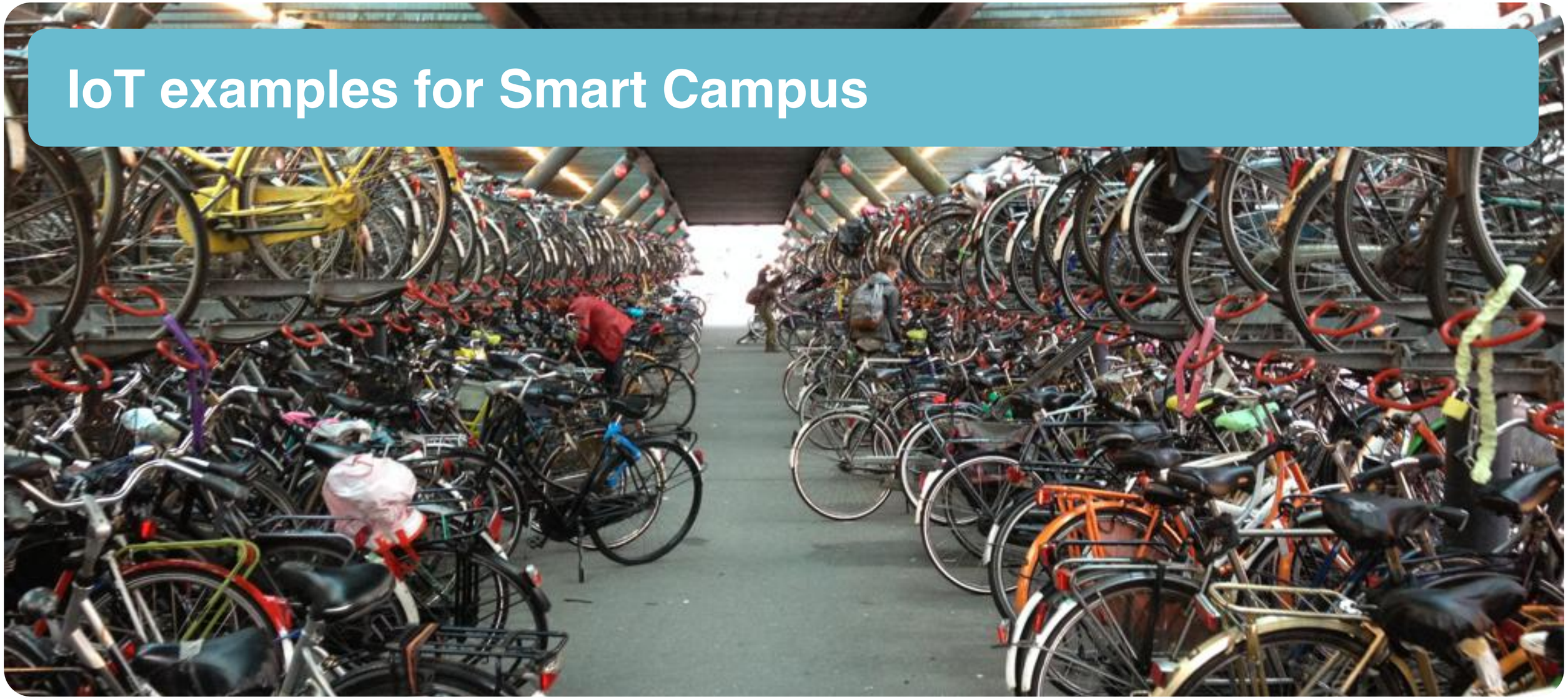
IoT examples for Smart Campus

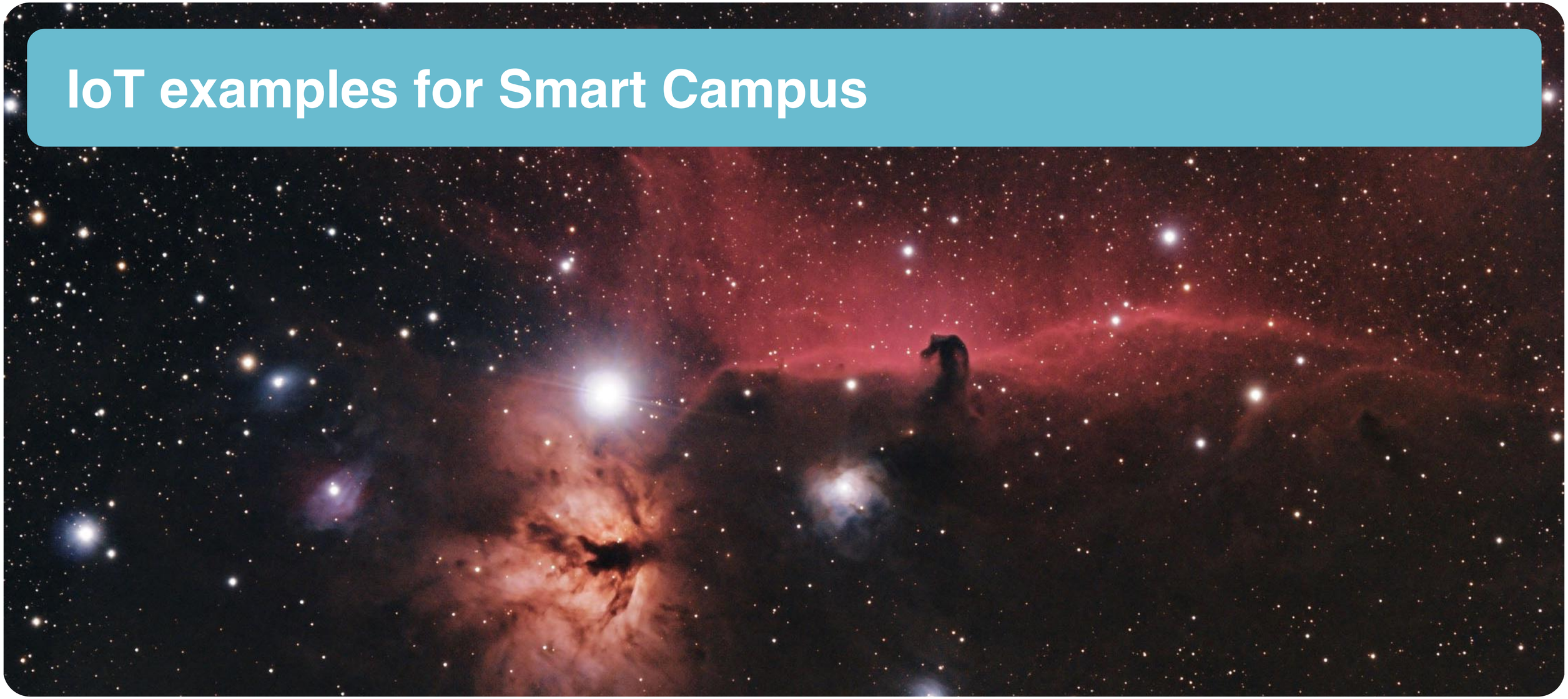


Paul Dekkers

March 7, 2019

