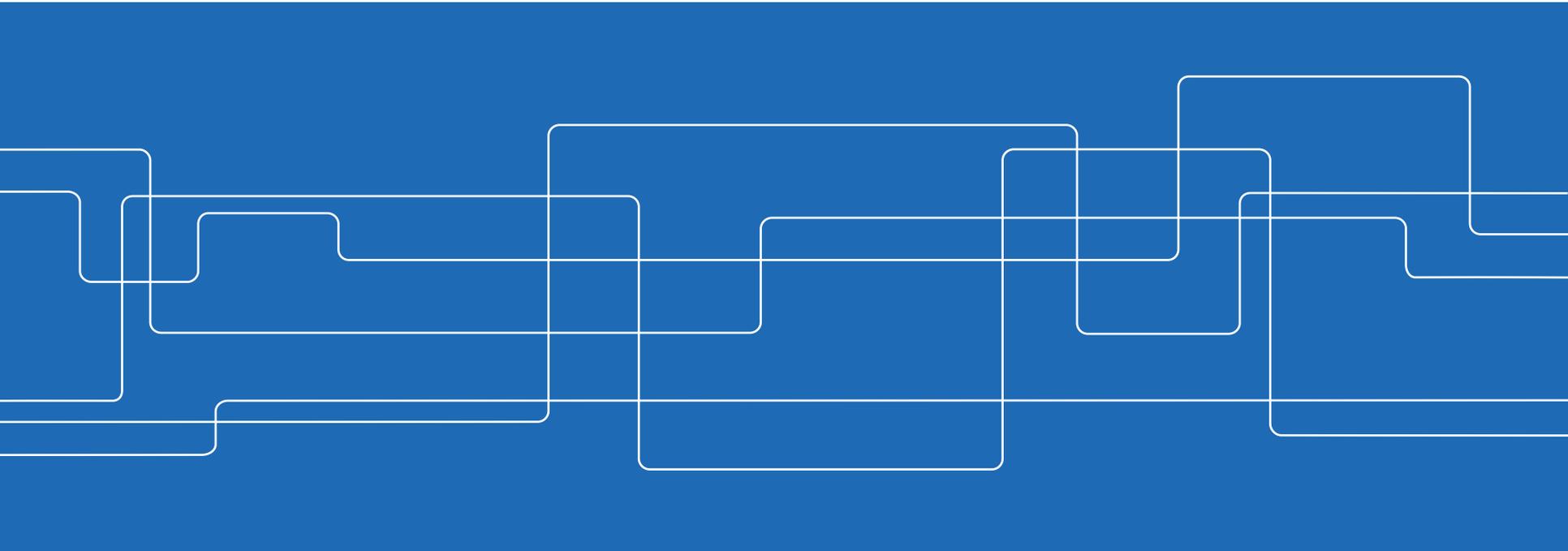




# K T H LIVE-IN LAB

## EXPECT INNOVATION



# Background

**40% energy is used in the built environment**

20-20-20 EU Target

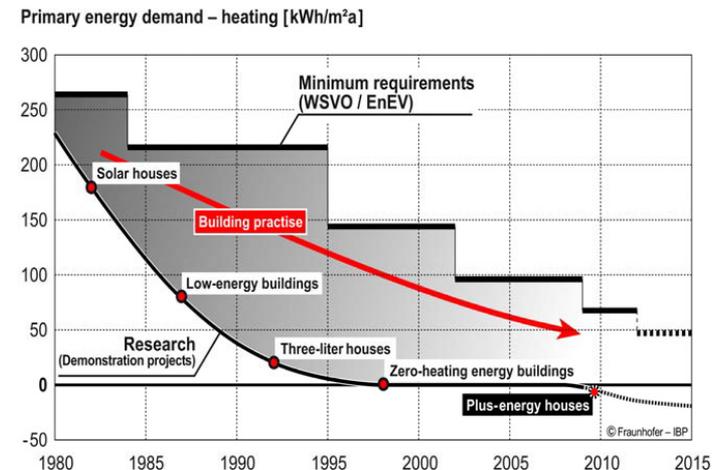
- -20% GHG (1990)
- +20% RW
- +20% Energy efficiency

