PRODUCTBLOKS

Cooperative cooling systems for sustainable & emission-free temperature-controlled city logistics

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Challenges for users

Thermal intrusion (e.g. hot loads, door openings,…)

Cargo monitoring

Regulatory compliance

Failing equipment

Driver

Vehicle range

Vehicle battery life

Cargo pay load

Charging infrastructure

Fleet size and structure

Service and maintenance


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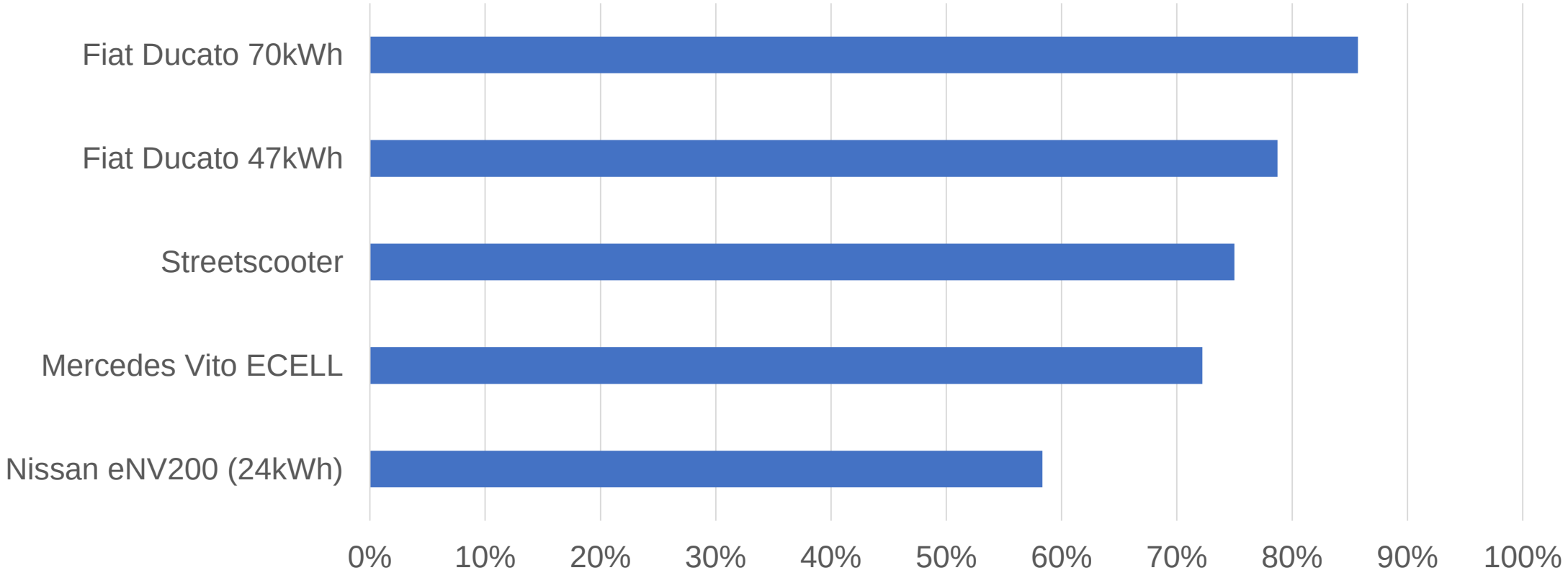
Refrigeration system energy consumption

Up to **10 kWh** per day

Remaining battery capacity for propulsion



How to enable battery electric LCV for transport refrigeration?

1. Do your homework on the hardware
2. Optimize the refrigeration system operational strategy
3. Cooperative control strategies to maximise vehicle range
4. Increase knowledge at user side and let them gain confidence

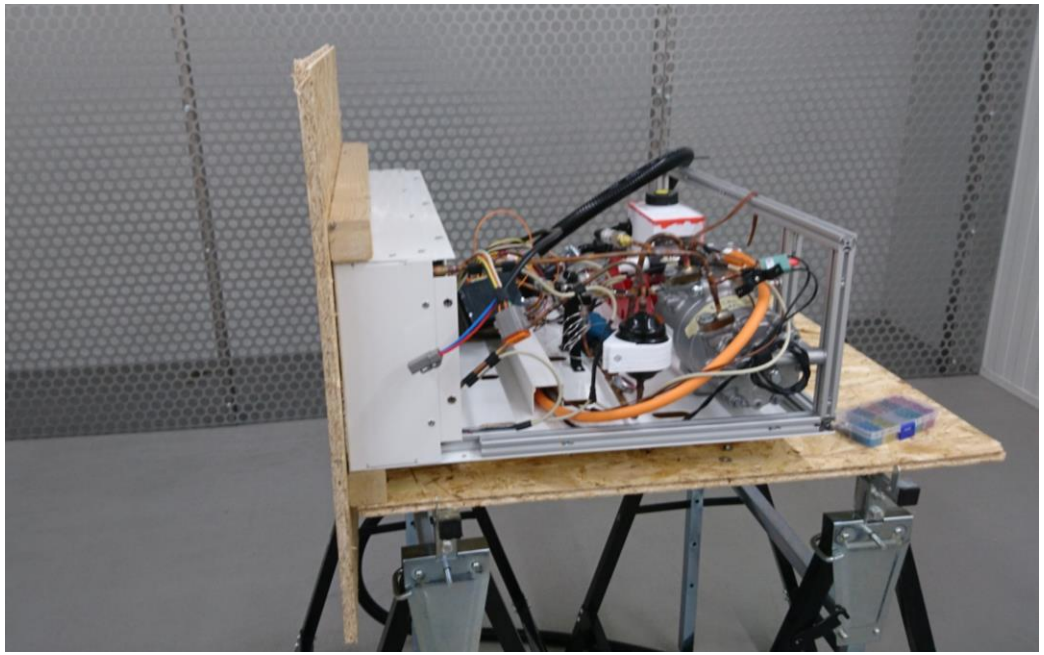
Hardware improvements of HCBLOKS

Sustainable low GWP refrigerant (R290/Propane)

