viboo

intelligent buildings

Building control algorithms for heating technology manufacturers as a cloud software service.

Felix Bünning, CEO
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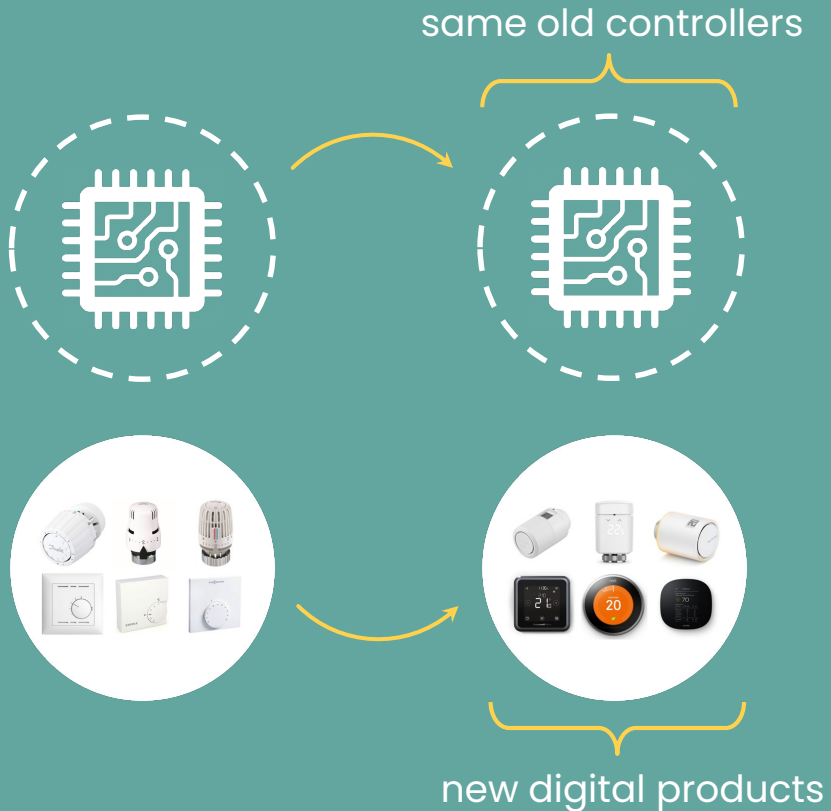https://viboo.io

BRIDGE

VENTURE KICK

spin-off | Empa

viboo:
problem&solution

Problem

same old controllers

new digital products

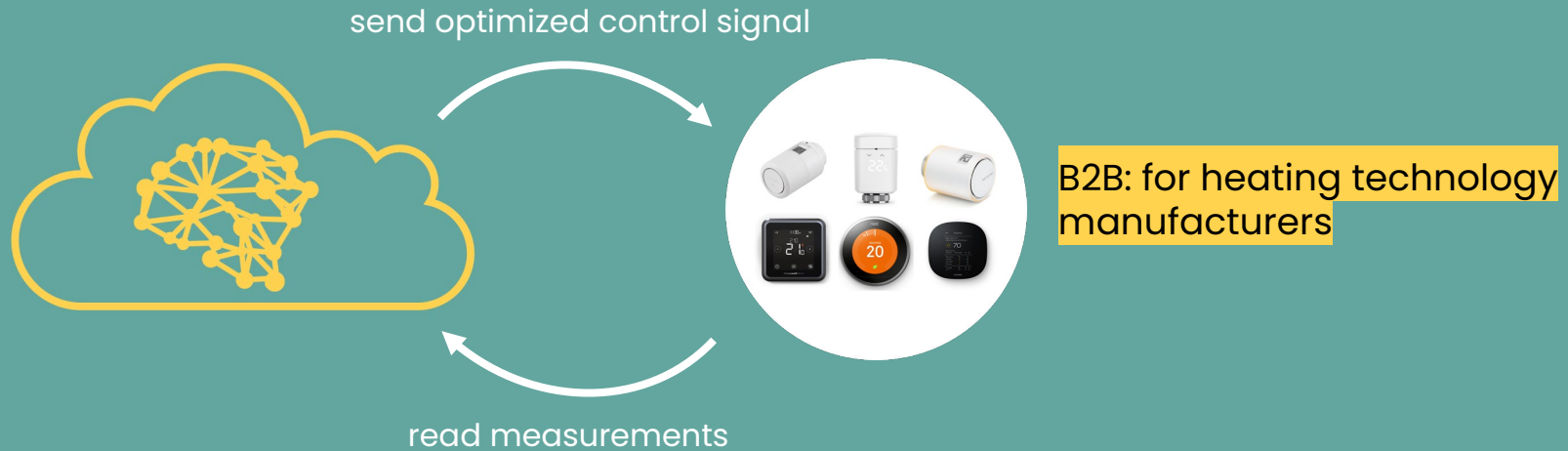Climate change, CO_2 emissions, energy security