EPBD recast (2010): future buildings will be:

- Low-Energy Buildings
- Zero-Net Energy Buildings (ZEB)

Extensive efforts to reduce energy use in new buildings

Older buildings consume more and still constitute the major share of the building stock





# ICT and the built environment

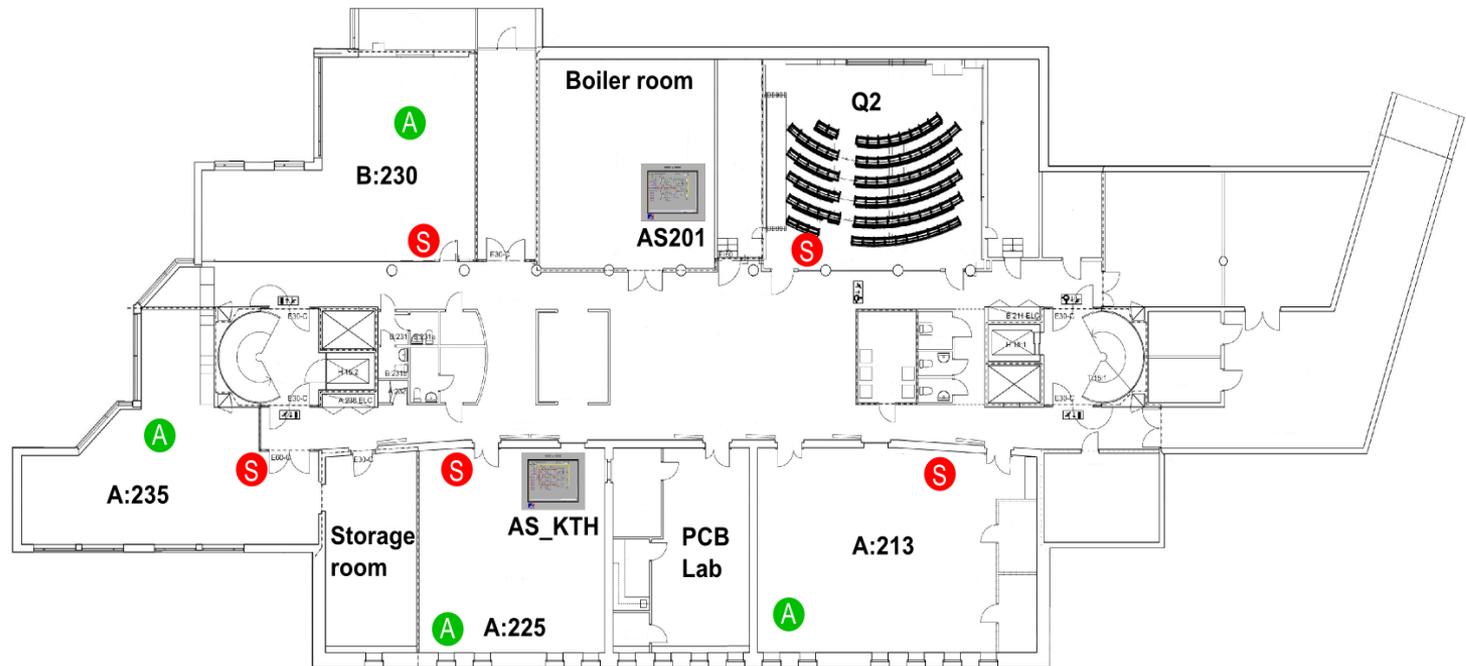
Previous work has shown that there are inefficiencies due to, among others:

- Human behavior
- Faulty systems
- Design and construction standard
- Heating and ventilation system performance degradation

