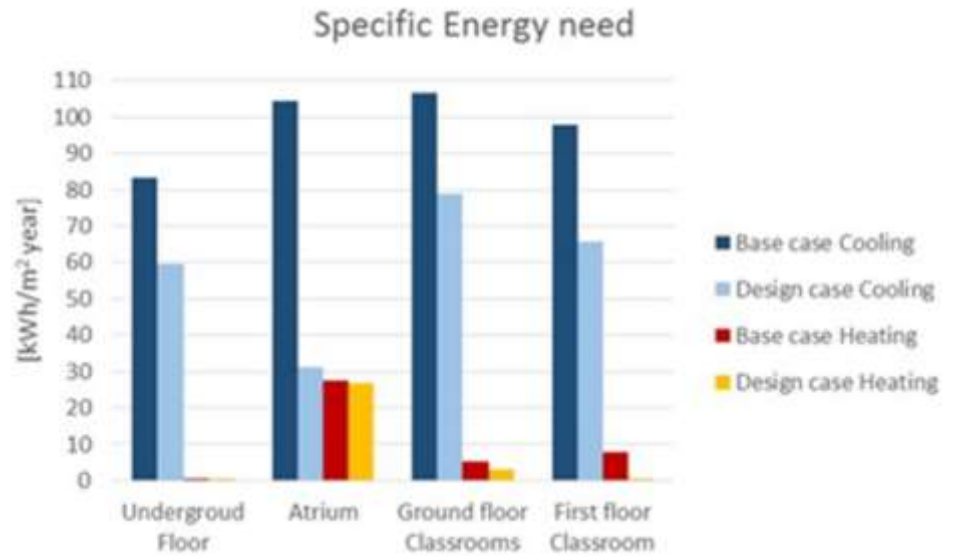
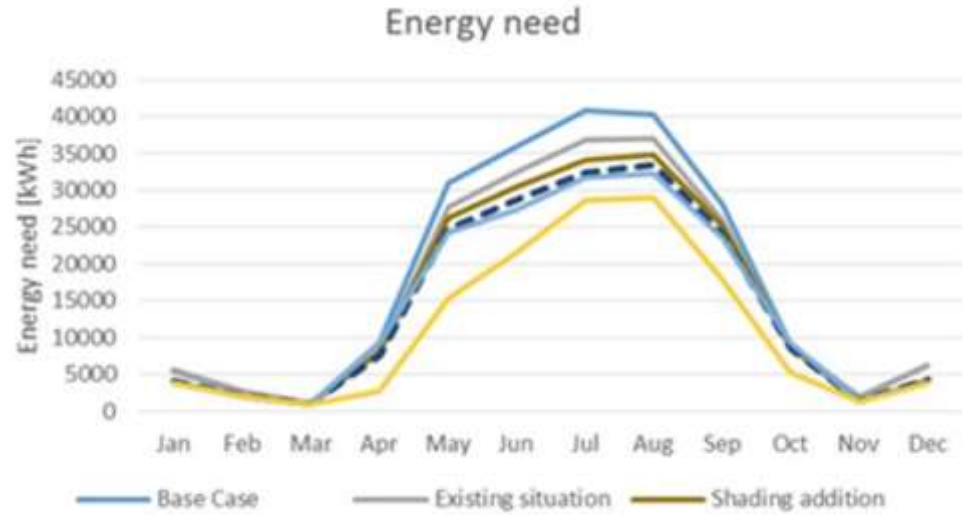
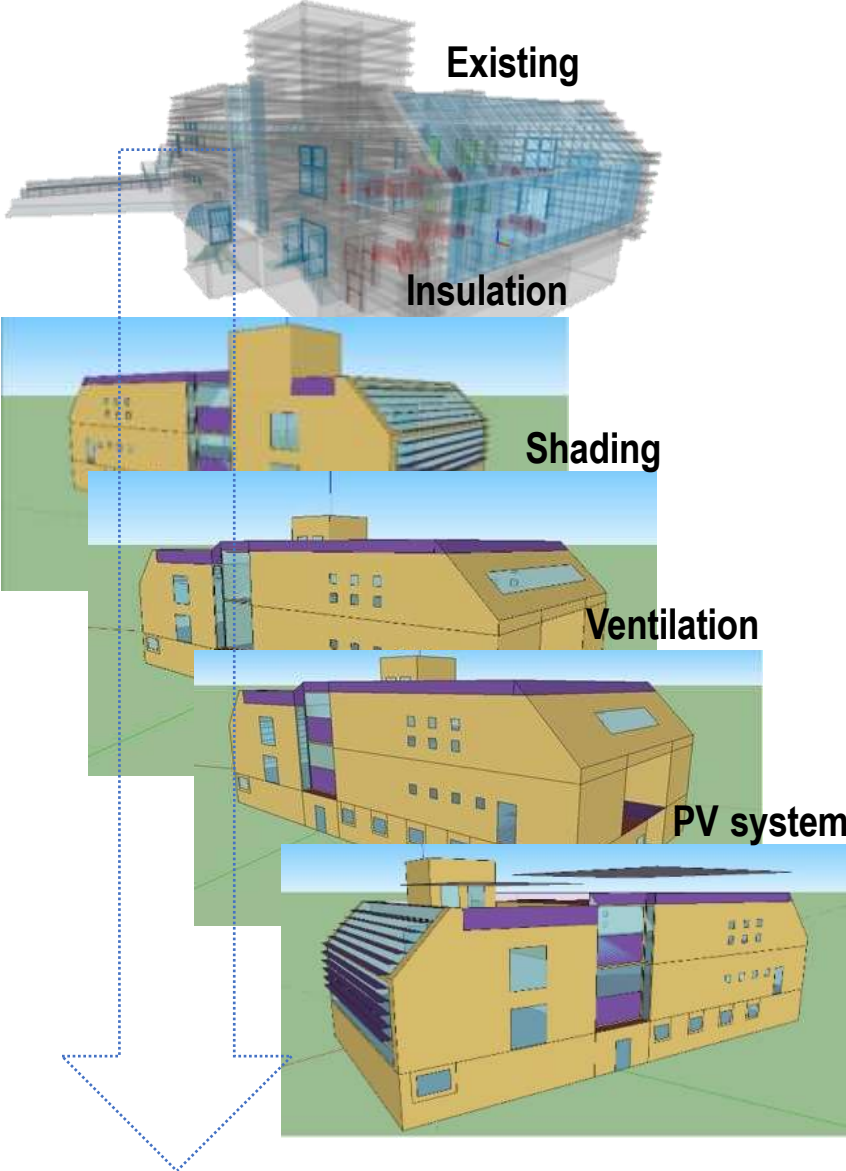