35% weight decrease*

Up to 20% efficiency increase*

*compared to competitor

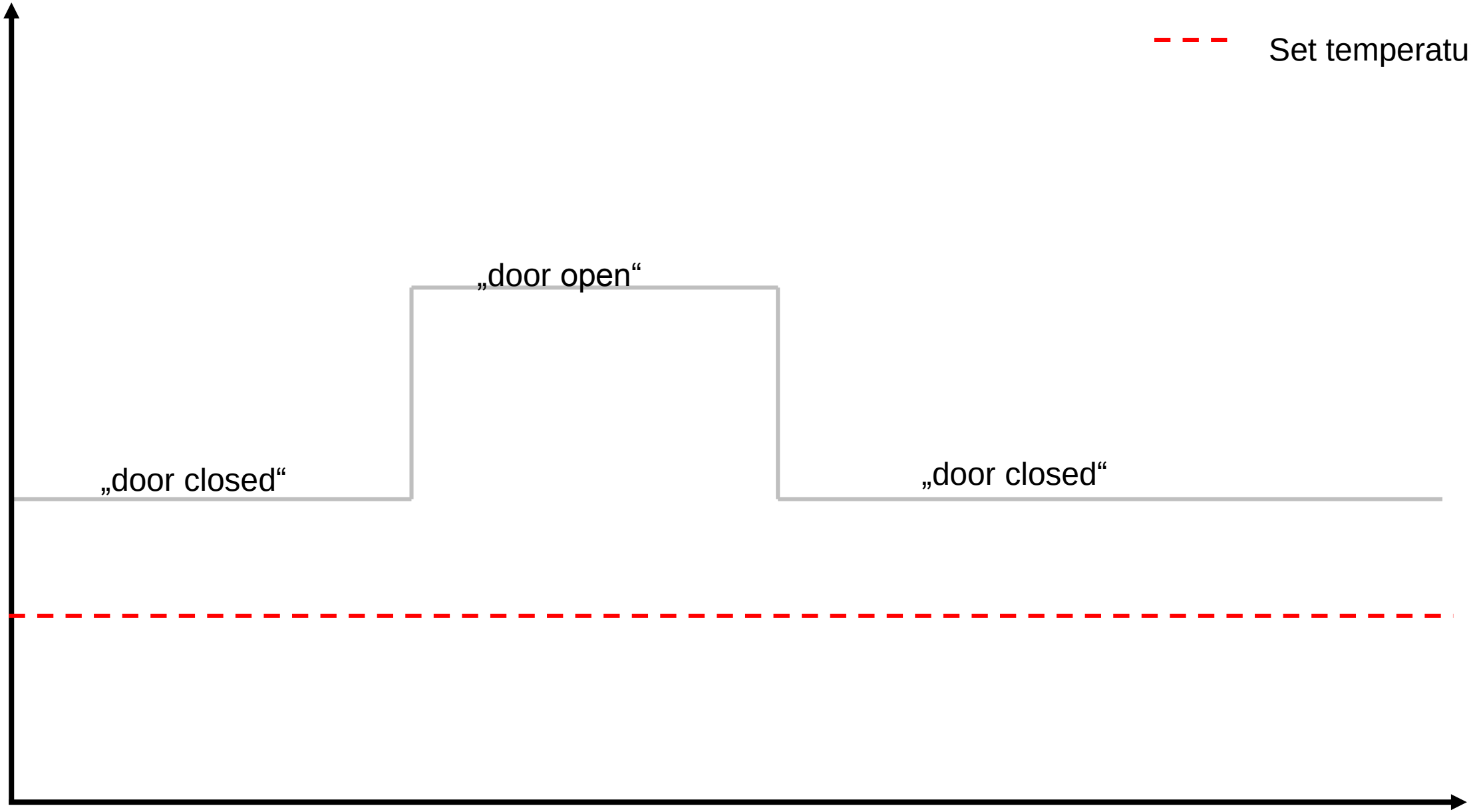


Optimized operation strategy – “fun-to-use“

- Predictive control strategy to reduce impact of thermal intrusion
- Demand-oriented actuator control
  - Variable speed compressor
  - Variable speed secondary actuators
- Automated cargo box preconditioning
- Hot load detection

Door opening compensation

Up to **100 door openings** per day/route


Set temperature
„door open“
„door closed“
„door closed“
time

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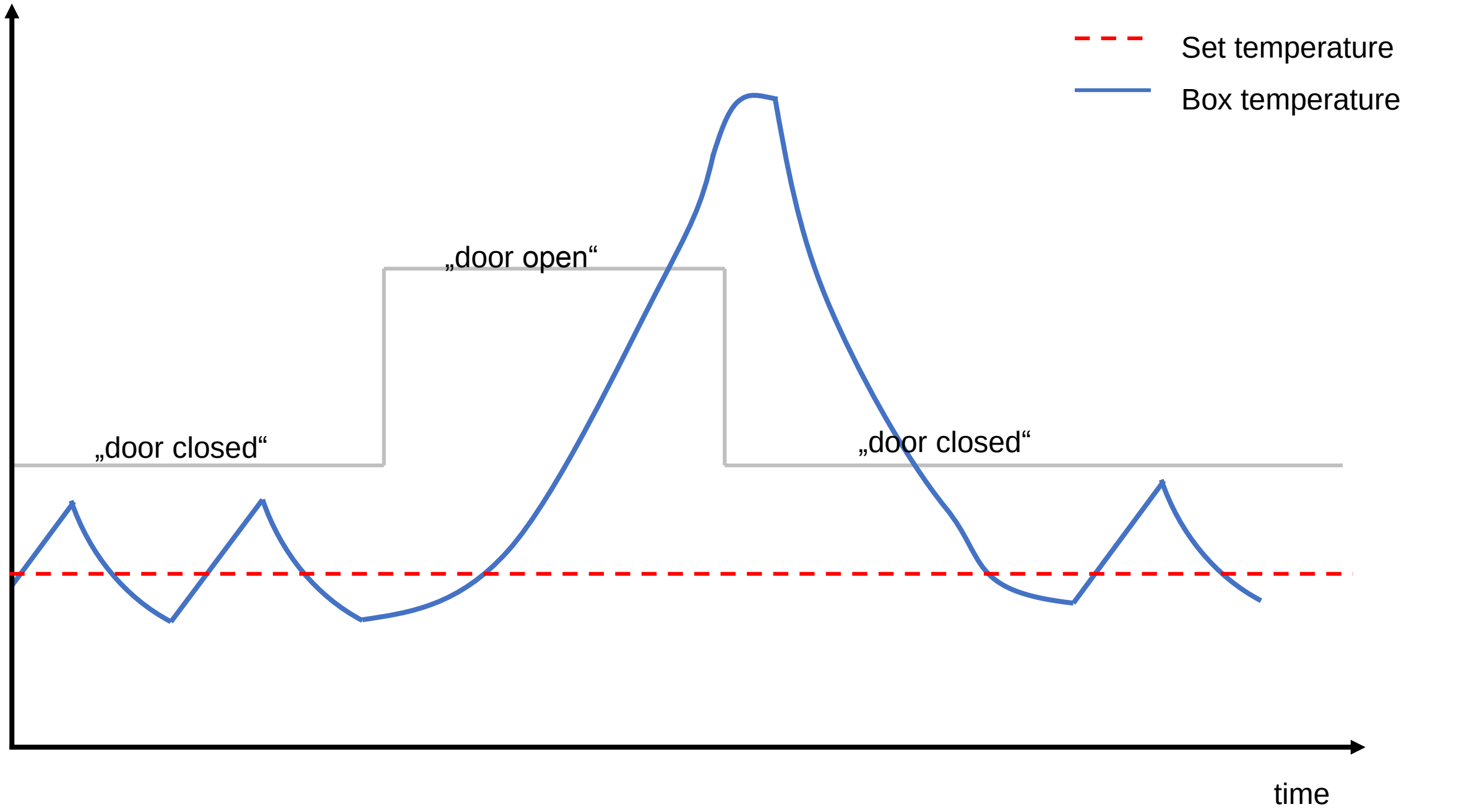