Electrification of heating

New markets in energy flexibility and smart home

→ **old controllers not suitable for new challenges and markets**

Predictive control as a cloud service

send optimized control signal

B2B: for heating technology manufacturers

read measurements

- Self-learning, predictive algorithm

- 20-40% energy savings, opens new markets: energy flexibility

- In pilots with market leader *Danfoss* and others

Business model

End user

Saves CHF 400 heating costs per year

Subscription through smart phone-app: CHF XX /month

50%

50%
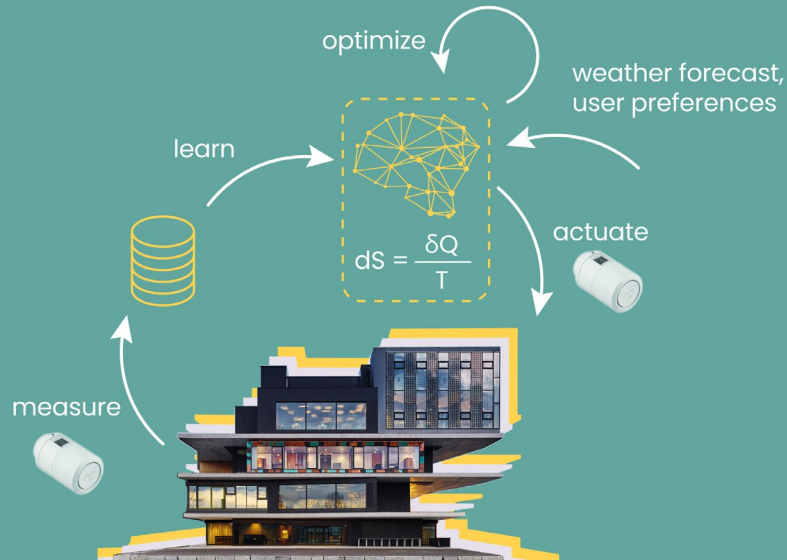
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Reseller