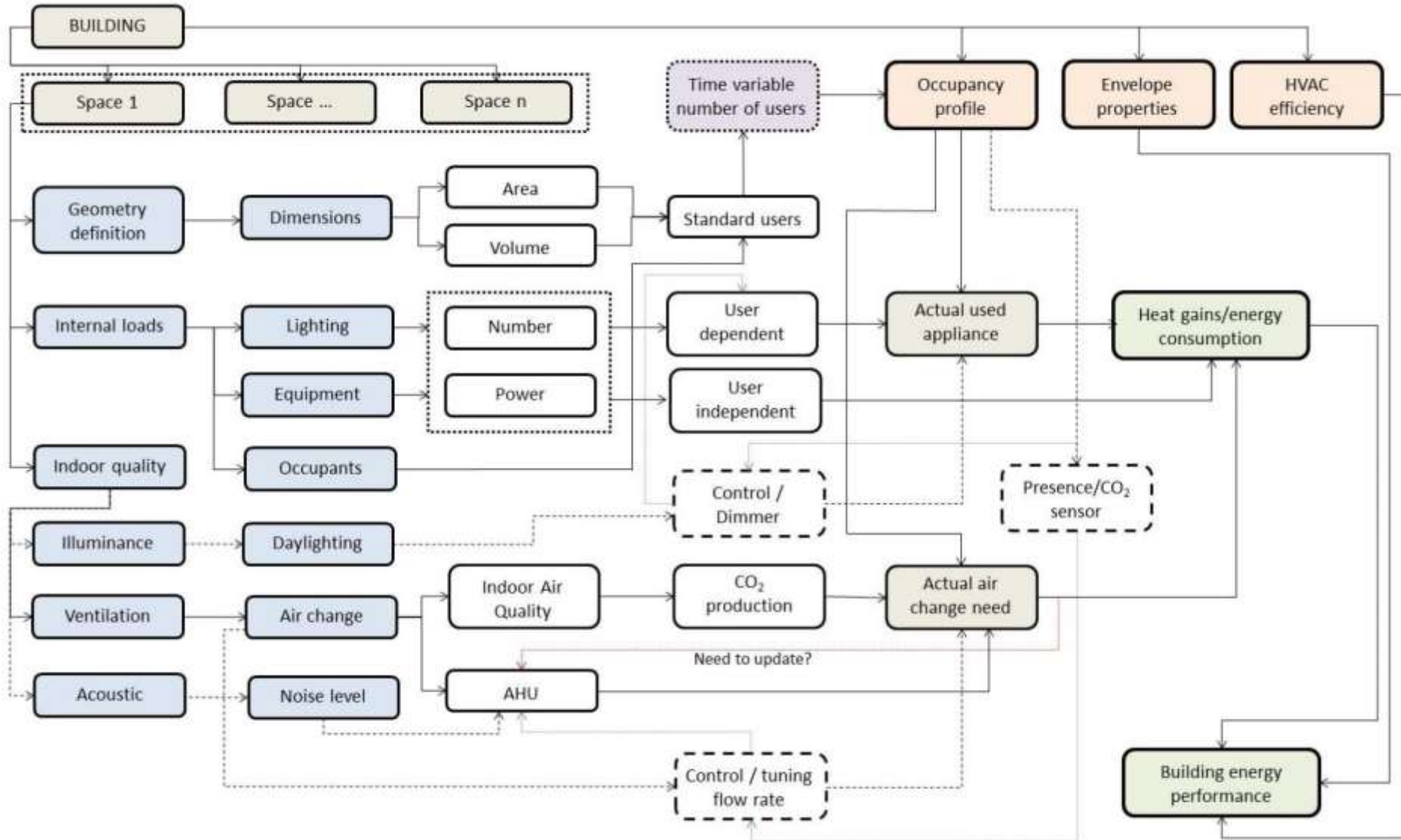
MEP model



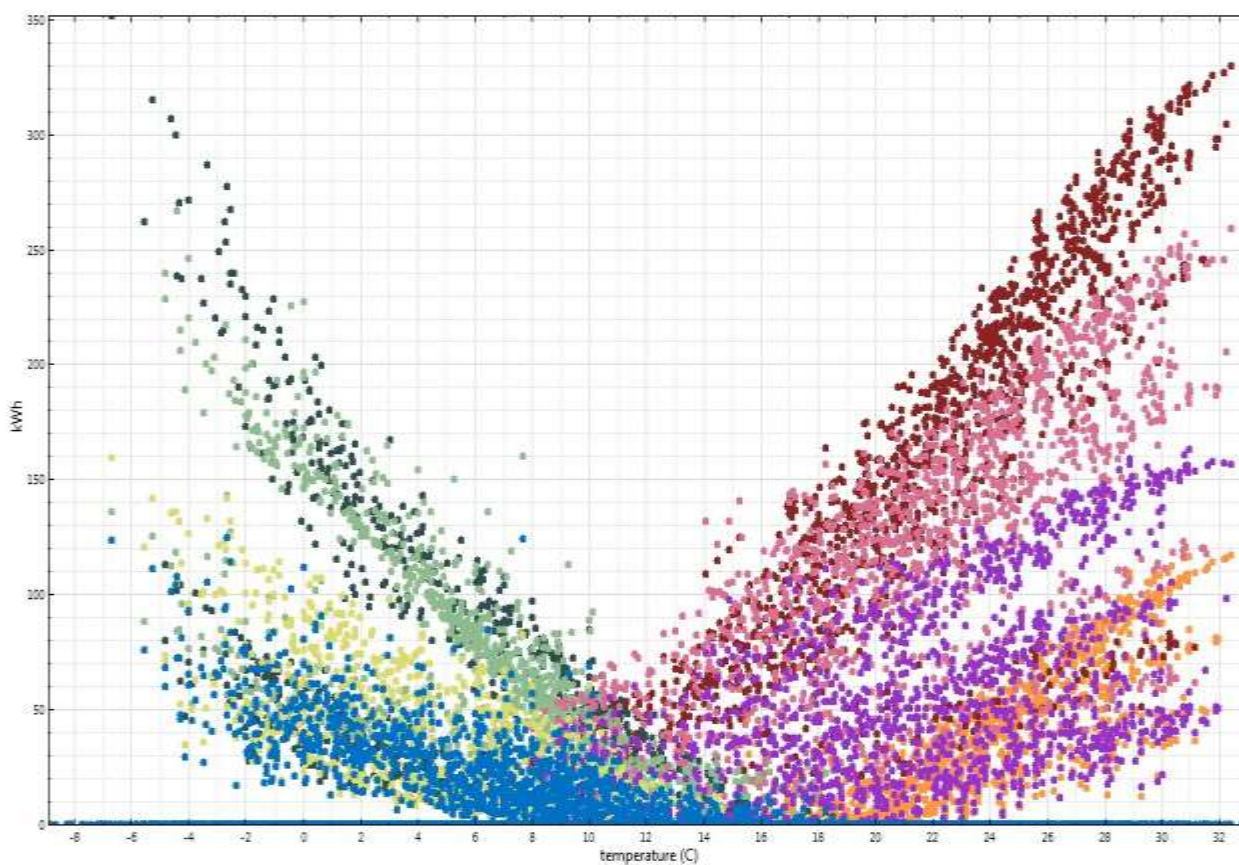