SURF

IoT examples for Smart Campus



Paul Dekkers

March 7, 2019

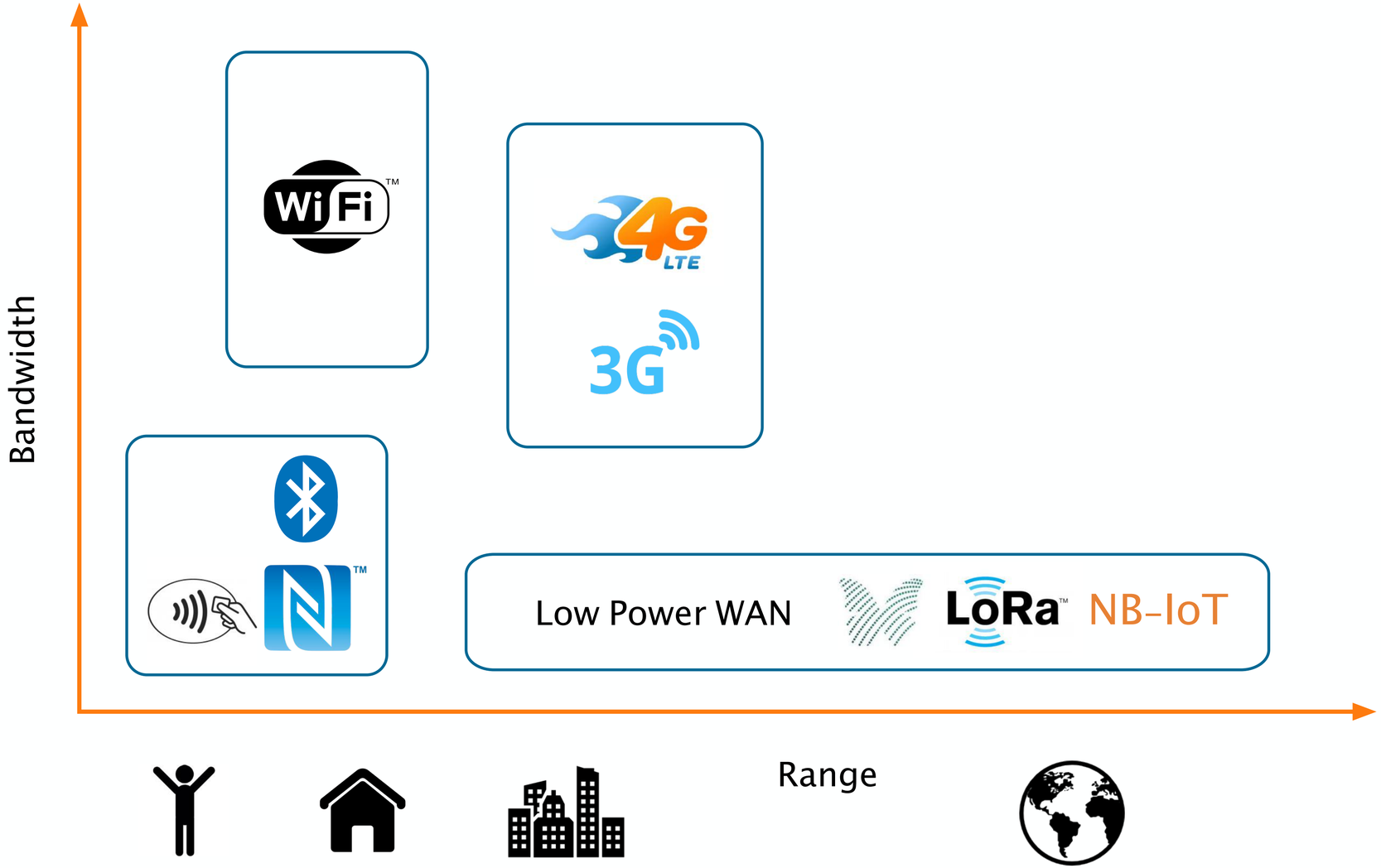
SURF

Smart City, Campus, …?