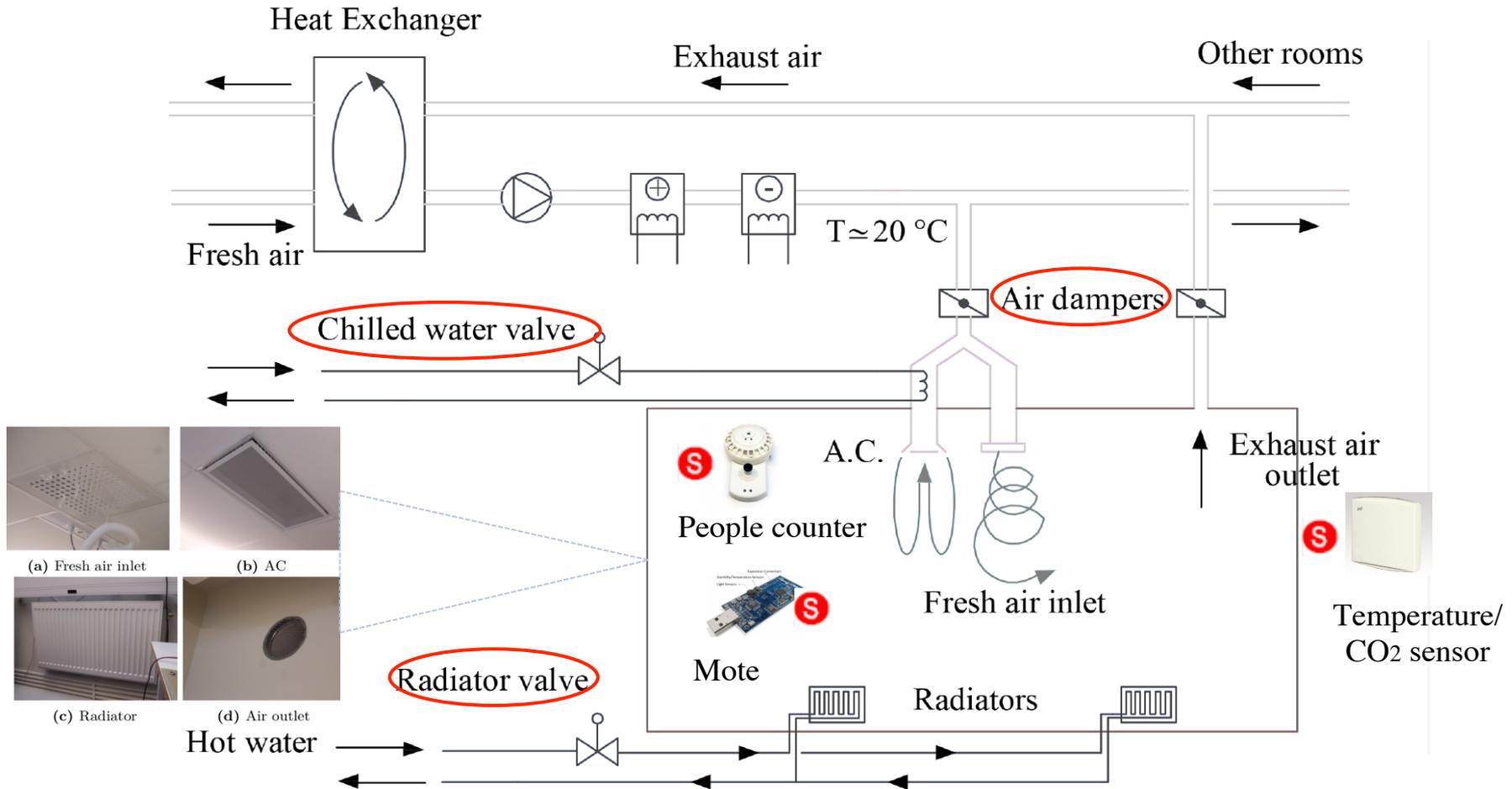
Growing importance of how ICT can improve the energy management in our society

- Improved buildings monitoring
- Understand complex phenomena like human behavior
- Better building systems control
- Improve the services systems