Energy
model



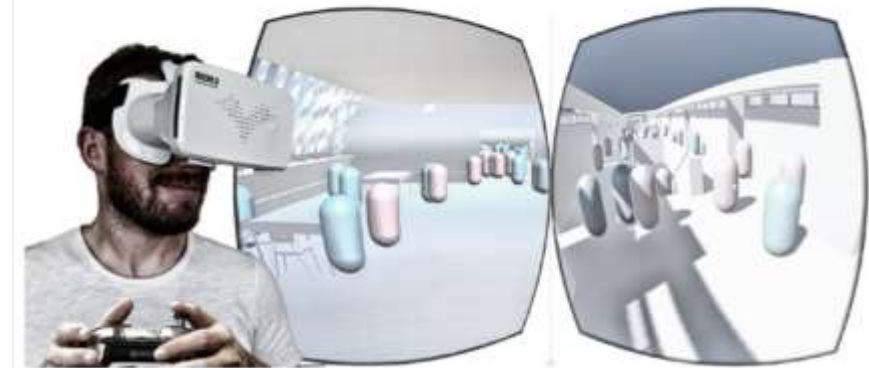
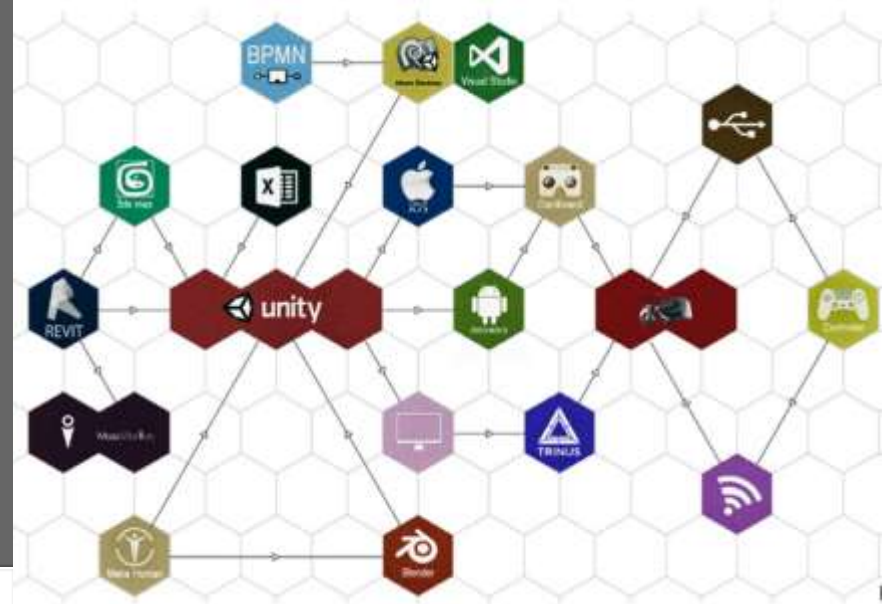
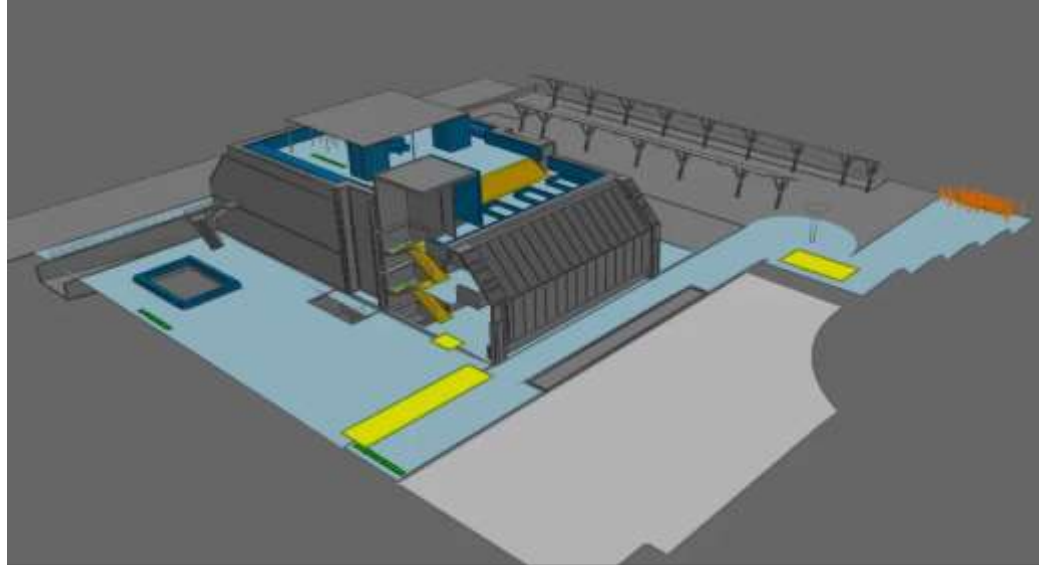