- **Gather data, use it**, improve efficiency, flexibility
  - **Occupancy**
  - **Cleanups** (eg. bins)
  - Asset management
  - **Air quality**
    Regulations (daycare, schools), energy consumption
  - Travel patterns (eg. bike movements)

- Be better off with it than without it! (privacy)

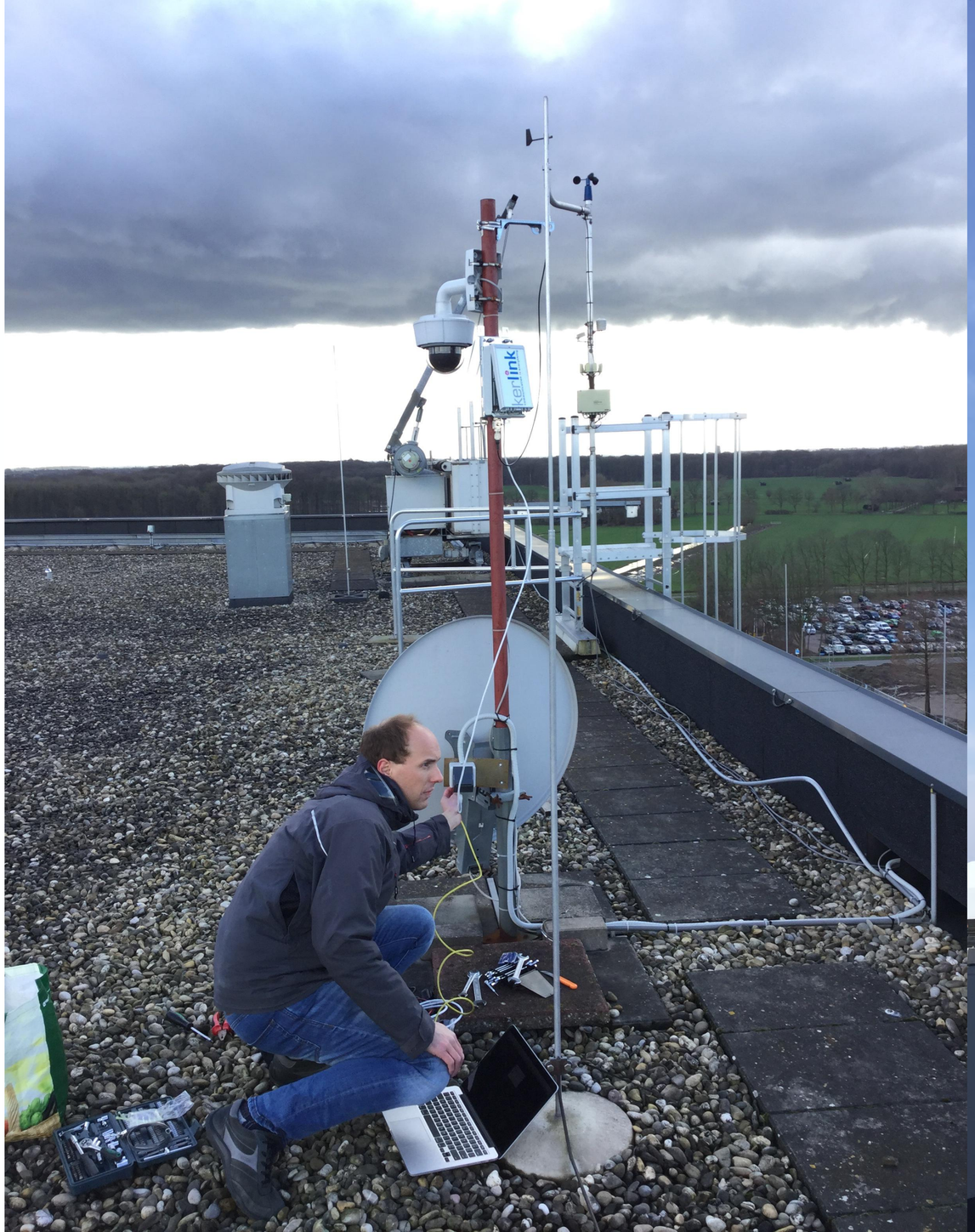
IoT: technology spectrum, network types



