Data-driven optimization layer on existing BMS – challenges and obstacles

PhD Mikk Maivel

SCANVAC WEBINAR

17.04.2026

Agenda

- **R8 general overview:**
  - ✓ HVAC control additional layer
  - ✓ Smart FDD
  - ✓ Reporting and ESG
- **Smart control examples:**
  - ✓ Air volume control by occupancy/electricity
  - ✓ Supply air temperature control by actual need
  - ✓ Chiller supply water temperature setting control
- **Summary**

About R8 Technologies

Operating since **2017**, we are a human-centric **XAI** technology company that helps commercial real estate operate efficiently and decarbonize

350+
Our AI-powered solutions are trusted by +350 buildings amongst international portfolios

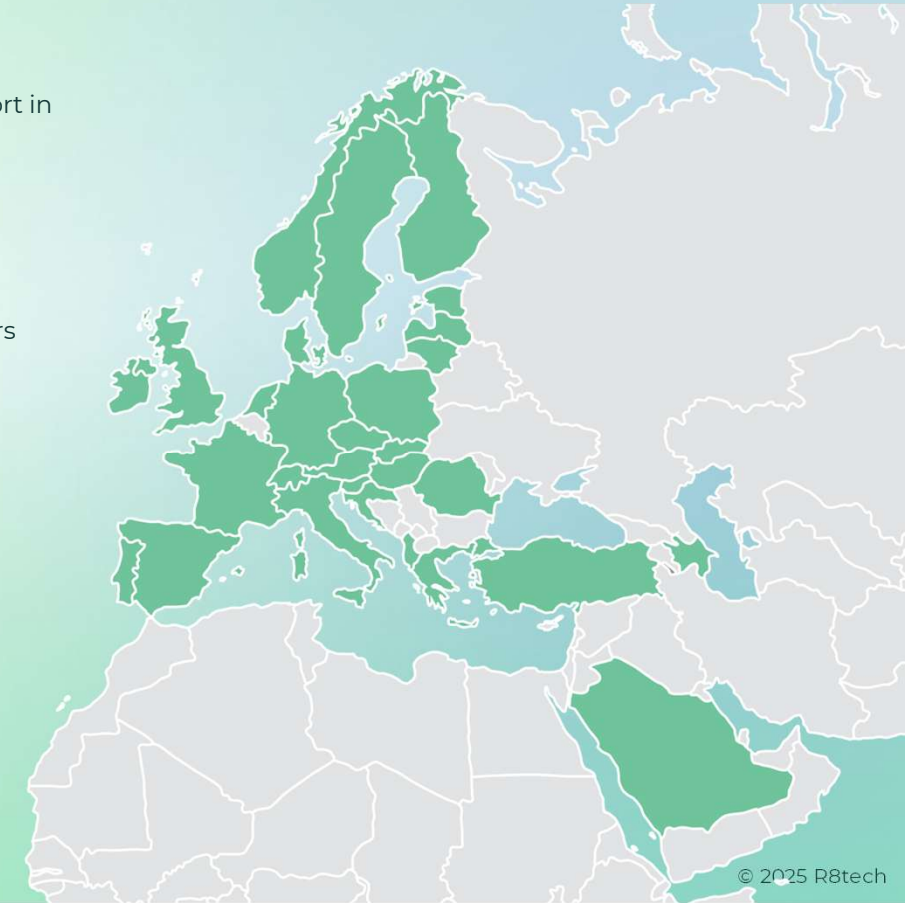
15+
We provide multilingual Energy Efficiency & HVAC Experts' support in over 15 languages

5 Mil+
Our portfolio consists of over 5 Mil m^2 of commercial real estate **across 25 countries**

60+
Members of our highly skilled team combine expertise from real estate, energy & IT sectors

90,000t+
Real estate CO_2 emissions avoided with R8 Jenny

2.5 Mil+
Building adjustments made by R8 Jenny **monthly**



Internationally certified

ISO/IEC 27001:2022:

CERTIFIED ISO 27001

Quality in Business by:

INTERNATIONAL TRADE COUNCIL

Compliance with TÜV § 71a GEG:

TÜVRheinland CERTIFIED — Regular Surveillance

R8 Jenny — Data-Driven Digital Operation

R8 Digital Operator Jenny is a software layer for existing building systems that transforms siloed BMS and IoT data into a unified performance twin—enabling real-time visibility, automated diagnostics, and predictive operations