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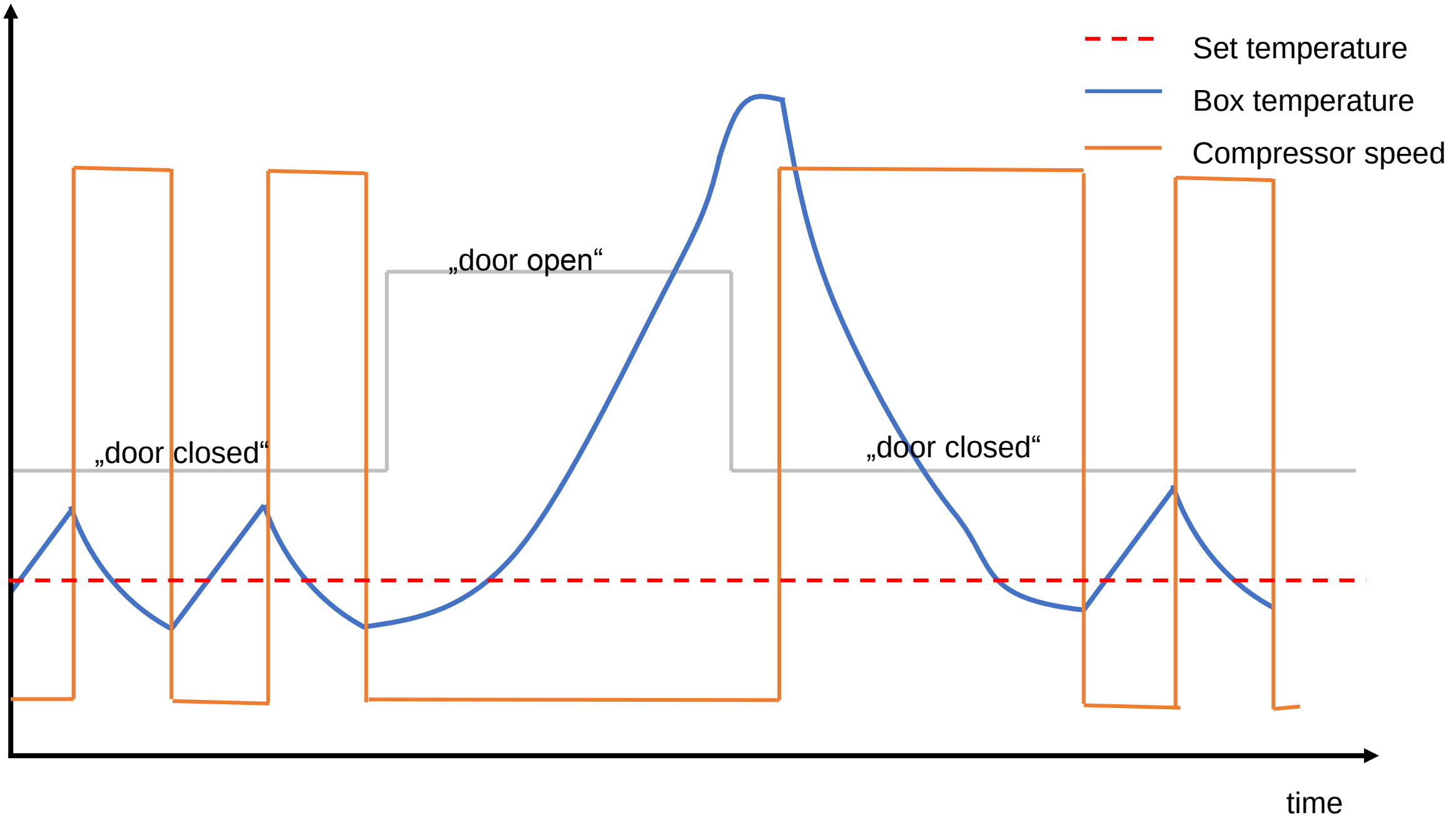

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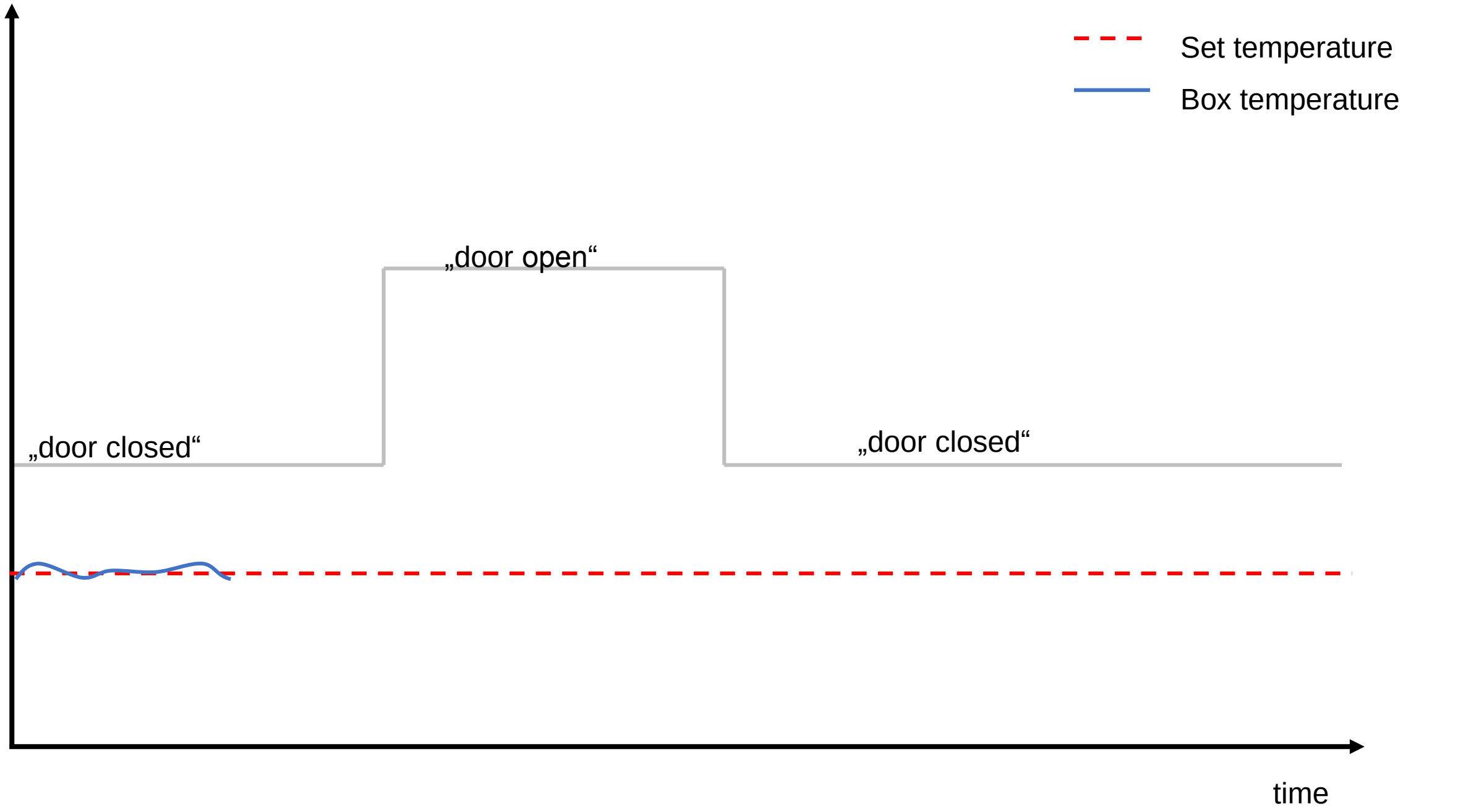