Data predictive control with physics-based constraints

optimize

weather forecast, user preferences

learn

$$dS = \frac{\delta Q}{T}$$

actuate

measure

efficient — 20-40% energy use reduction

fast comissioning — learning period only 1-2 weeks

scalable — ready for energy flexibility markets

unique — only cloud service available

fast evolution — close to top research at ETH Zürich (#3 for automation) and Empa
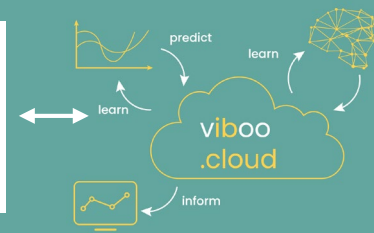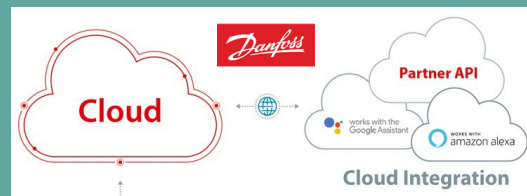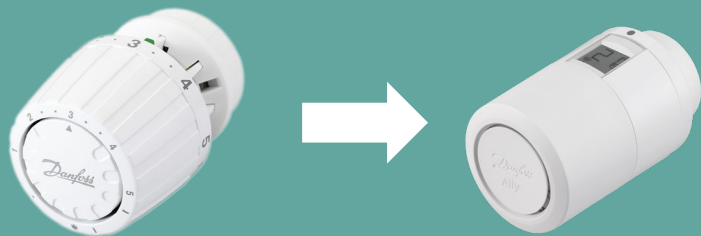
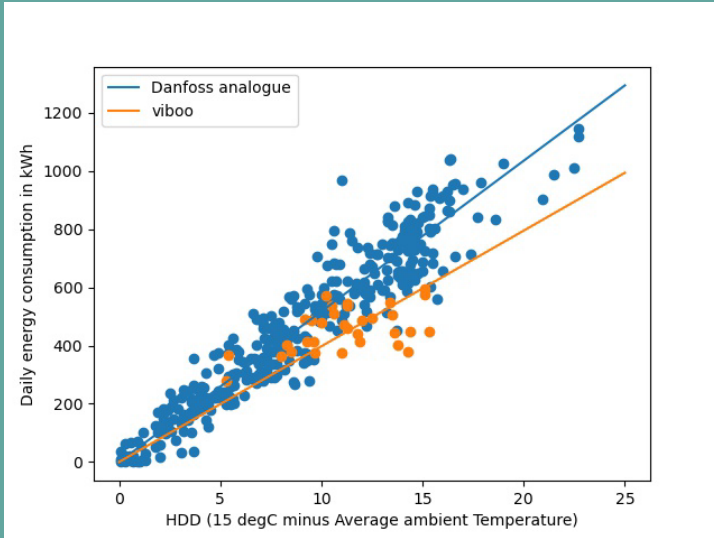viboo:
pilot project

Administration building at Empa

- **Purpose:** prove integration of algorithms with smart thermostats
- **Building:** light commercial, 2000m^2, 150 radiator thermostats

Connection via Danfoss Ally Partner API
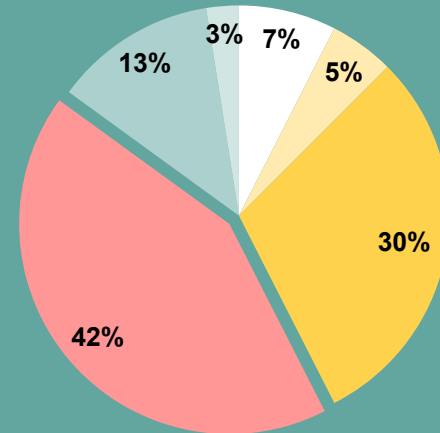
Energy and comfort results

Energy consumption

23% reduction compared to base-case

(28 750 kWh, CHF 3500, 6t CO$_2$)

Comfort

Has your room temperature comfort improved or worsened in the last month compared to the last heating period (last winter)?