DYNAMIC BUILDING DIGITALIZATION

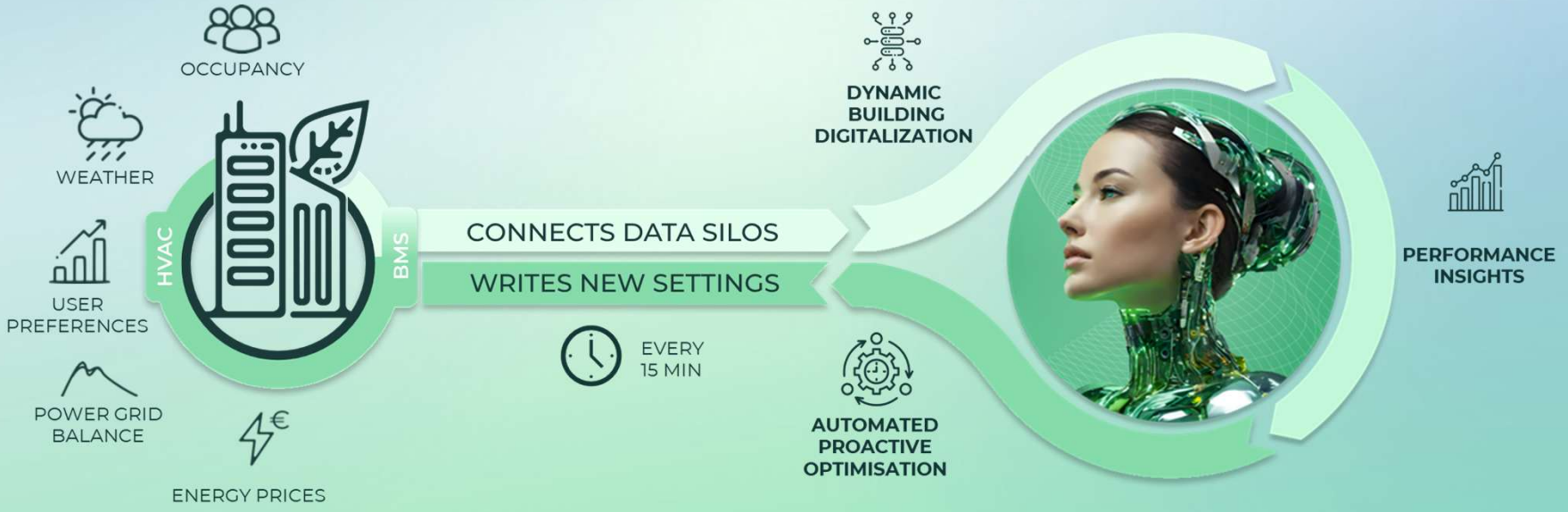
R8 Jenny structures all key data points from BMS, IoT, and EMS systems into a dynamic performance twin; enabling live insights and centralized operational control for buildings and portfolios.

PERFORMANCE INSIGHTS

Delivers 50+ automated diagnostic tests for HVAC systems and provides complete IAQ and energy analytics fully exportable for ESG and portfolio reporting.

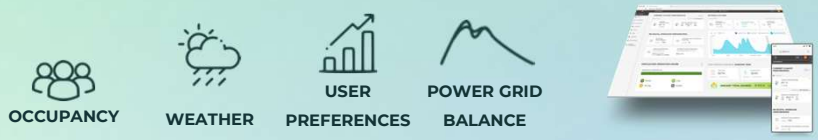
AUTOMATED PROACTIVE OPTIMISATION

With a market-leading xAI engine, R8 Jenny continuously synchronizes all HVAC subsystems through intelligent micro-adjustments, maximizing comfort and system health and minimizing energy use



R8 Jenny Upgrades Existing BMS to Meet and Exceed EPBD Standards

Building automation and control systems (BACS) are mandatory for non-residential buildings ≥ 290 kW (by end of 2024) and ≥ 70 kW (by end of 2029)