Classroom	Week day	8:30-9:00	9:00-9:30	9:30-10:00	10:00-10:30	10:30-11:00	11:00-11:30	11:30-12:00	12:00-12:30	12:30-13:00	13:00-13:30	13:30-14:00	14:00-14:30	14:30-15:00	15:00-15:30	15:30-16:00	16:00-16:30	16:30-17:00	17:00-17:30	17:30-18:00	18:00-18:30	18:30-19:00
MLAB1	M	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0
	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
	W	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0
	T	1	1	1	1																	
MLAB2	M	0	0	1																		
	T	1	1	1																		
	W	1	1	1																		
	F	0	0	1																		
MTA	M	0	0	0																		
	T	1	1	1																		
	W	0	0	0																		
	T	1	1	1																		
MTB	M	0	0	0																		
	T	0	0	0																		
	W	0	0	0																		
	T	0	0	0																		
MI	M	0	0	0																		
	T	1	1	1																		
	W	1	1	1																		
	T	0	0	0																		
Atrium	M	1	1	1																		
	T	1	1	1																		
	W	1	1	1																		
	T	1	1	1																		



- Out
- temperature (C)
- Energy need.csv
- Heating30 (kWh)
- Cooling30 (kWh)
- Heating60 (kWh)
- Cooling60 (kWh)
- Heating100 (kWh)
- Cooling100 (kWh)
- HeatingStandard (kWh)
- CoolingStandard (kWh)