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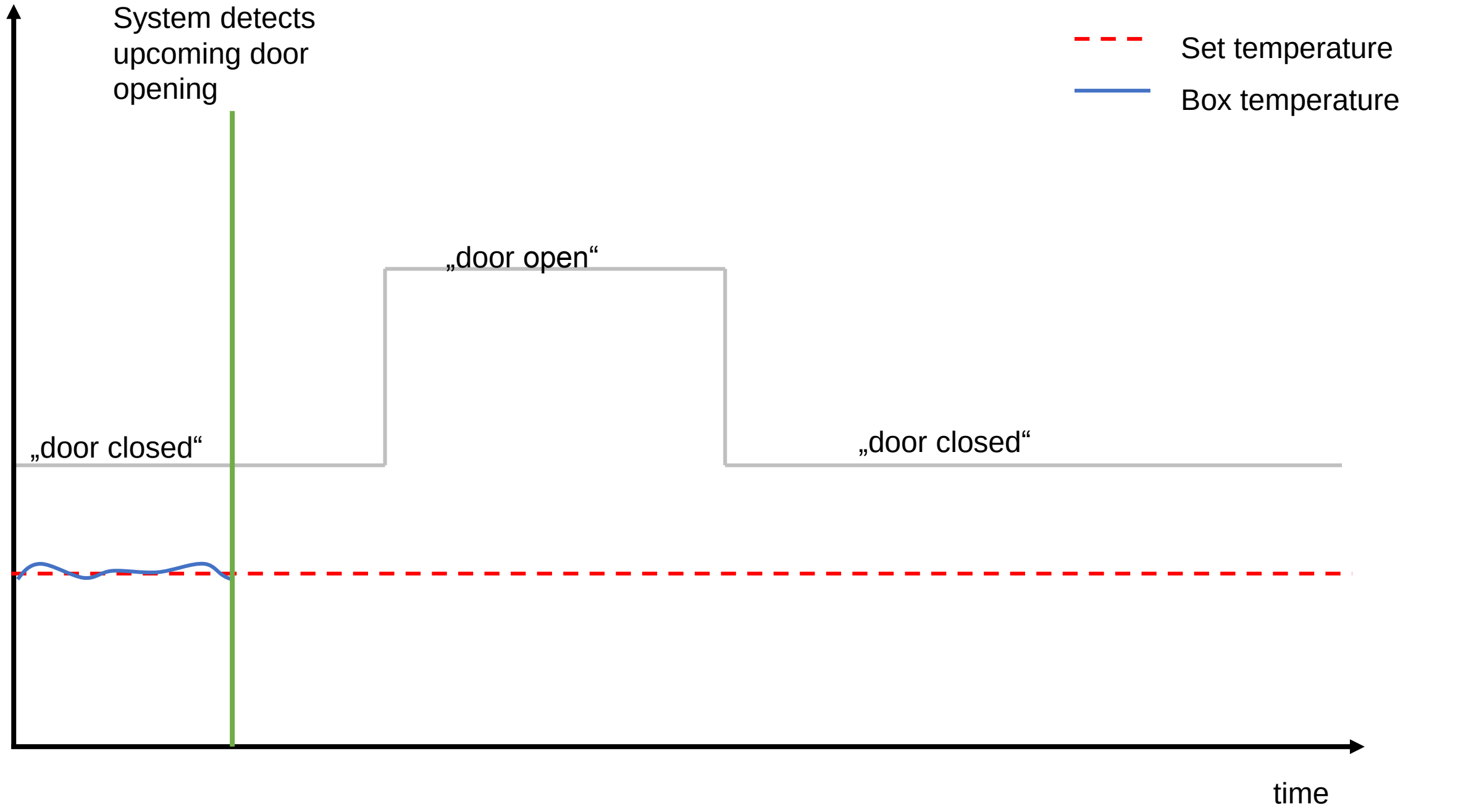

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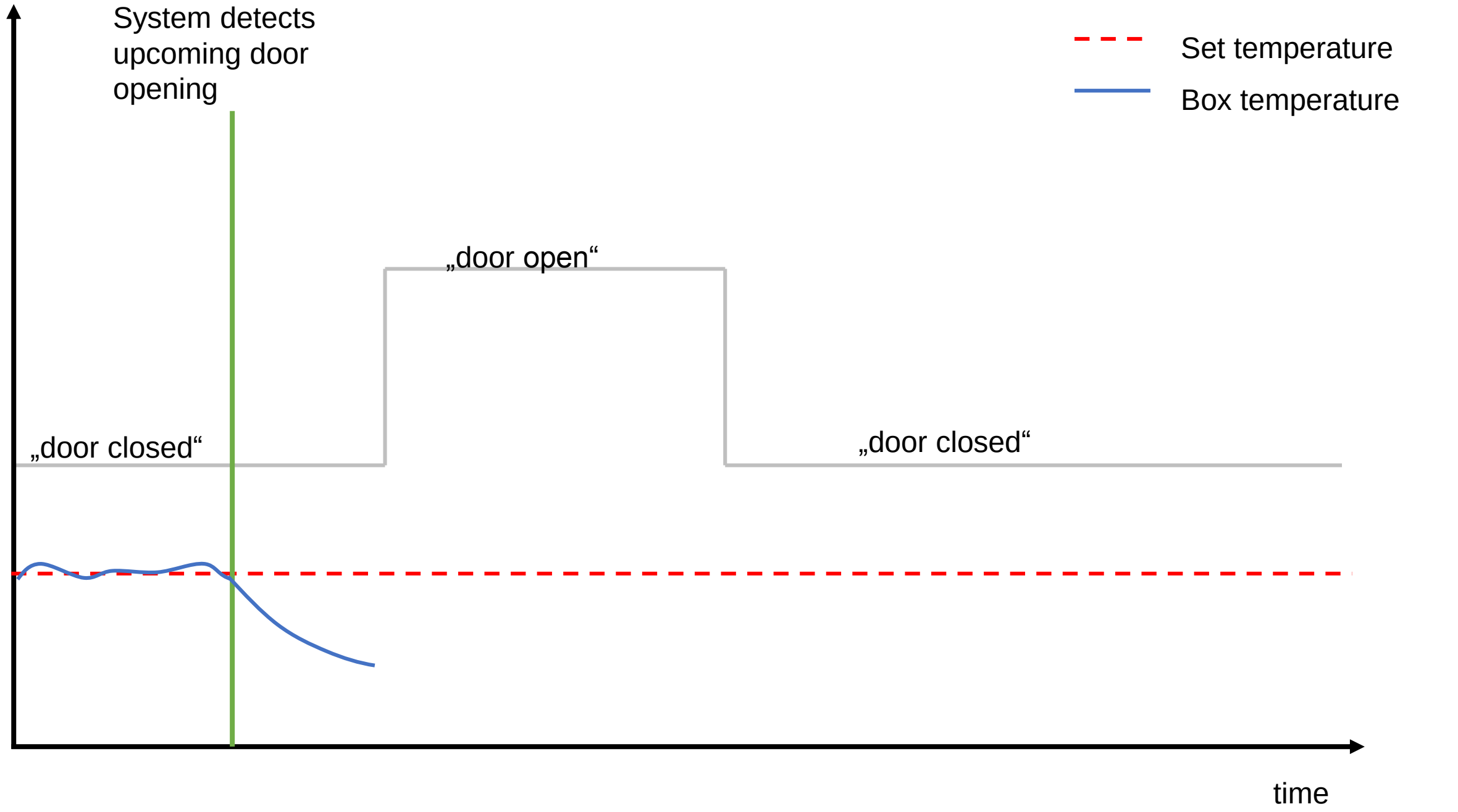