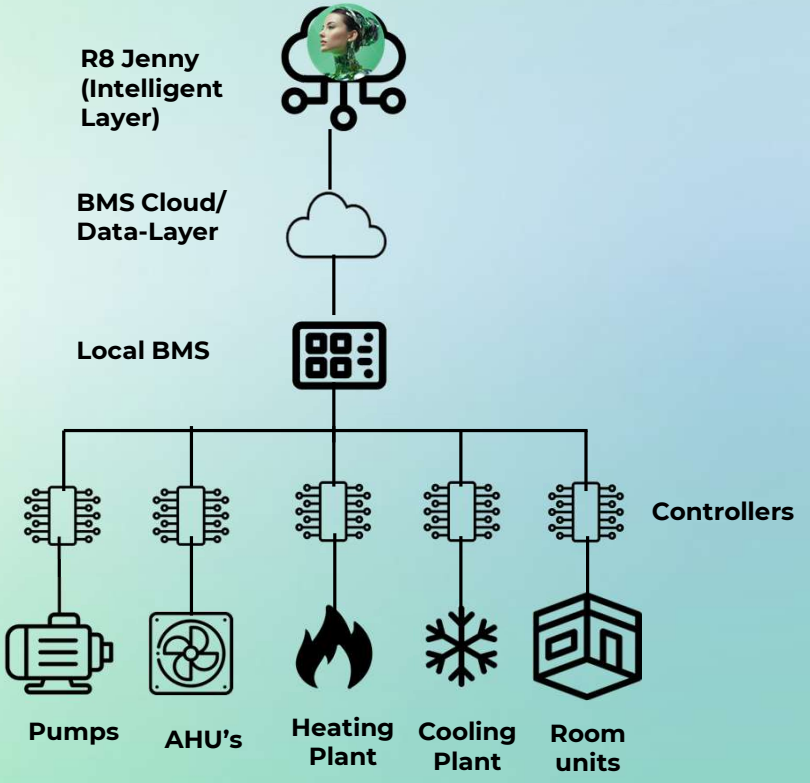


<u>According to EPBD</u>
<u>Building automation systems must be capable of:</u>

1. Continuous monitoring, recording, and analysis of energy use, enabling automatic adjustment of building operation.

2. Comparative analysis and fault detection identifying efficiency losses in HVAC, or other systems, and notifying facility managers of improvement opportunities.

3. Communication and interoperability between connected building systems and in-building devices, independent of manufacturer or protocol, ensuring seamless, vendor-neutral integration



Aligned with EPBD 2024 Articles 14 & 15 (Building Automation & Control).
Supports SRI (Smart Readiness Indicator) and
MEPS (Minimum Energy Performance Standards) compliance.

Automated detection of energy-impacting HVAC faults

5 Most Common Technical Issues

- ✓ **Faulty or Inaccurate Sensors:**

  Sensors may provide unreliable data, leading to poor decision-making and inefficiencies in building operations.

- ✓ **Automation Systems Ignoring Schedules:**

  Systems fail to follow the predefined schedules set in the Building Management System (BMS), resulting in wasted energy and inconsistent operations.

- ✓ **Failure to Maintain Setpoints:**

  HVAC systems may not adjust to the required temperature setpoints, leading to fluctuating indoor climate conditions and higher energy costs.

- ✓ **Cascade Logic Failures:**

  Errors in the cascade logic of air-handling units cause disruptions, affecting the entire ventilation system's performance.

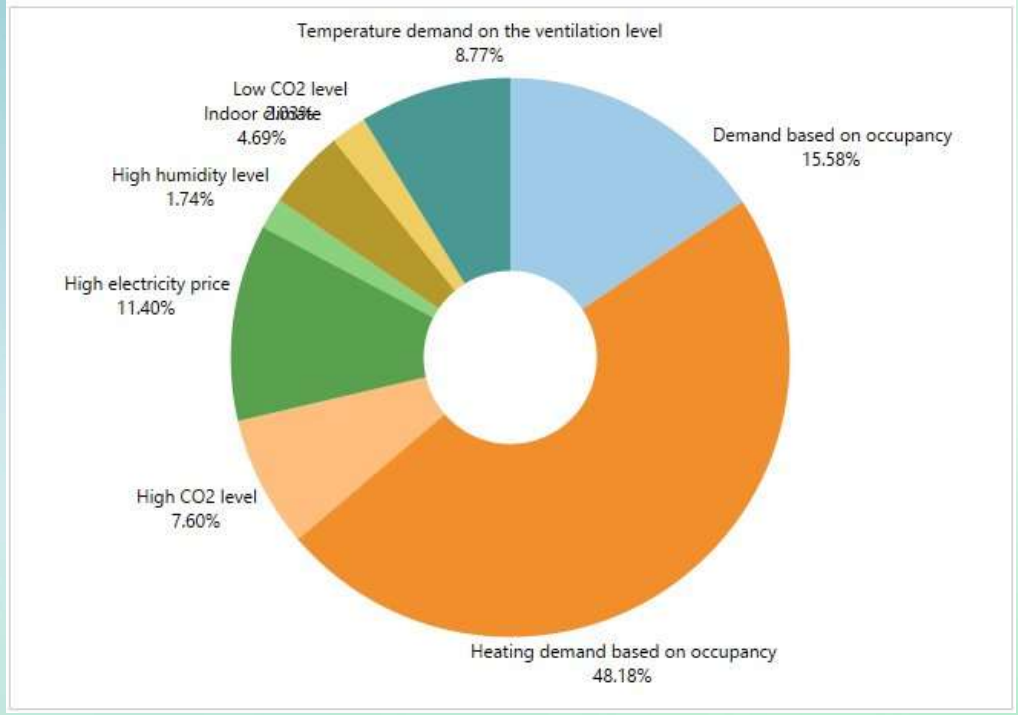
- ✓ **Leaking Cooling and Heating Valves:**