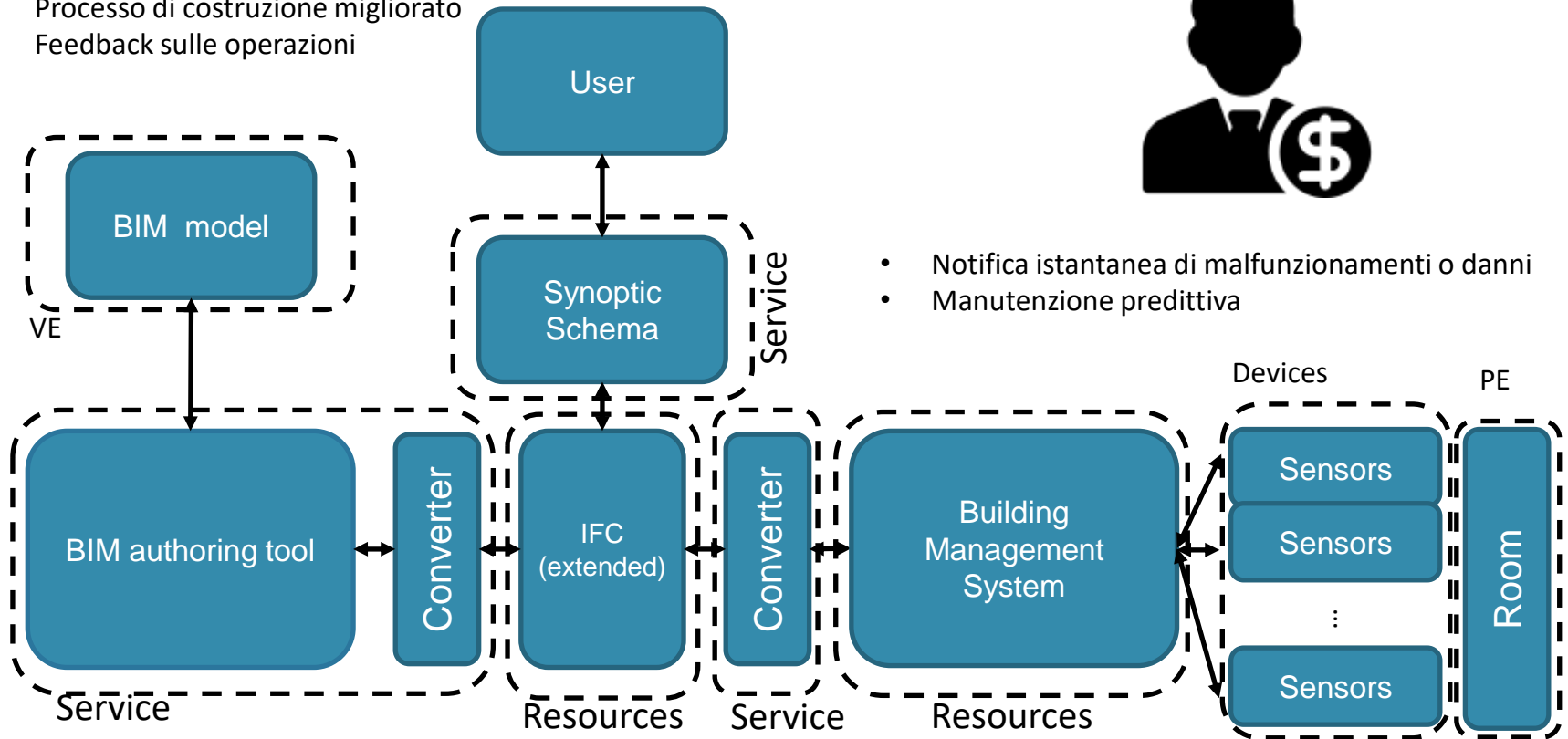


- Consapevolezza dei comportamenti
- **Interazione con l'edificio**

- Processo di costruzione migliorato
- Feedback sulle operazioni



- Notifica istantanea di malfunzionamenti o danni
- Manutenzione predittiva



Real-time data window

MLab1 sensors

Temperature	22°C
Relative humidity	45%
Luminosity	23 lx
CO ₂ concentration	14.7 ppm
VOC concentration	98.8 ppm