Leiden projects

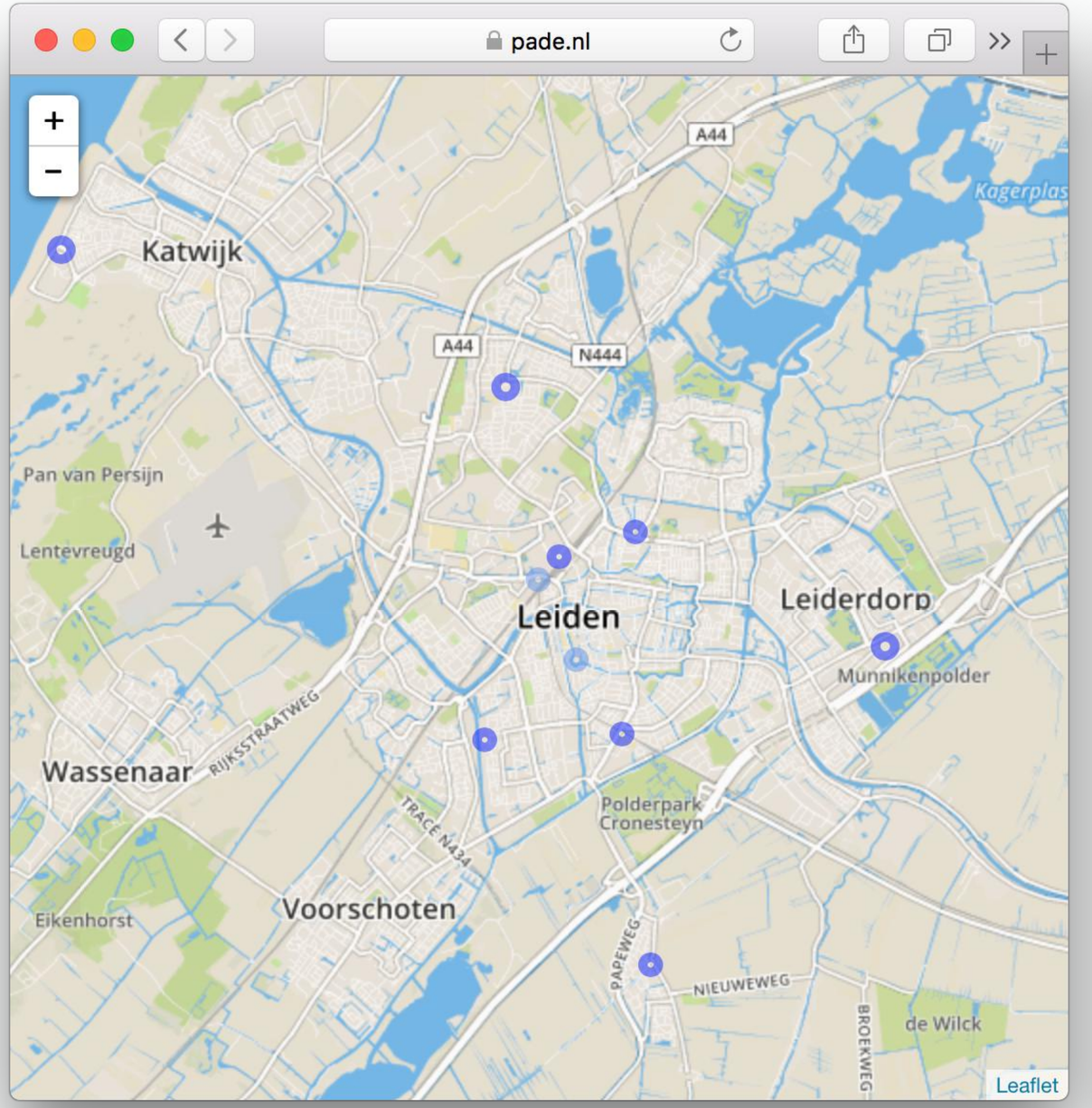
- Many SURF organizations (>10), collaboration in **economie071**

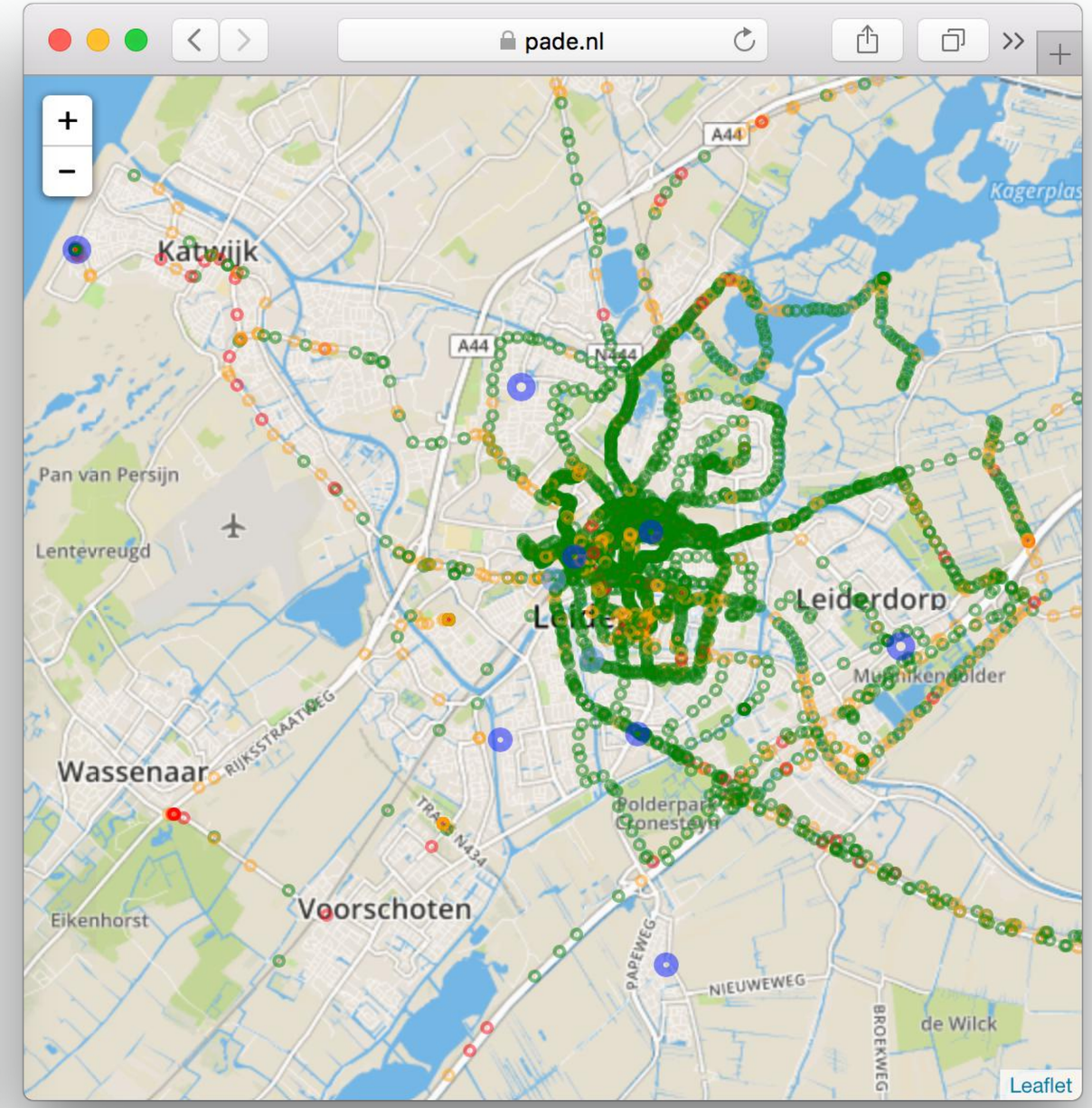
- Financing from economie071 for (booster)projects (students, startups)
- Wireless Leiden
- Research on required infrastructure for city-wide network coverage: **enable the network**!