  Inefficient valve control results in leaks, causing excessive energy usage and system stress.

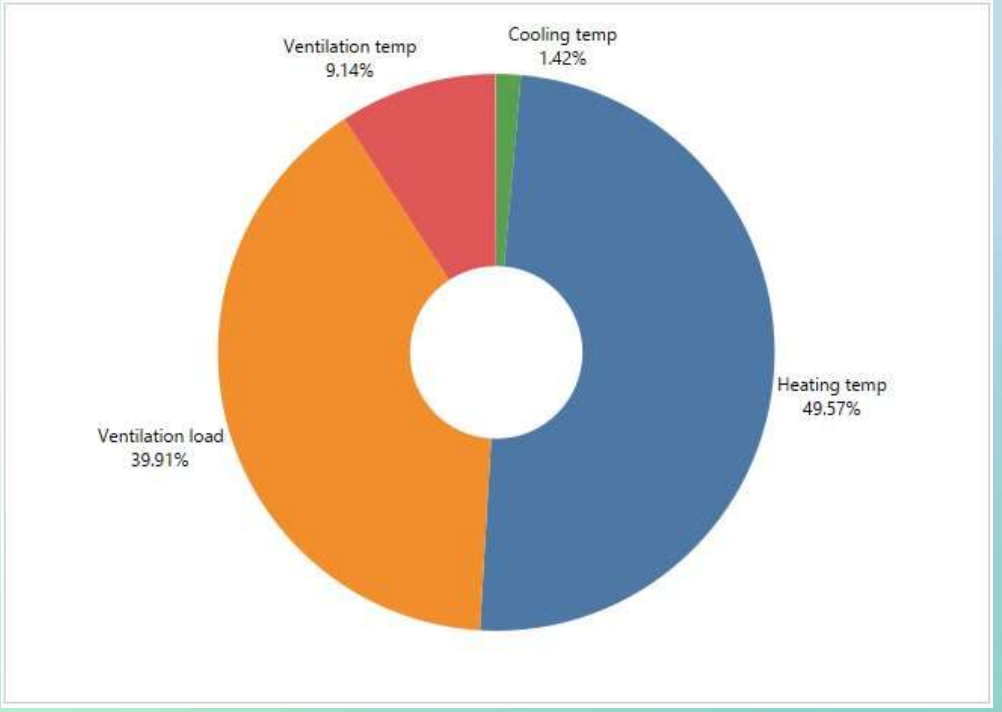
R8 automated control examples

74 328 adjustments made January – November 2025 in office building (27 000m^2)

Reasons for changes



What changes were made



R8 Jenny Automated Proactive Optimization

Datapoints used for control of your building by R8 Jenny:

- Temperature control graphs or set points
- Air volume control graphs or set points
- Pressure control graphs or set points
- Schedules (optional)

R8 Jenny works adaptively while BMS stays fully operational for any manual changes necessary at any given time.
The AI solution uses the same datapoints that are accessible by your building's technical operator from the following systems:

Ventilation

- Fans (R/W)
- Temperatures (R/W)
- Heat recoveries (R)
- Mixing boxes (R/W)
- Coils & Valves (R)
- Meters (R)

Heating

- Radiator circuits (R/W)
- Air curtain circuits (R/W)
- Ventilation heating circuits (R/W)
- Street heating circuits (R/W)
- DHW circuits (R/W)
- Heat pumps (R/W)
- Meters (R)

Cooling

- Chiller & circuits (R/W)
- Fan coil circuits (R/W)
- Ventilation circuits (R/W)
- Meters (R)

Rooms

- Room temperature set points (R/W)
- Room thermostat modes (R/W)
- Fan coils (R/W)
- Radiators (R)
- Active, passive panels (R)
- VAVs (R/W)
- Sensors (incl third-party)

R –read, W – write option possible, depends on system set up and agreement

R8 control examples – Air volume control by Live occupancy (1)

Air volume control based on electricity price/expected occupancy etc.