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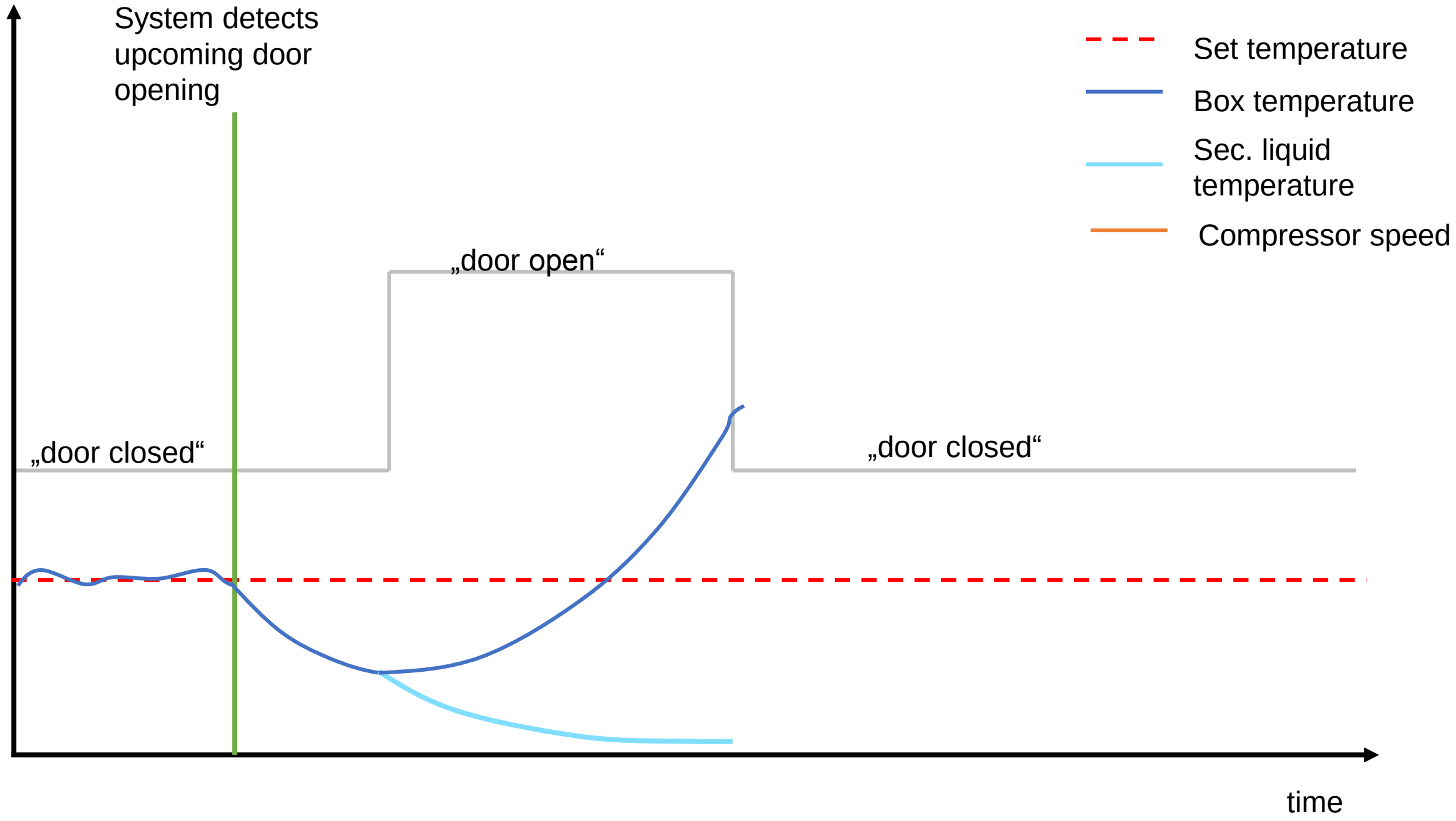