# Previous work: KTH EES Smart Building Testbed

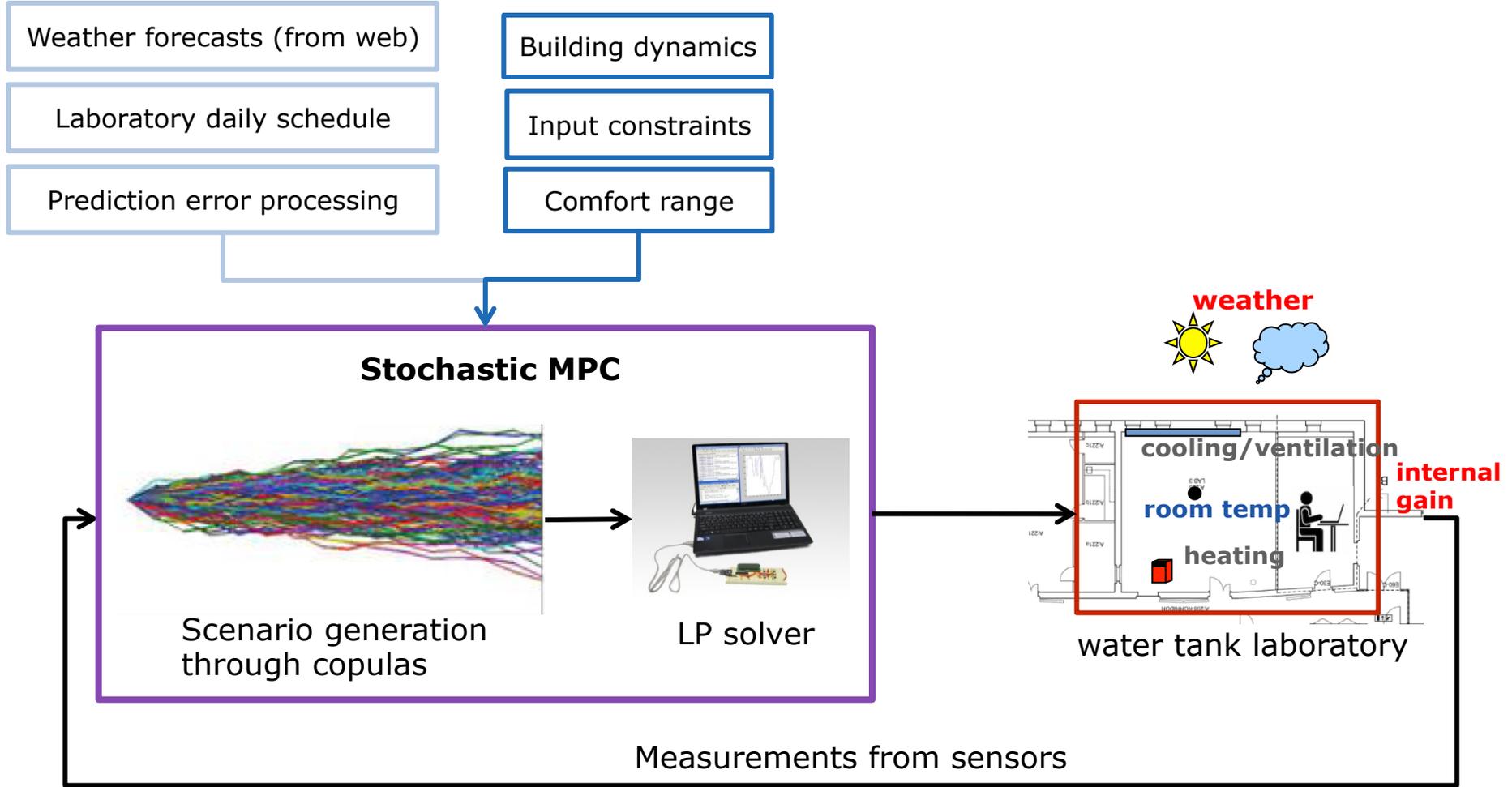


# Smart buildings in practice: Wireless sensor network



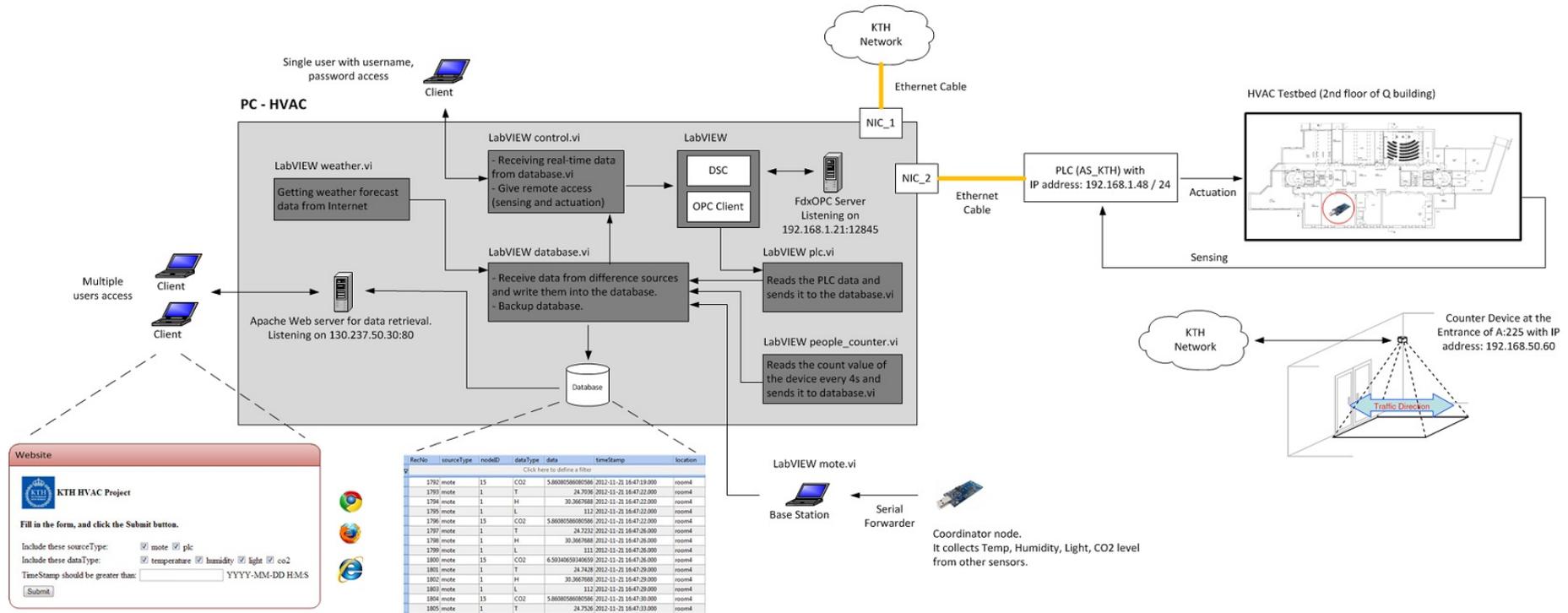


# HVAC Control Scheme





# Architecture





# Lessons learned

## Positive experiences

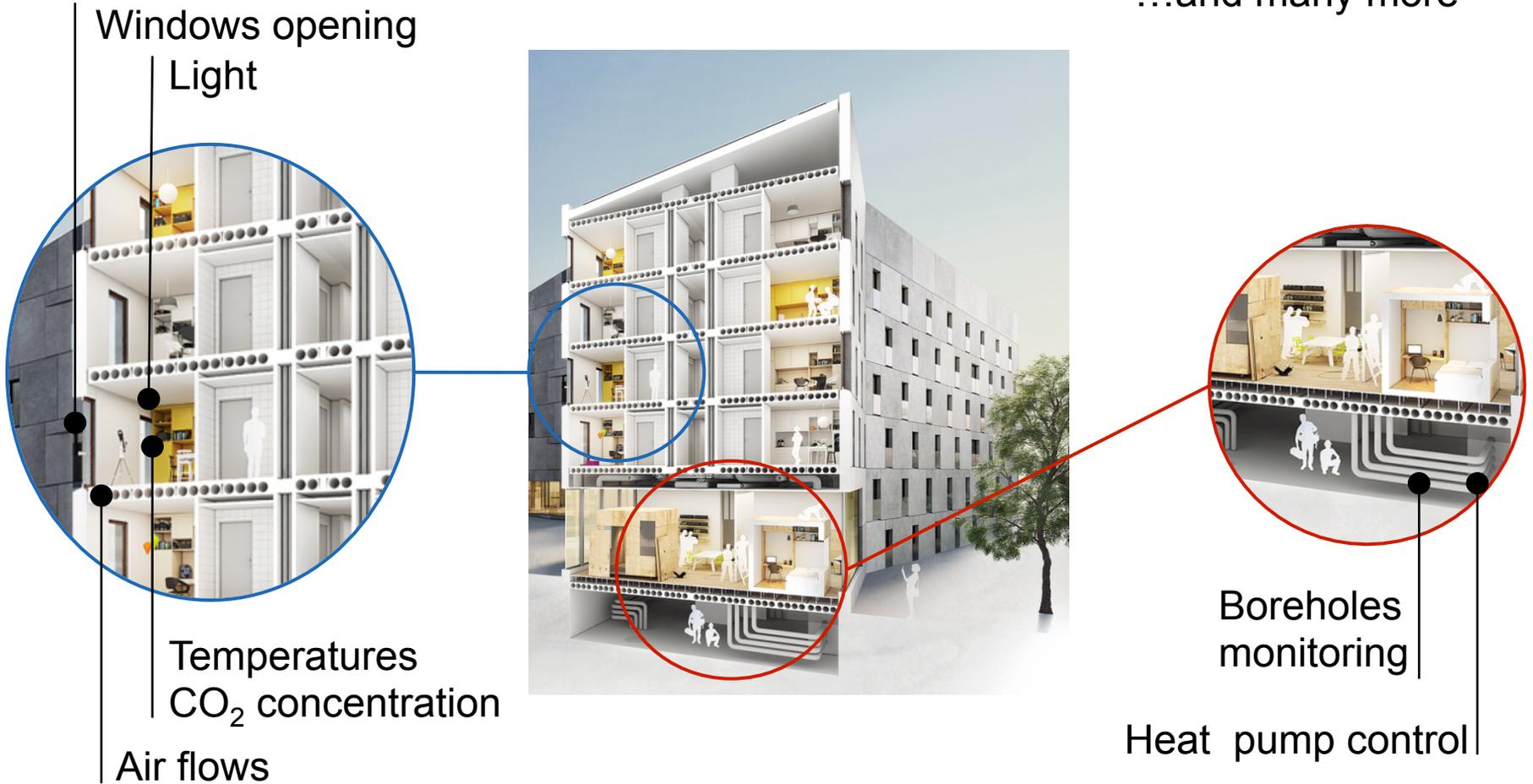
- Flexible system and architecture
- Reproducibility
- Encouraging results (10-30% energy savings)
- Reliable control system

## Challenges

- Implementation labor
- Standardization
  - Software & programming languages
  - Hardware
  - Communication protocols
- Proprietary systems
  - Welcome open source approach!

# Example of sensors

...and many more