Before R8 ventilation ON 07:00 – 19:00 design air volume

Initial occupancy profile

Hours

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mon	0	0	0	0	0	0	0	4	8	9	9	8	5	5	8	8	9	8	4	3	0	0	0	0
Tue	0	0	0	0	0	0	0	4	8	9	9	8	5	5	8	8	9	8	4	3	0	0	0	0
Wed	0	0	0	0	0	0	0	4	8	9	9	8	5	5	8	8	9	8	4	3	0	0	0	0
Thu	0	0	0	0	0	0	0	4	8	9	9	8	5	5	8	8	9	8	4	3	0	0	0	0
Fri	0	0	0	0	0	0	0	4	8	9	9	8	5	5	8	8	9	8	4	3	0	0	0	0
Sat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

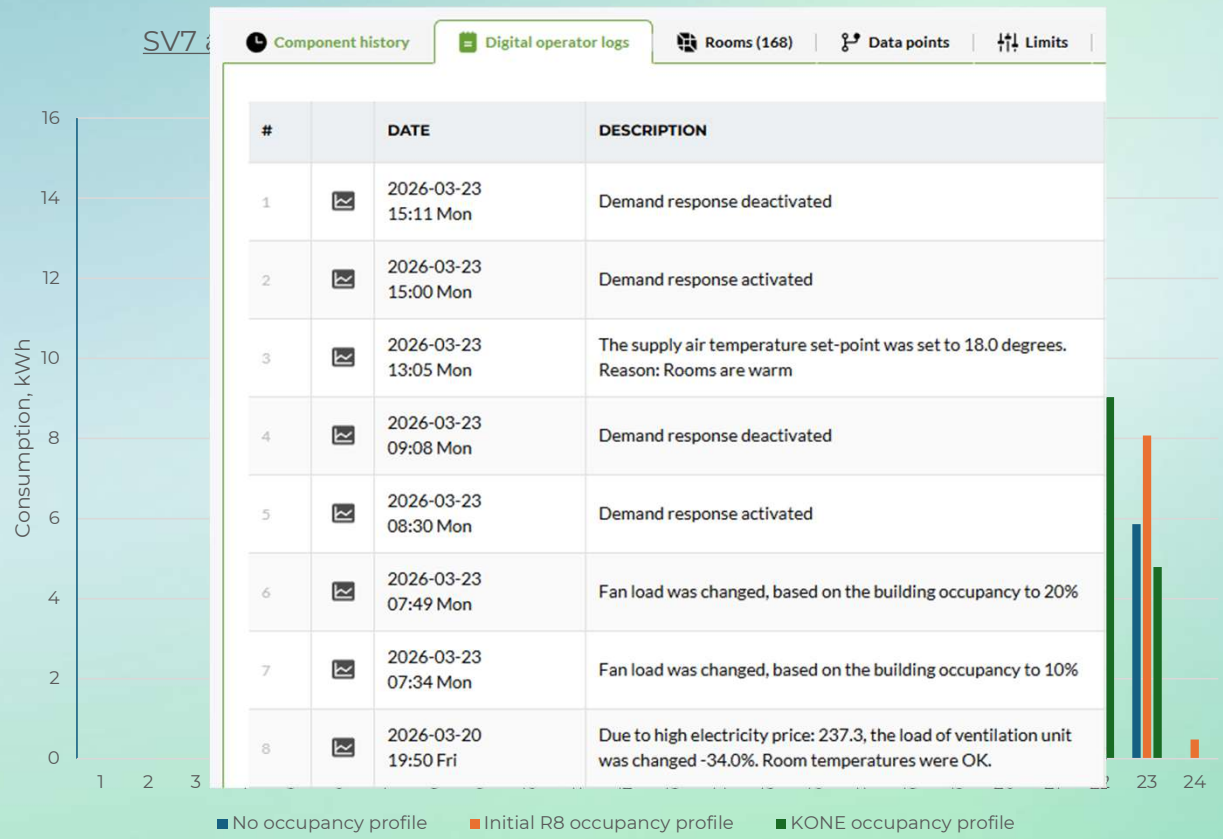
Elevator normalized data at working days between 7:00 – 18:00 was used as new occupancy profile

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Mon	0	0	0	0	0	0	0	1	3	6	6	7	7	7	7	7	6	5	0	0	0	0	0	0
Tue	0	0	0	0	0	0	0	1	4	6	7	7	7	8	8	8	7	5	0	0	0	0	0	0
Wed	0	0	0	0	0	0	0	1	3	6	7	7	7	7	8	8	7	5	0	0	0	0	0	0
Thu	0	0	0	0	0	0	0	1	3	6	6	6	6	7	7	7	6	5	0	0	0	0	0	0
Fri	0	0	0	0	0	0	0	1	3	5	5	6	6	6	7	7	6	6	0	0	0	0	0	0
Sat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Airflow does not change linearly with pressure because each terminal (diffuser/plenum) has its own resistance and control characteristics – so it is important to understand local system!