Legend:
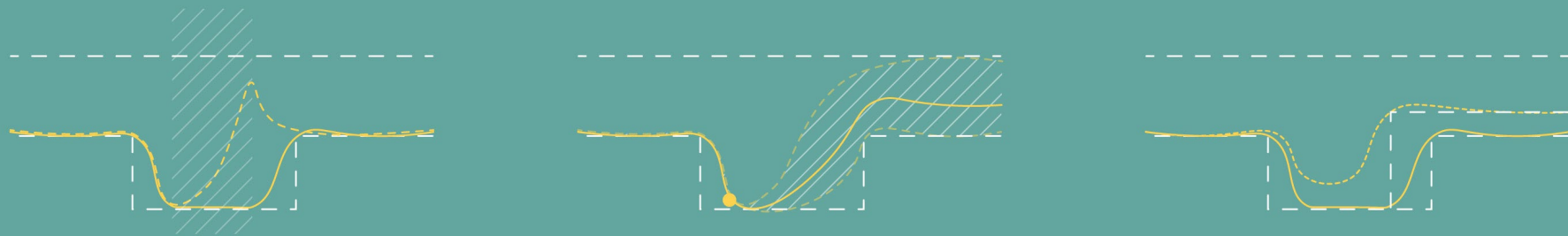- no info
- clearly improved
- rather improved
- stayed the same
- rather worsened
- clearly worsened

Further technical potentials: interactive buildings

More than just energy reduction!

Any constraints and set-ups can be integrated efficiently, including:

time-of-use pricing, demand response, individual comfort, supply temperature optimization, other smart devices integration

Research background

Six experimental studies

- Saves 26%-49% of heating/cooling energy, reduces comfort violations by 70% [1, 3]

- Similar performance compared to physics-based MPC [2]

- Physics-constrained ML reduces training data to 1 week [3]

- Works in distributed control [4]

- Works with demand response schemes [5]

- Efficient sun blind integration [6]

› **250 days of experiments**

Heating energy consumption

— Standard Operation
— Data Predictive Control

Solar-corrected ambient temperature
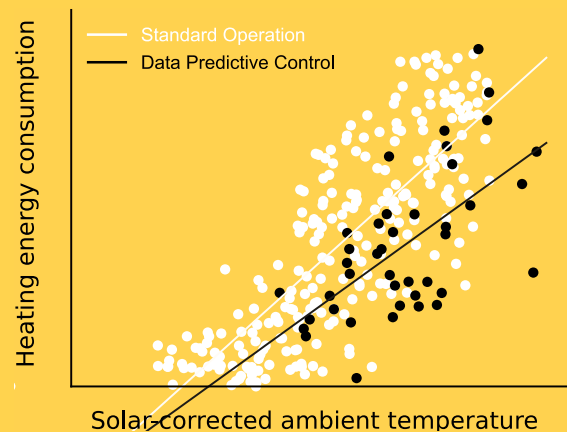
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market potential

TRV market vs Smart home and demand response

Global Smart Home market: $98bn

Recurring revenue model: $13.92bn

(**116m** homes with smart thermostats and **$120** subscription price)