Legend

Temperature

- < 20°C
- > 20°C

To Inform and Visualise

Information concerning real building behaviour

To Check and Verify

To Analyse

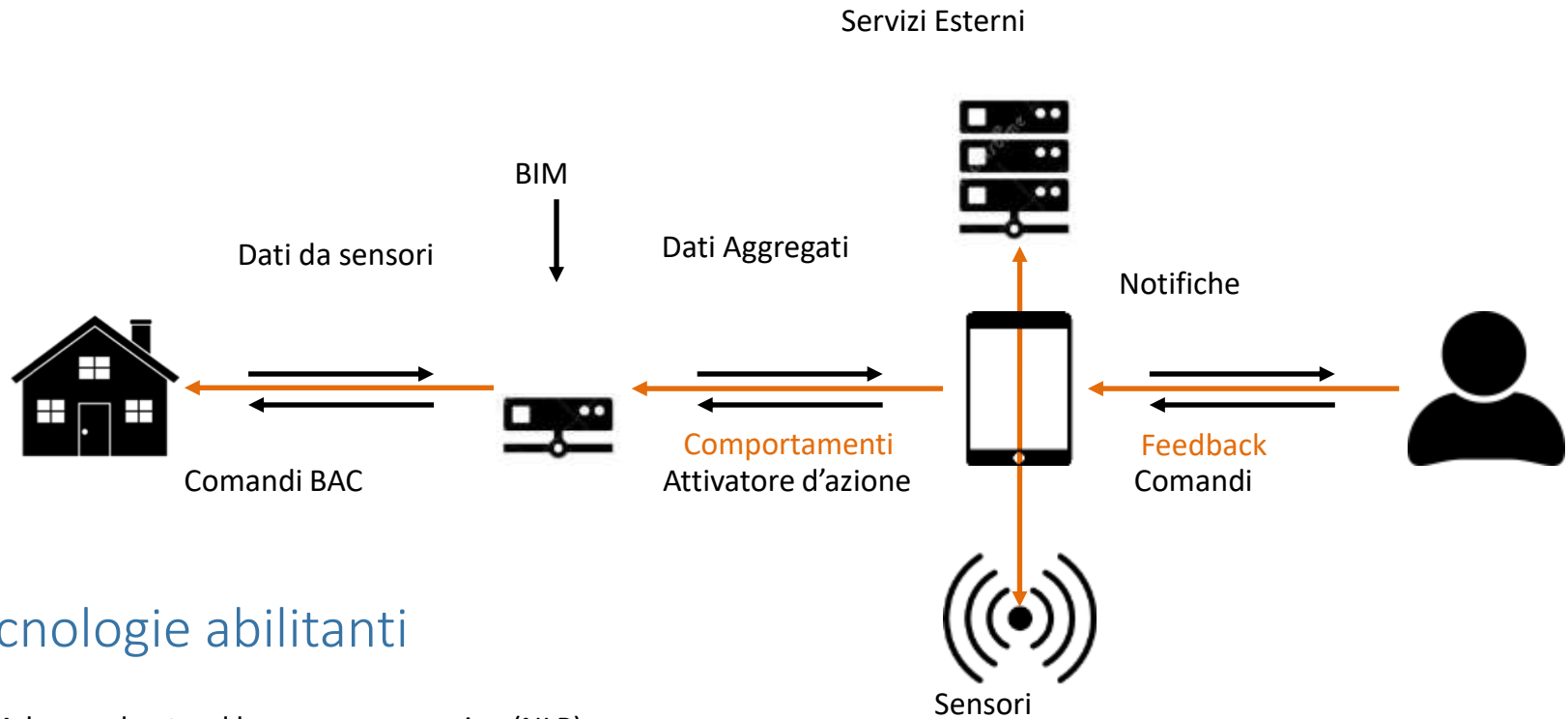
User comfort

Thermal comfort	✓
Hygrometric comfort	✗
Visual comfort	✗

To Control and Report

Warning

Registered temperatures exceed threshold for 6 hours. Please, visit the room and control the mechanical equipment.



Tecnologie abilitanti

- Advanced natural language processing (NLP)
- Rappresentazione semantica
- Machine learning



Paolo Bellagente: <http://bg001.sgush.cards>



paolo.bellagente@unibs.it

Laboratorio eLUX

Modulo Didattico, Università degli Studi di Brescia
Via Branze 38
25123 Brescia BS
Italia
Ref. Prof.ssa Flammini
(Dipartimento Ingegneria Informazione)

<http://elux.unibs.it>
elux@unibs.it



@PaoloBellagente
@elux_lab

GRAZIE PER L'ATTENZIONE