R8 control examples – air volume control (2)

The reduction in energy consumption is evident when using occupancy profiles compared to no profile.
Also, using live occupancy data from elevator is more efficient than R8 default profile for office buildings.



Consumption reduction compared to no occupancy profile:

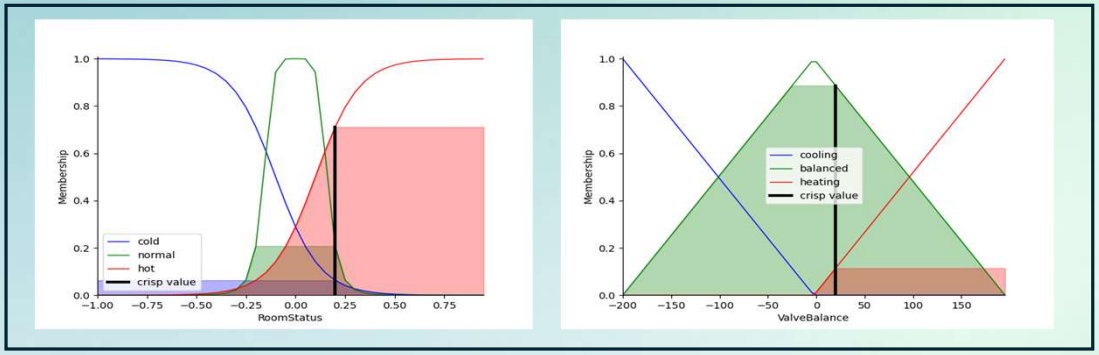
Initial R8 occupancy profile: -19%

Elevator occupancy profile: -27%

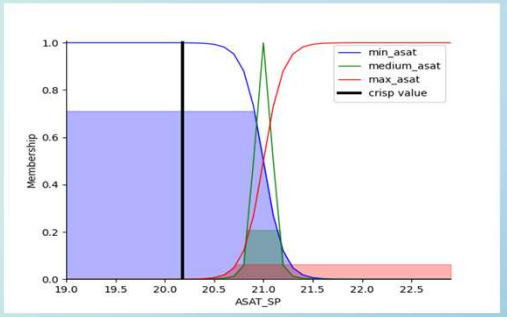
R8 control examples – Supply air temperature smart control (Fuzzy)

Basic configuration: Supply air temperature limits: 19...23 °C

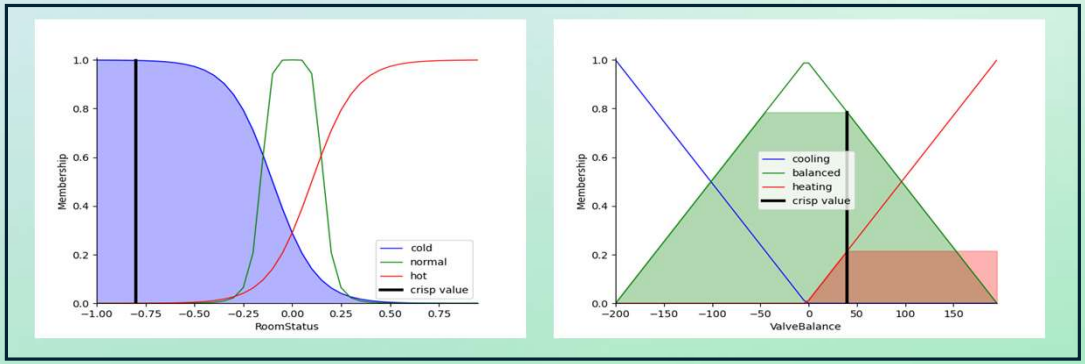
Example 1: room status: 0.2, valve input balance: 20