Global TRV market: $1.3bn

Global Demand Response market: $35bn

Global eTRV market: $0.3bn
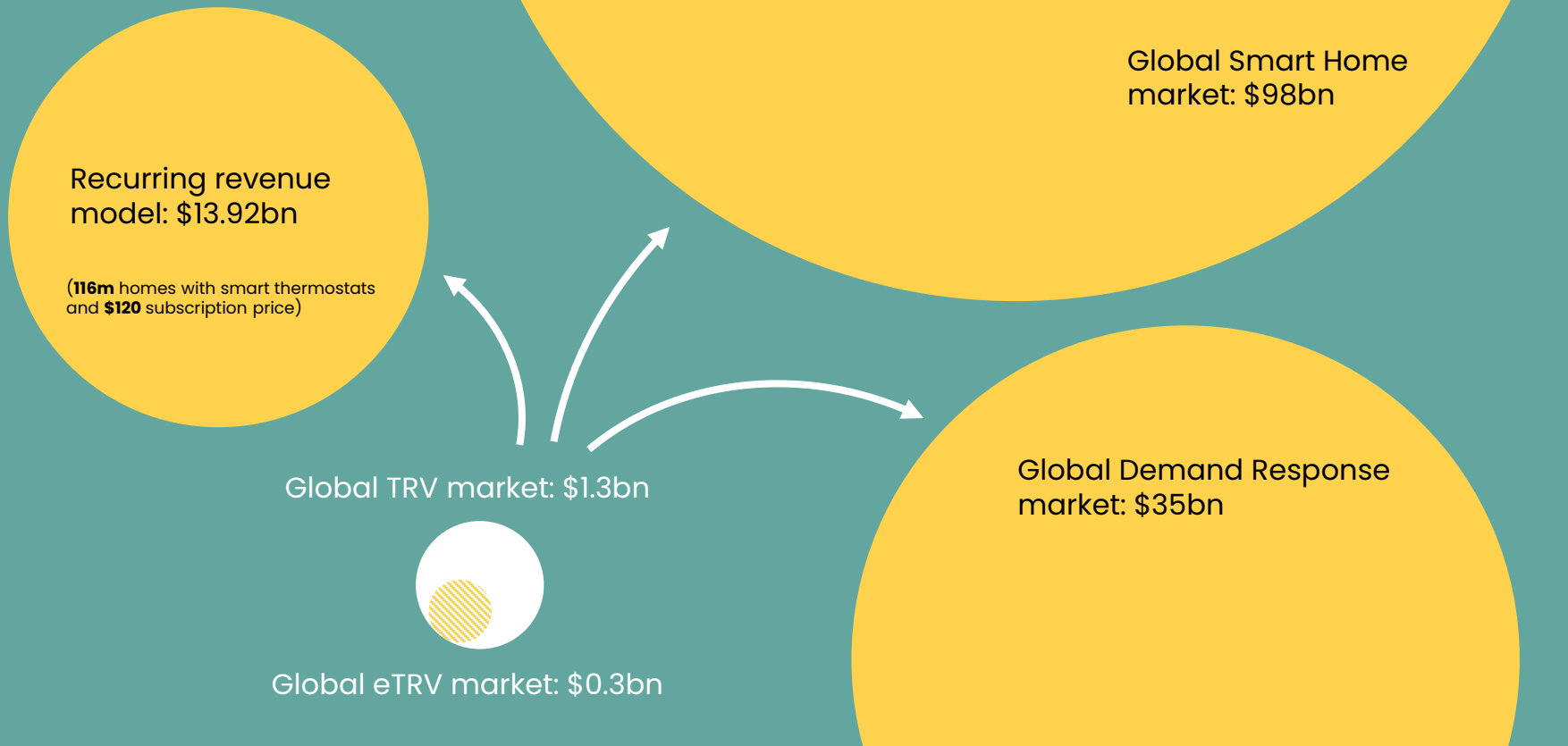
Customer and end-user pipeline

Awareness

- Empa network (email addresses)
- LinkedIn
- Press releases
- Website www.viboo.io
- PDF brochure

In contact

Push
1 pot. customer

ecobee

Pull
7 end users

AXA | ISS FACILITY SERVICES | ...

swisscom | UBS

In discussion

Push
2 pot. customer

evon

Pull
5 end users

willers | TBW

Google | SBB CFF FFS

In Proof of C

Push
2 pot. Customers

ABB | Danfoss

> 40% of European residential market

Pull
1 end user

Empa
Materials Science and Technology

Team

Felix Bünning
- CEO | Co-founder
- Dr. sc. ETH Zürich
- World-leading research labs
- Expert on building automation

„Get stuff done."

Benjamin Huber
- CTO | Co-founder
- MSc Mechanical Engineering
- ETH Zurich, PSI & Empa
- Industry experience in project management

„Plan it right."

Matthias Sulzer
- CFO | Co-founder
- Experienced serial energy entrepreneur, including IPO
- Networked in building industry CH, US

„See the bigger picture."

advisors

Jonas Felix: Serial Software entrepreneur, IT consultant
Prof. John Lygeros: Professor for Automatic Control
Dr. Peter Richner: Deputy Director of Empa, building industry

hiring

Senior Software Engineer
Software Engineer
Project Engineer

track record of team

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