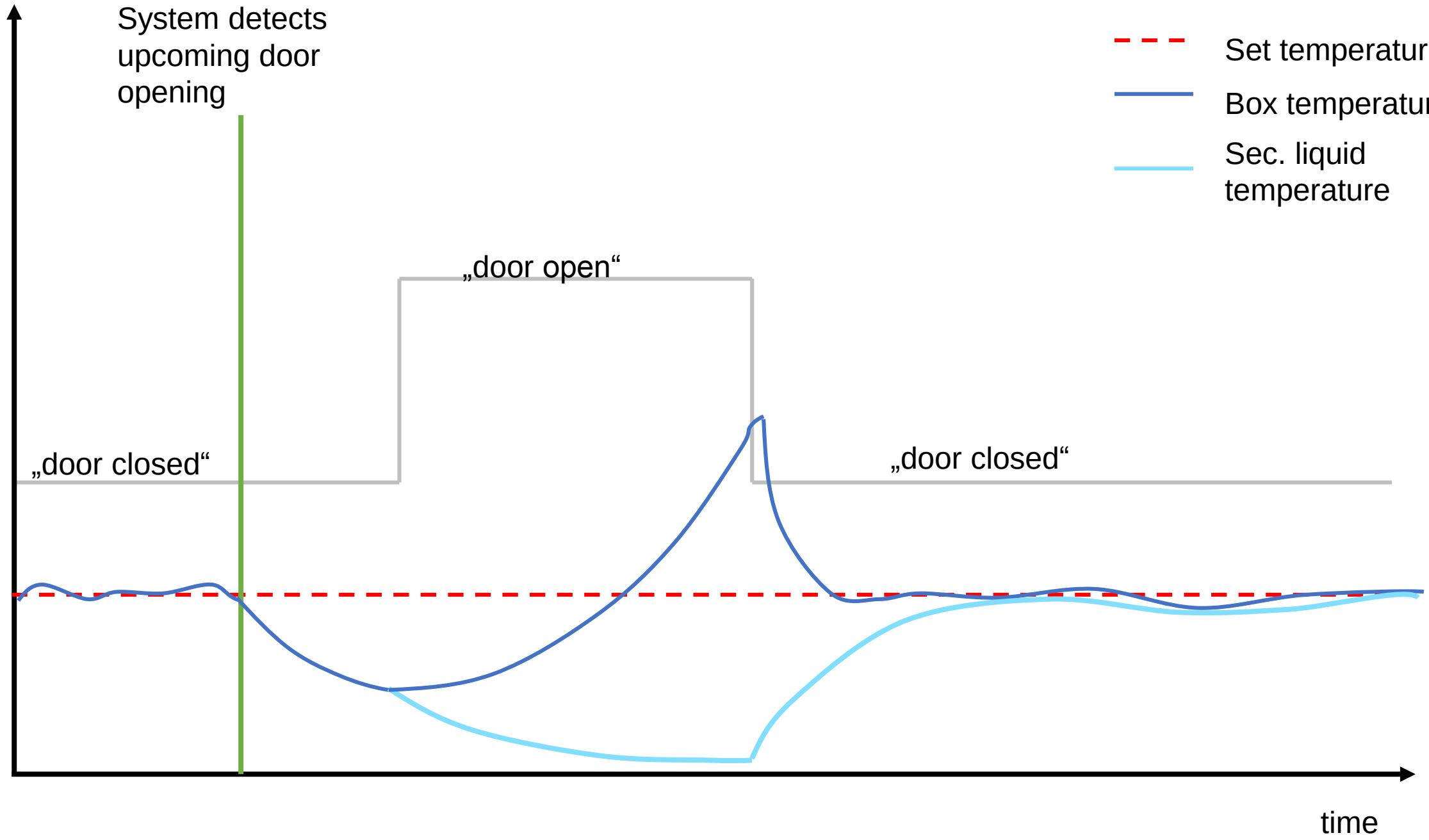
System detects upcoming door opening
„door open“
„door closed“
„door closed“
Set temperature
Box temperature
Sec. liquid temperature
time

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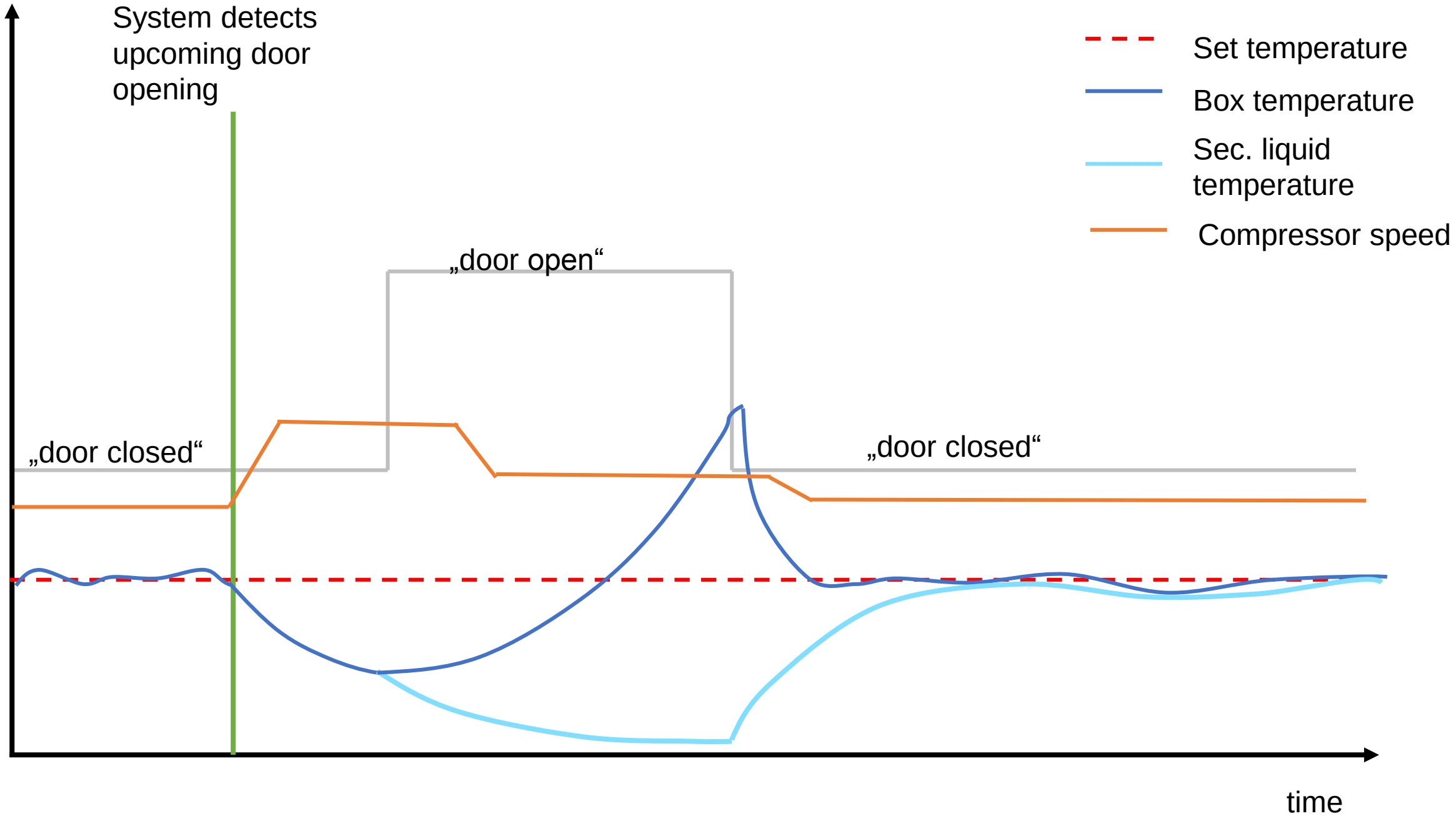