Wireless sensors for flexibility

# Adaptive Controllers: pilot projects

AKADEMISKA HUS

Residential buildings: Live-In Lab



Office buildings: Undervisning Hus





# Live-In Lab IoT workshop

Venue: Dome of Vision,  
Valhallavägen 79

Date: 26<sup>th</sup> November

Link for registration: [https://  
www.liveinlab.kth.se/kalender](https://www.liveinlab.kth.se/kalender)

The screenshot shows the KTH Live-In Lab website. At the top right, it says "KTH LIVE-IN LAB | KTH Live-In Lab in English". The navigation menu includes: HEM, UTVECKLING OCH FORSKNING, OM KTH LIVE-IN LAB, UTBILDNING, KALENDER, and KONTAKT. The main content area is titled "KTH LIVE-IN LAB / KALENDER" and "Kalender". It features a calendar for November 2016 with a highlighted event on November 25th. The event details are: "25 november", "Fredag, 16:00 - 18:00", "HÄNDELSER KTH Live-In Labs Digital Platform", "Föreläsare: Marco Molinari & Elena Malakhatka", and "Plats: Dome of Visions". There is a link "Läs mer". To the right of the event is a calendar grid for November 2016. Below the calendar, there are links: "Lista resten av året" and "Skriv ut denna lista". At the bottom, there is a section "Exportera kalender" with links: "Nuvarande tidsintervall" and "Exportera resten av året". The footer contains "KTH", "Intresserad av KTH Live-In Lab", and "Kontakt".