Also indoor, using

eduroam


pade.nl
Katwijk
A44
N444
Kagerplas
Pan van Persijn
Lentevreugd
Leiden
Leiderdorp
Munnikenpolder
Wassenaar
RIJKSSTRAATWEG
TRACE N434
Polderpark Cronesteyn
Voorschoten
Eikenhorst
PAPEWEG
NIEUWEWEG
BROEKWEG
de Wilck
Leaflet


pade.nl
Katwijk
A44
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Wassenaar
RIJKSSTRAATWEG
TRACE N434
Voorschoten
Eikenhorst
PAPEWEG
NIEUWEWEG
BROEKWEG
de Wilck
Leaflet

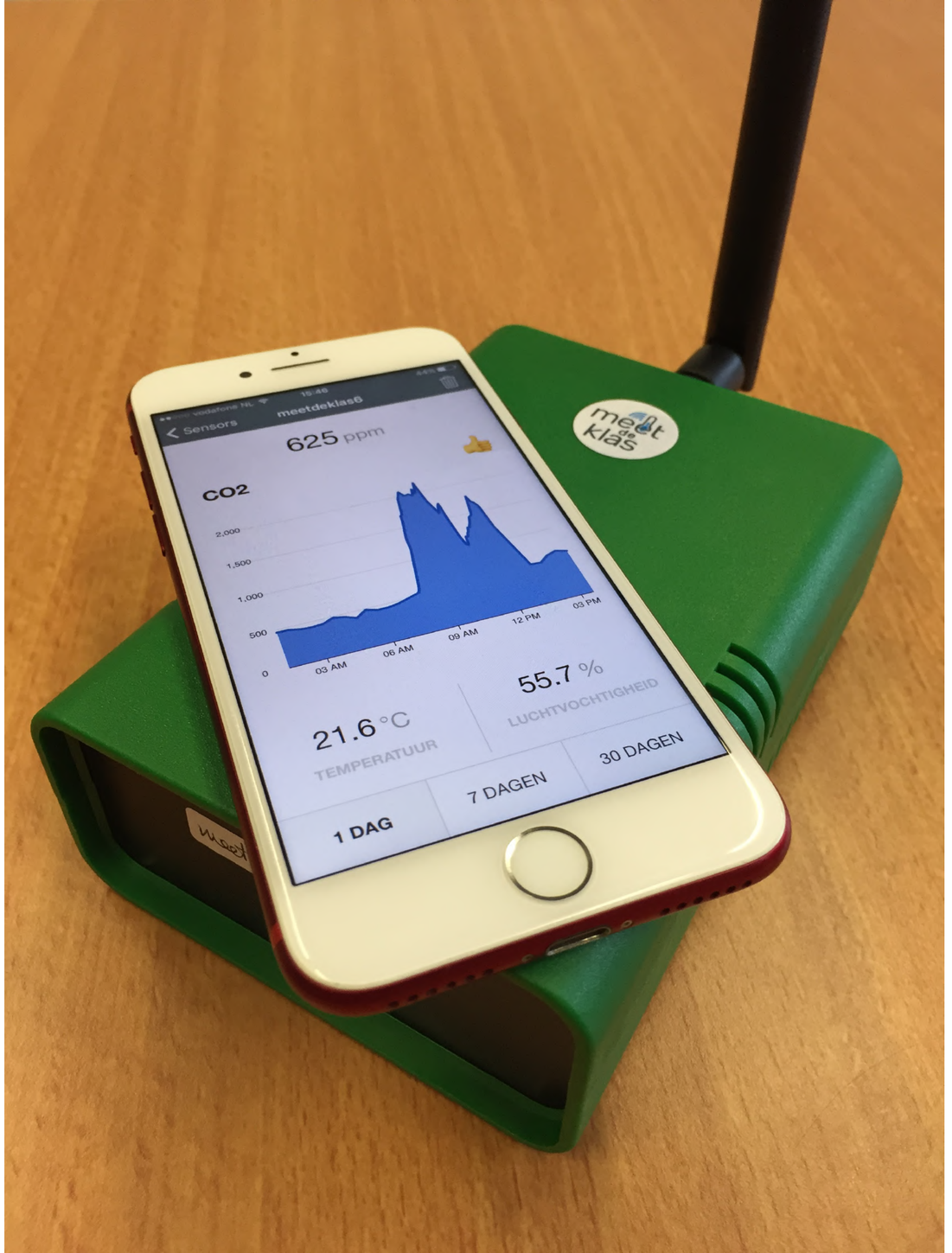
IoT for city (or campus) management