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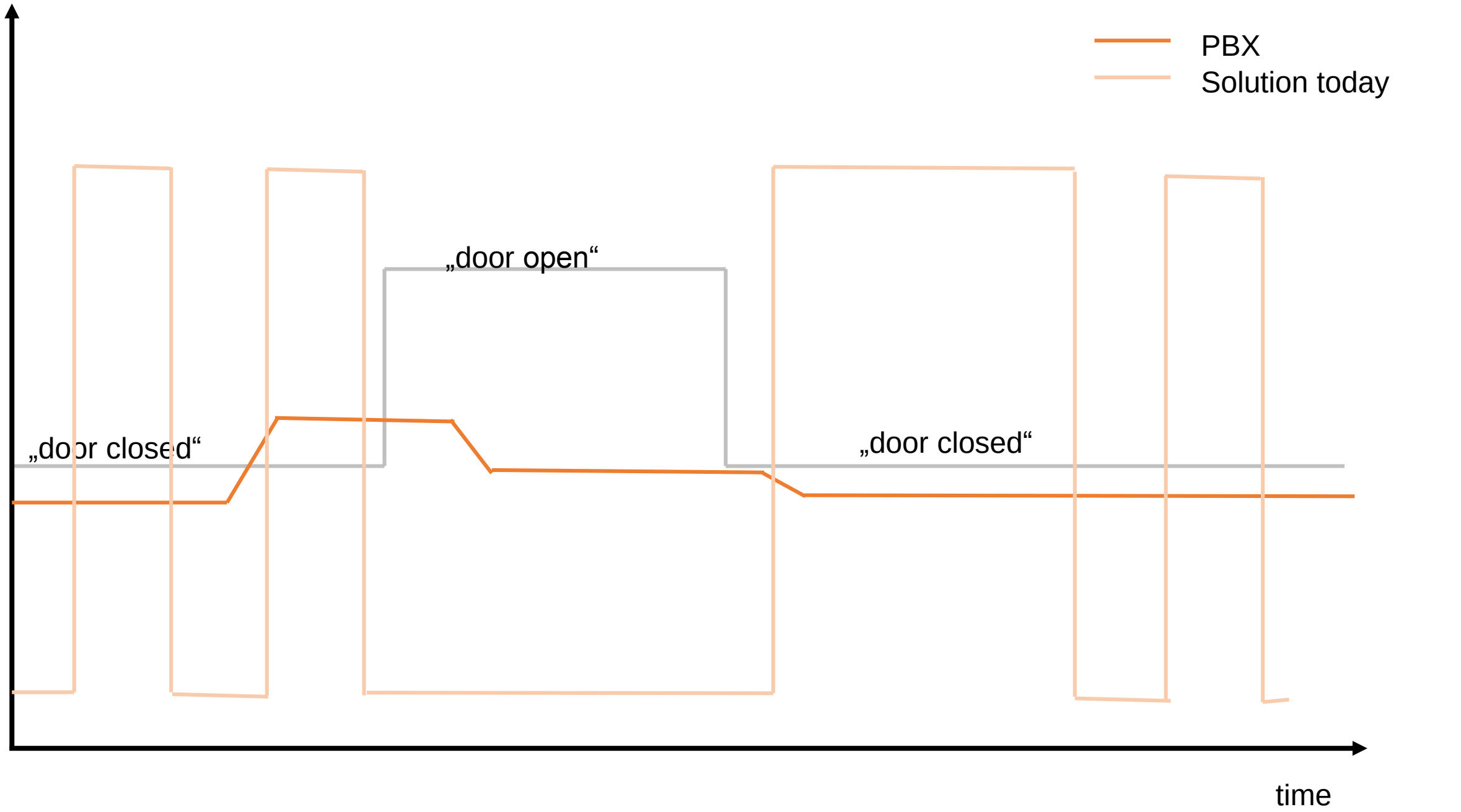
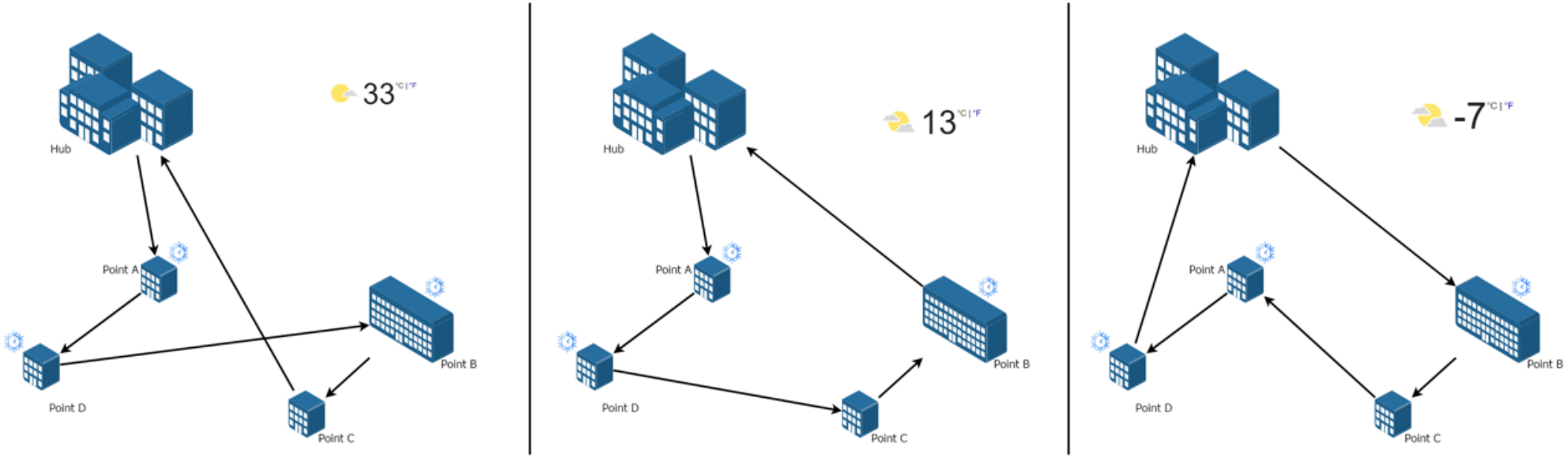


Cooperative control strategies

- Predictive load shifting to times with high power availability (e.g. intermediate charging processes, recuperation…)
- Eco-Routing with transport refrigeration
  - Optimization conflict between refrigeraiton system and propulsion system



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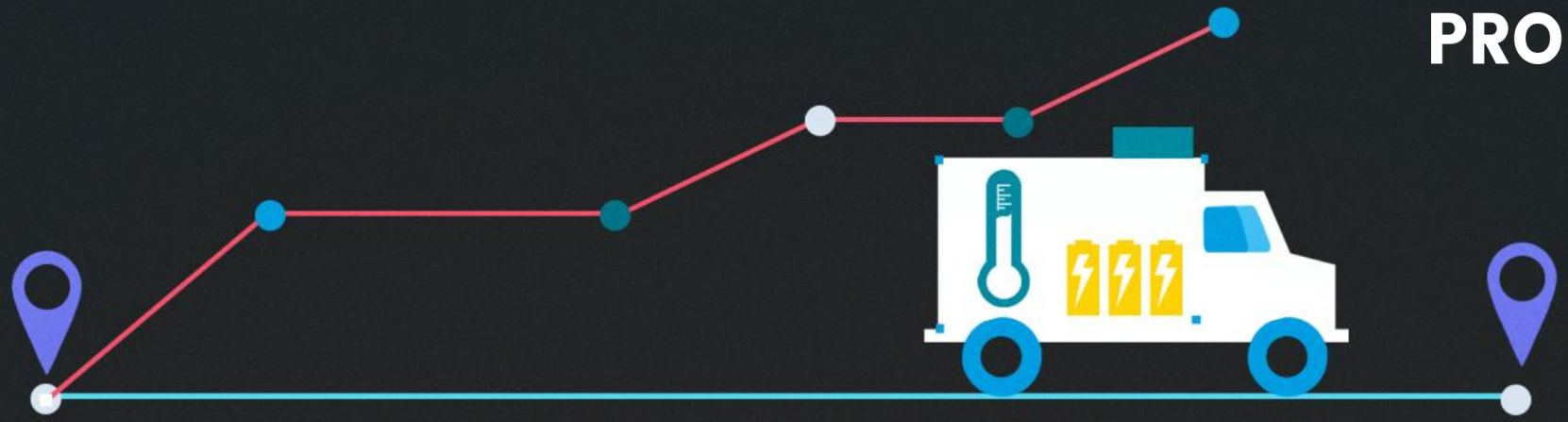