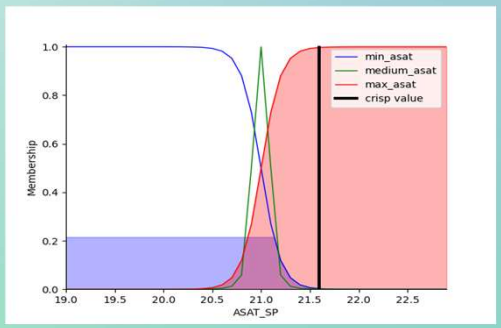
Result: proposed supply temp: 20.2 °C



Example 2: room status: -0.8, valve input balance: 40



Result: proposed supply temp : 21.6 °C



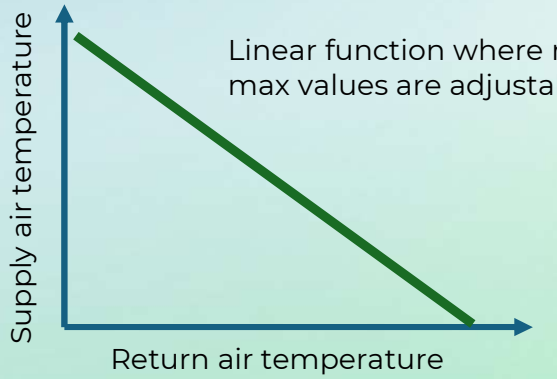
Fuzzy control benefits

Traditional (Linear Reset)

- Supply air temp = f(Return Air Temperature)
- One input → fixed relationship

Limitations

- Ignores room-level variation
- Cannot resolve conflicting conditions
- Same response regardless of system state



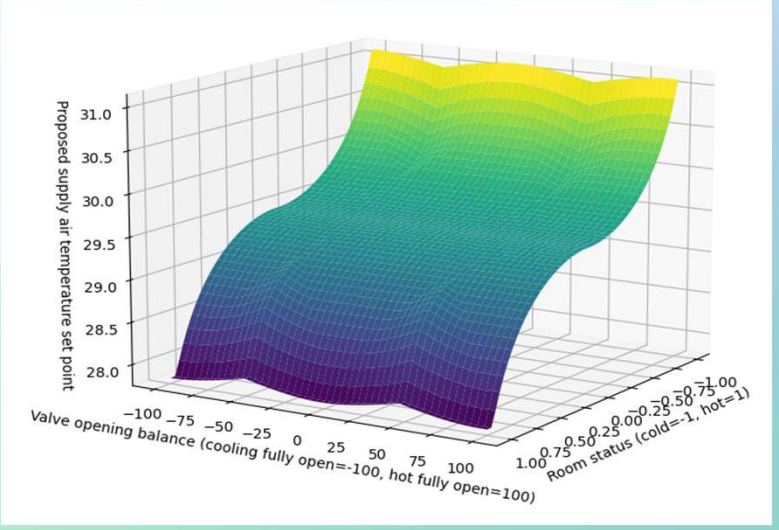
Linear function where min and max values are adjustable