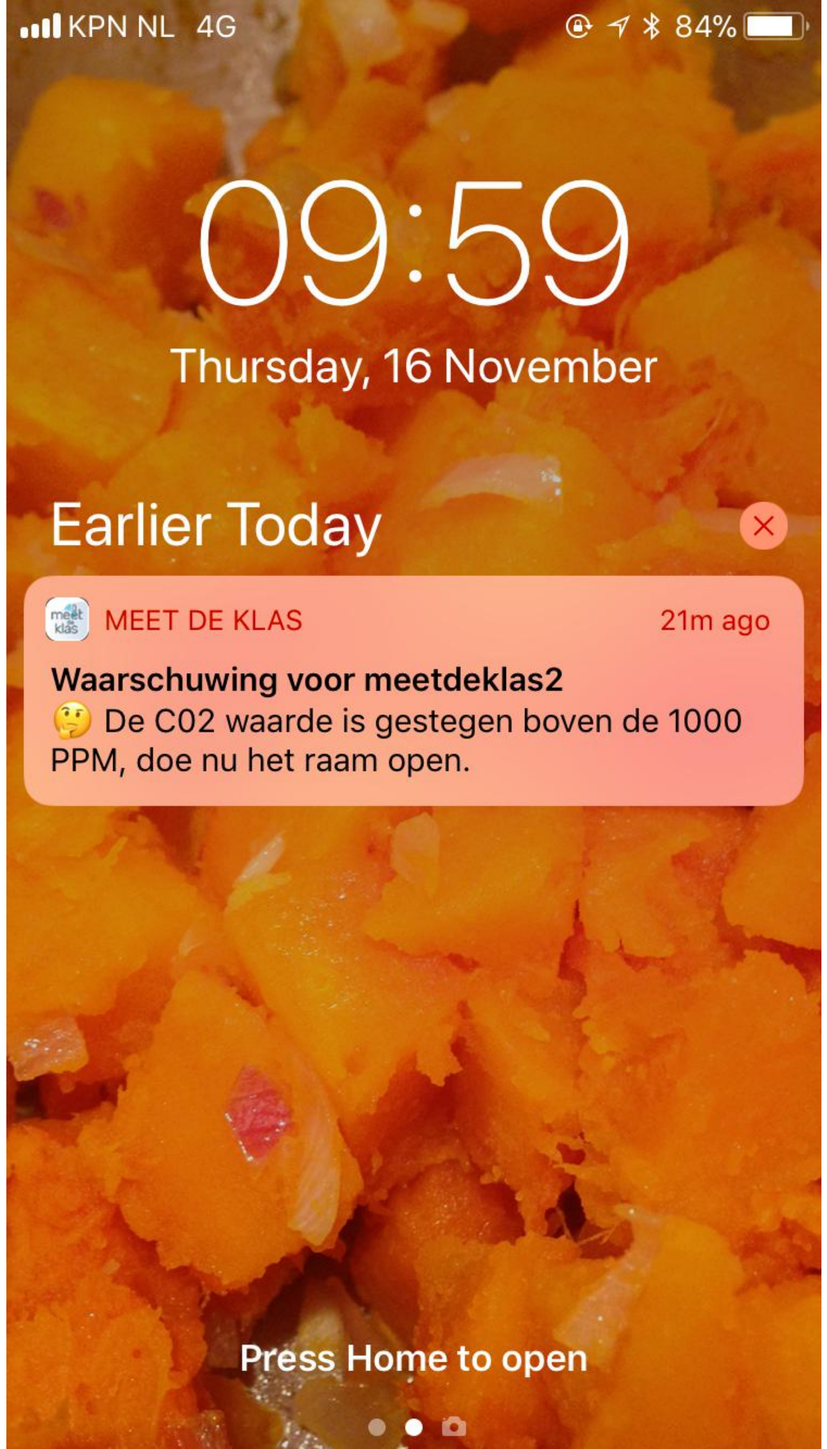
HU

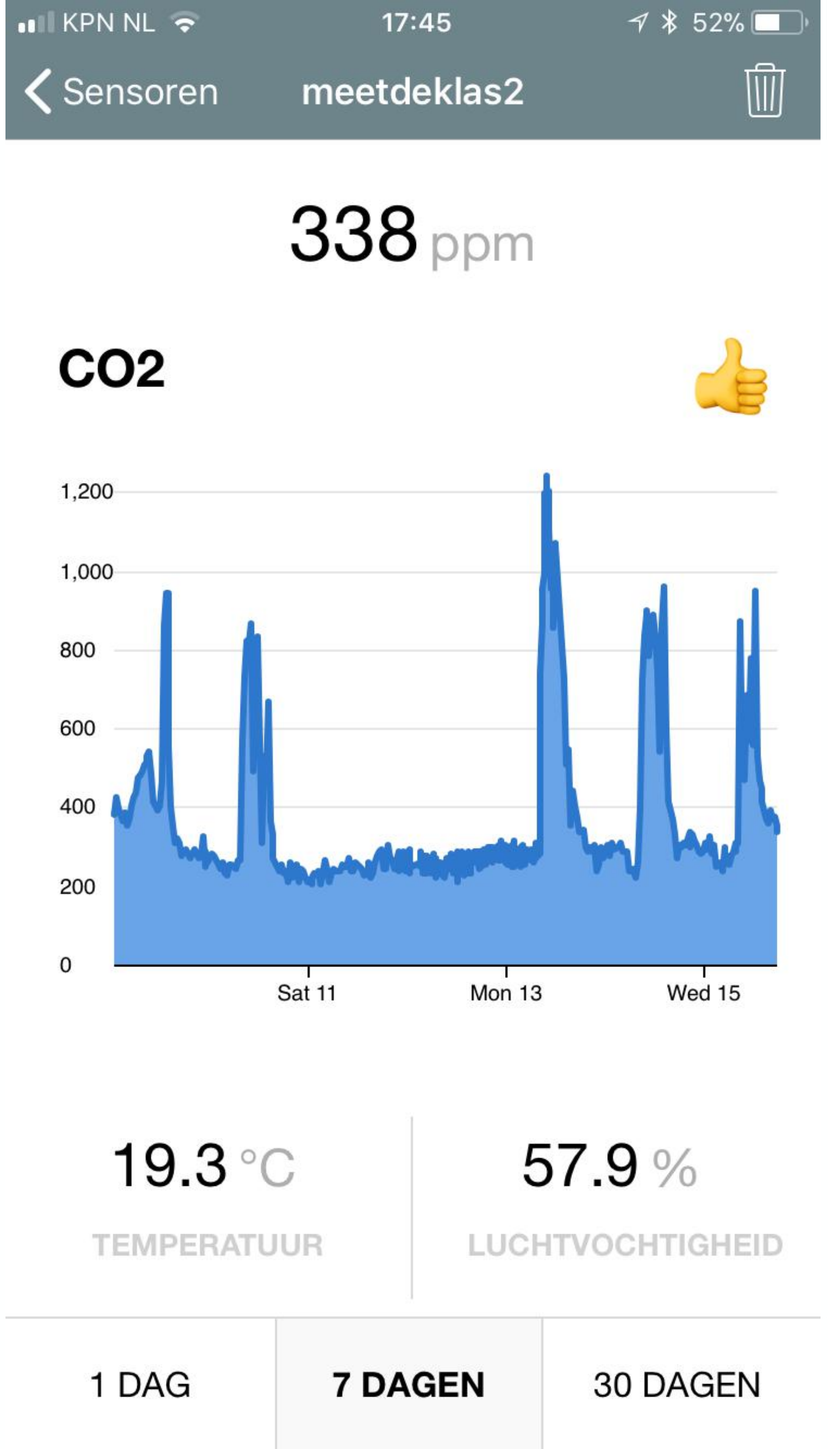
Student projects
with LoRaWAN

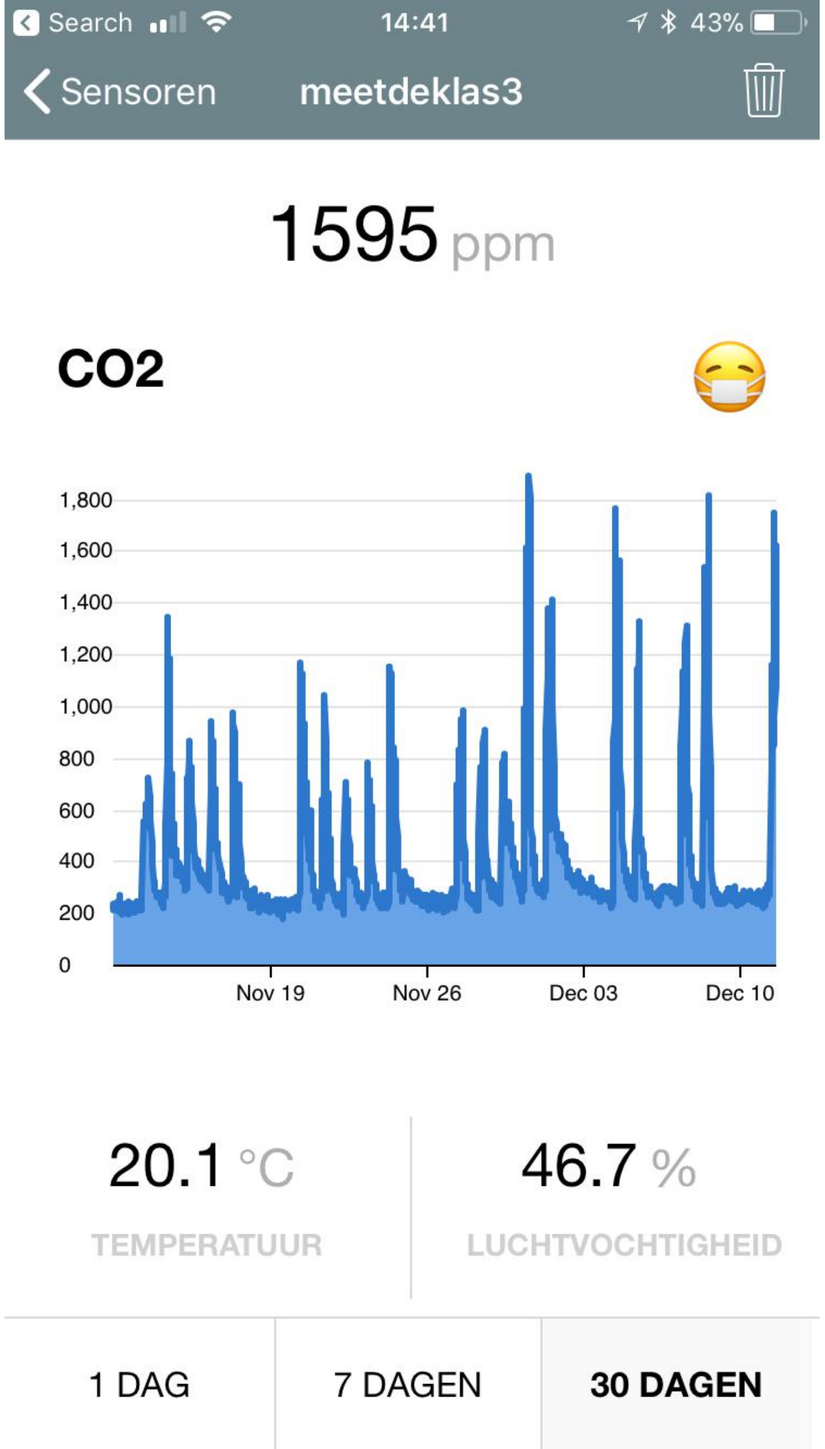
On campus parking sensors for disabled

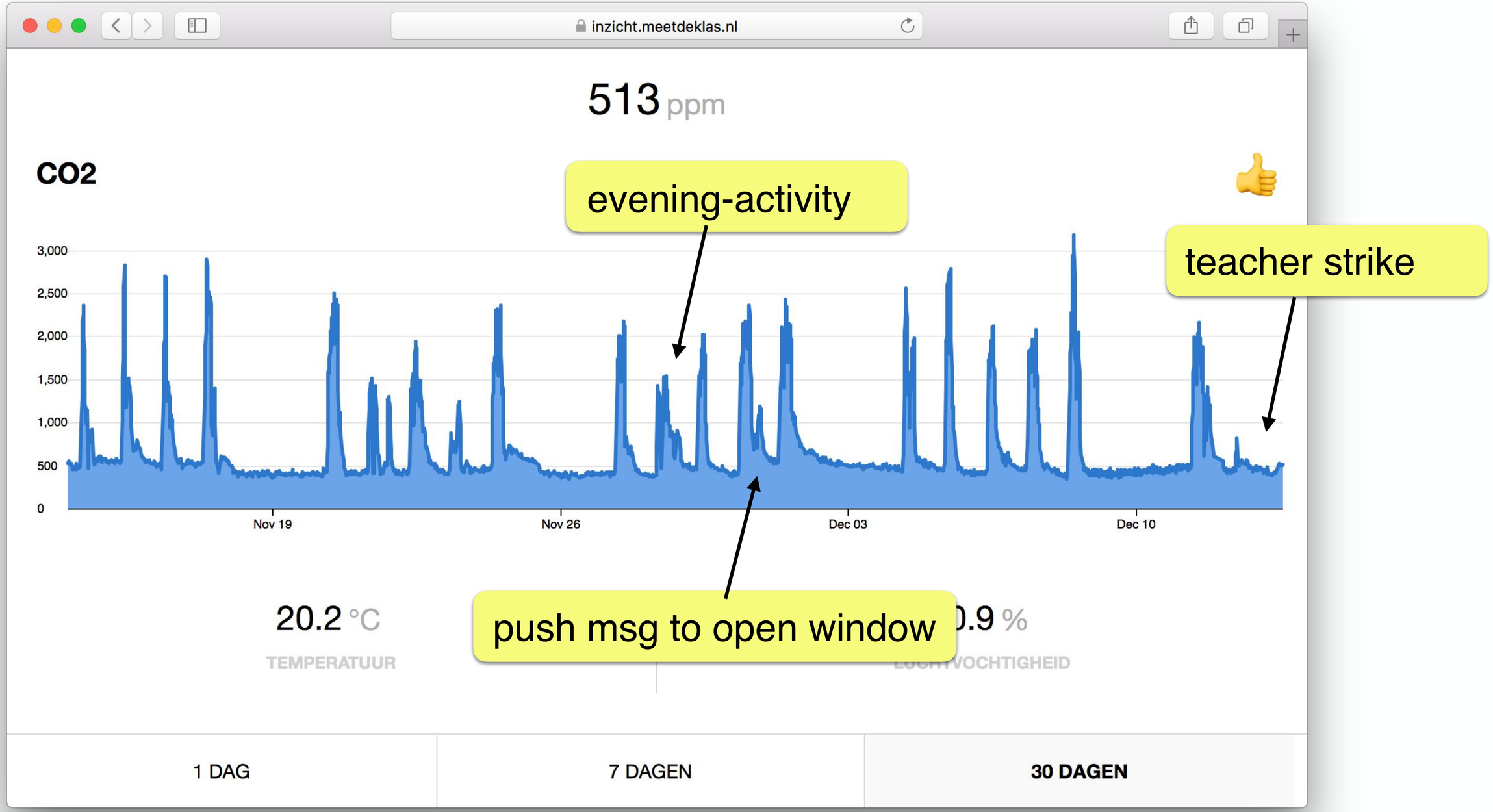
Meet de klas
Denk je dat de ruimte hier gezond is?
Kom erachter & download de app!
meet de klas
SAMSUNG
331 ppm
18.6
67.9
1 DAG
7 DAGEN
30 DAGEN
Kom erachter hoe gezond het hier is! Voeg de sensor; hubspot toe.
CAUTION
WET FLOOR


meetdeklas6
Sensors