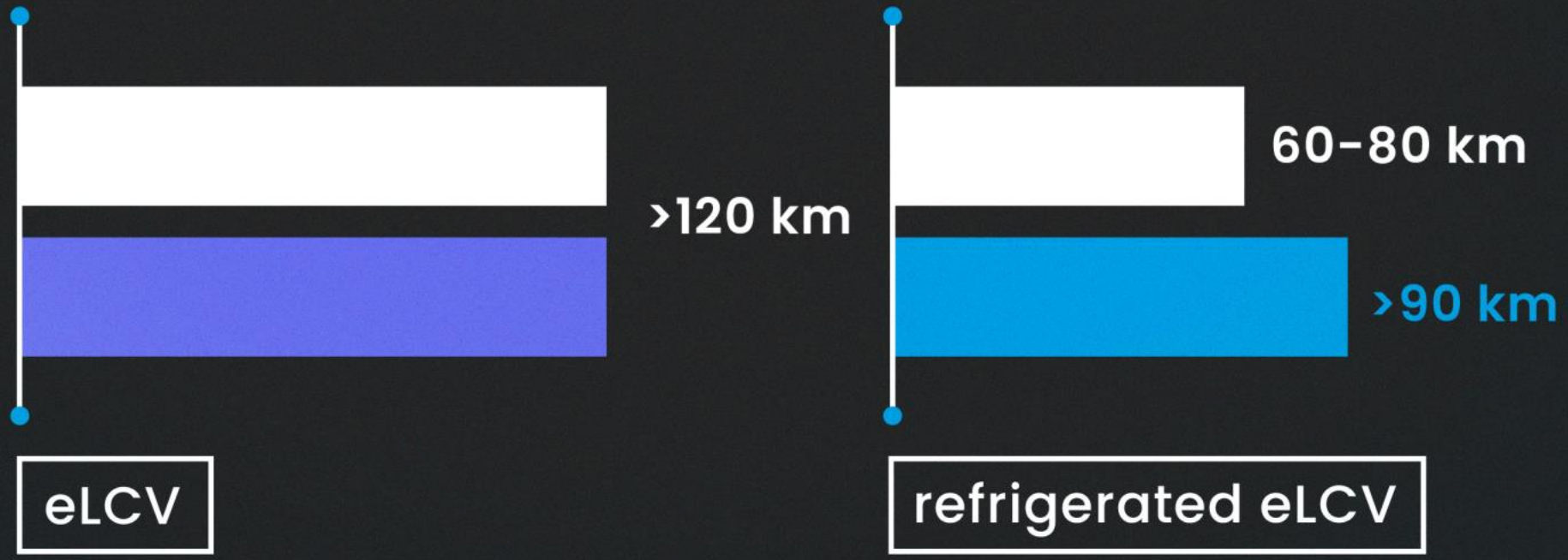

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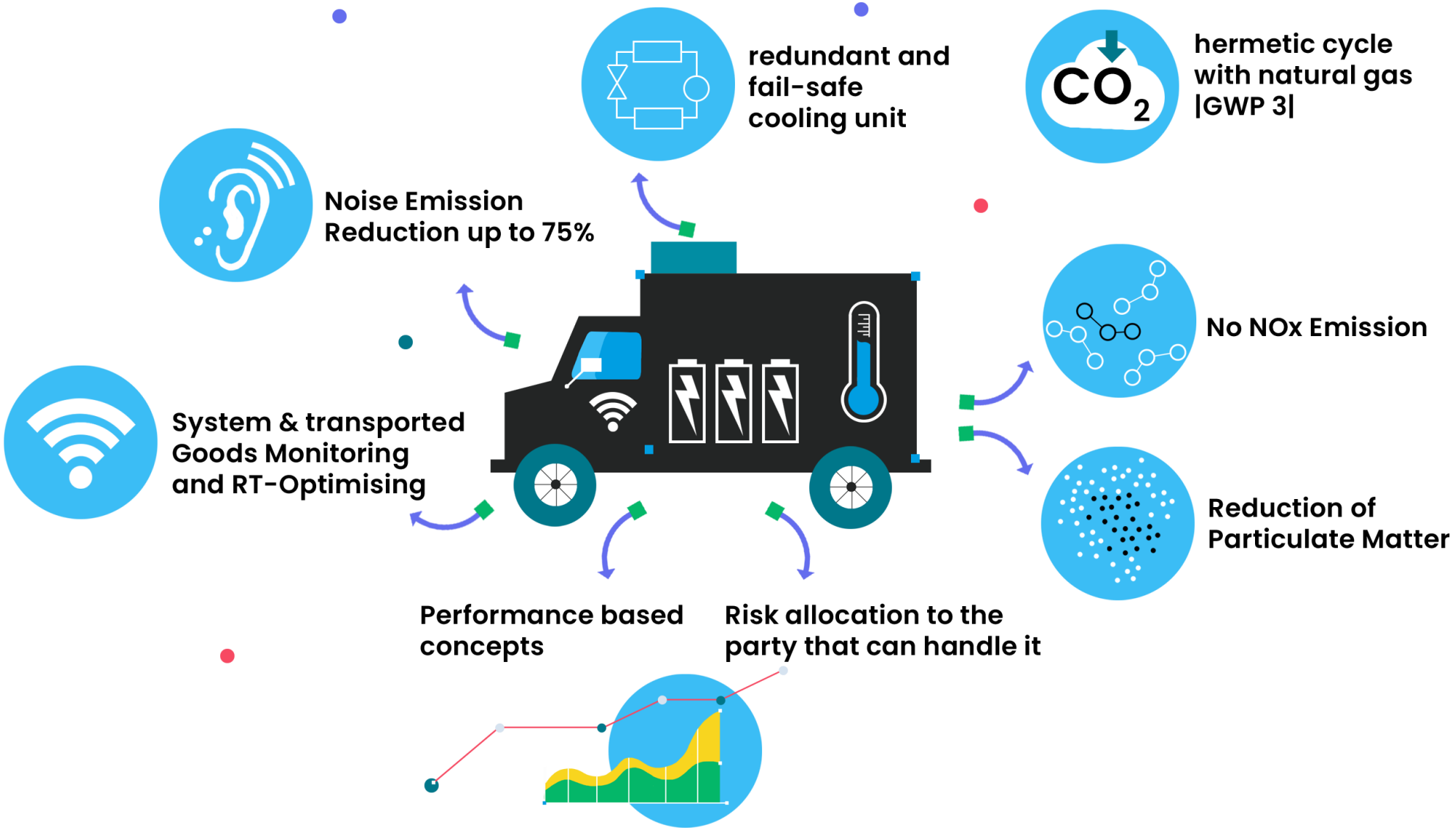

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