Fuzzy Control

- Inputs: **room comfort + valve state**
- Rule-based, non-linear behavior

Advantages

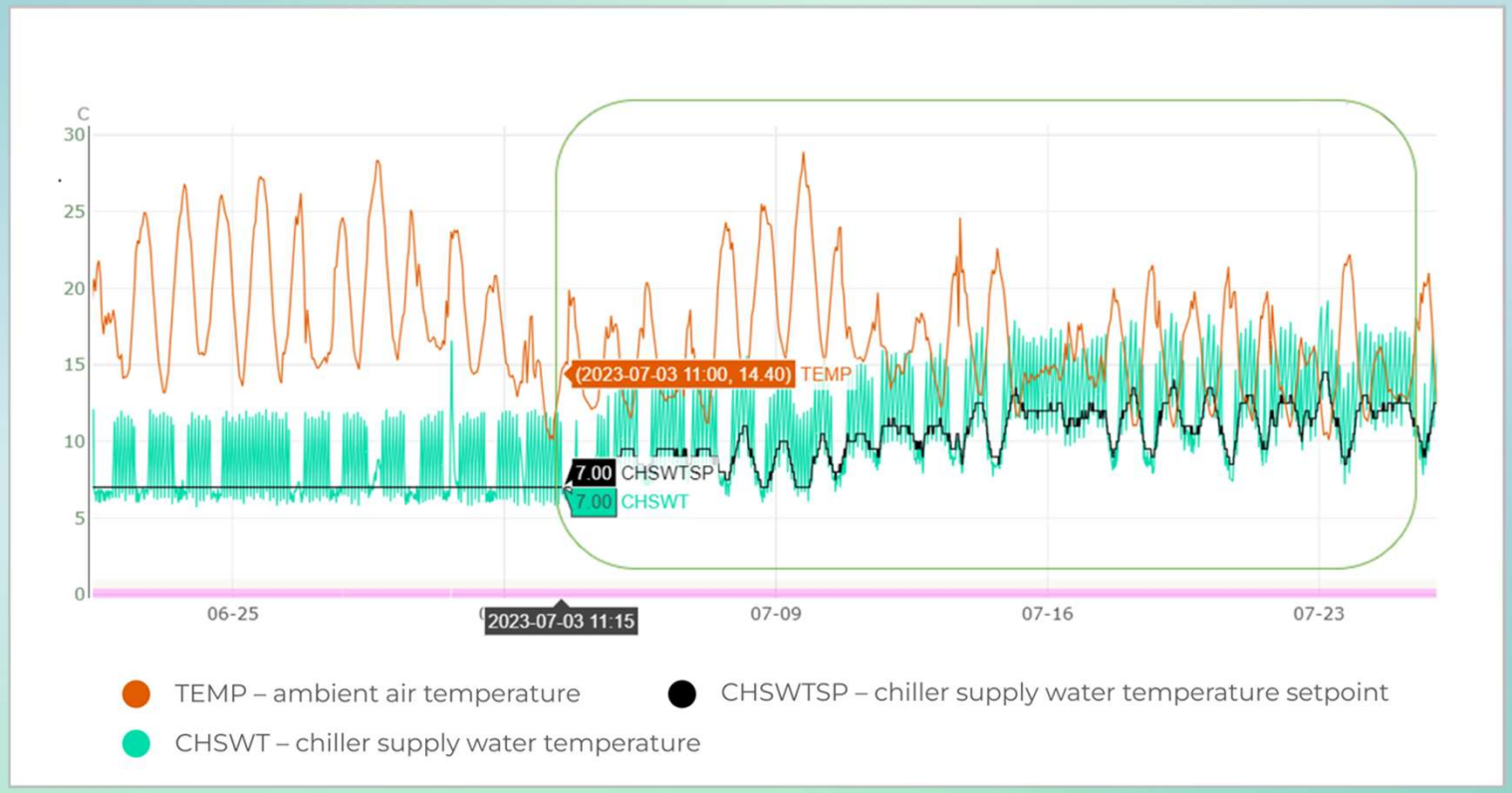
- Handles mixed room conditions
- Adapts to heating/cooling
- Smooth, stable response



Linear control reacts to temperature
Fuzzy control reacts to comfort and system behavior

R8 control examples – Chiller supply water temperature

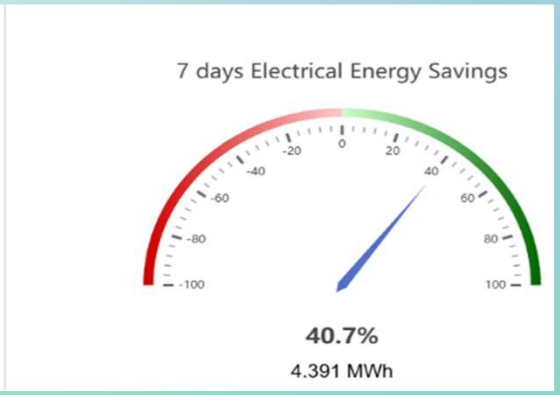
Real-time chiller optimization based on actual system demand, ambient temperature, and energy price controllable through factors such as system return water temperature, cooling valve openings and trends in indoor temperatures.



Increasing chiller supply water will increase chiller efficiency +1°C will increase 2...4% compressor efficiency!

Summary - challenges

- Most HVAC systems are not operating as designed;
- HVAC operates on static settings, while buildings are used dynamically;
- Significant differences in mindset: IAQ requirements, and HVAC solutions across regions!
- Fragmented room-level control (diverse room controllers and logic);
- BMS ↔ local controller integration challenges;
- Saving (R8 impact) calculation (whole building or component level calculation);



Summary - obstacles

- **Facility manager's** main KPIs → reducing complaints, lowering energy costs, improving EPC rating;
- **Technical manager's** main KPI → number of complaints;
- **Unrealistic tenant expectations** for IAQ (e.g., 24 °C in winter, 22 °C in summer);
- **Saving or impact calculation;**
- Technical issues, long troubleshooting times, and lack of sensors

Save, Earn, Enjoy!

Together towards a greener buildings operations

Thank You!

PhD Mikk Maivel
Energy Efficiency Expert
mikk.maivel@r8tech.io
+37256461251
www.r8tech.io