625 ppm
CO2
2,000
1,500
1,000
500
0
03 AM
06 AM
09 AM
12 PM
03 PM
55.7 %
LUCHTVOCHTIGHEID
21.6 °C
TEMPERATUUR
1 DAG
7 DAGEN
30 DAGEN
meet de klas


KPN NL 4G
84%
09:59
Thursday, 16 November
Earlier Today
MEET DE KLAS
21m ago
Waarschuwing voor meetdeklas2
🤔 De C02 waarde is gestegen boven de 1000 PPM, doe nu het raam open.
Press Home to open


KPN NL
17:45
52%
Sensoren
meetdeklas2
338 ppm
CO2
1,200
1,000
800
600
400
200
0
Sat 11
Mon 13
Wed 15
19.3 °C
TEMPERATUUR
57.9 %
LUCHTVOCHTIGHEID
1 DAG
7 DAGEN
30 DAGEN


Search
14:41
43%
Sensoren
meetdeklas3
1595 ppm
CO2
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Nov 19
Nov 26
Dec 03
Dec 10
20.1 °C
TEMPERATUUR
46.7 %
LUCHTVOCHTIGHEID
1 DAG
7 DAGEN
30 DAGEN


inzicht.meetdeklas.nl
513 ppm
CO2
evening-activity
teacher strike
3,000
2,500
2,000
1,500
1,000
500
0
Nov 19
Nov 26
Dec 03
Dec 10
20.2 °C
TEMPERATUUR
push msg to open window
1 DAG
7 DAGEN
30 DAGEN

Okku Dashboard

https://dashboard.okku.io/home/surf/utrecht

Motion 0

CO2 408 ppm

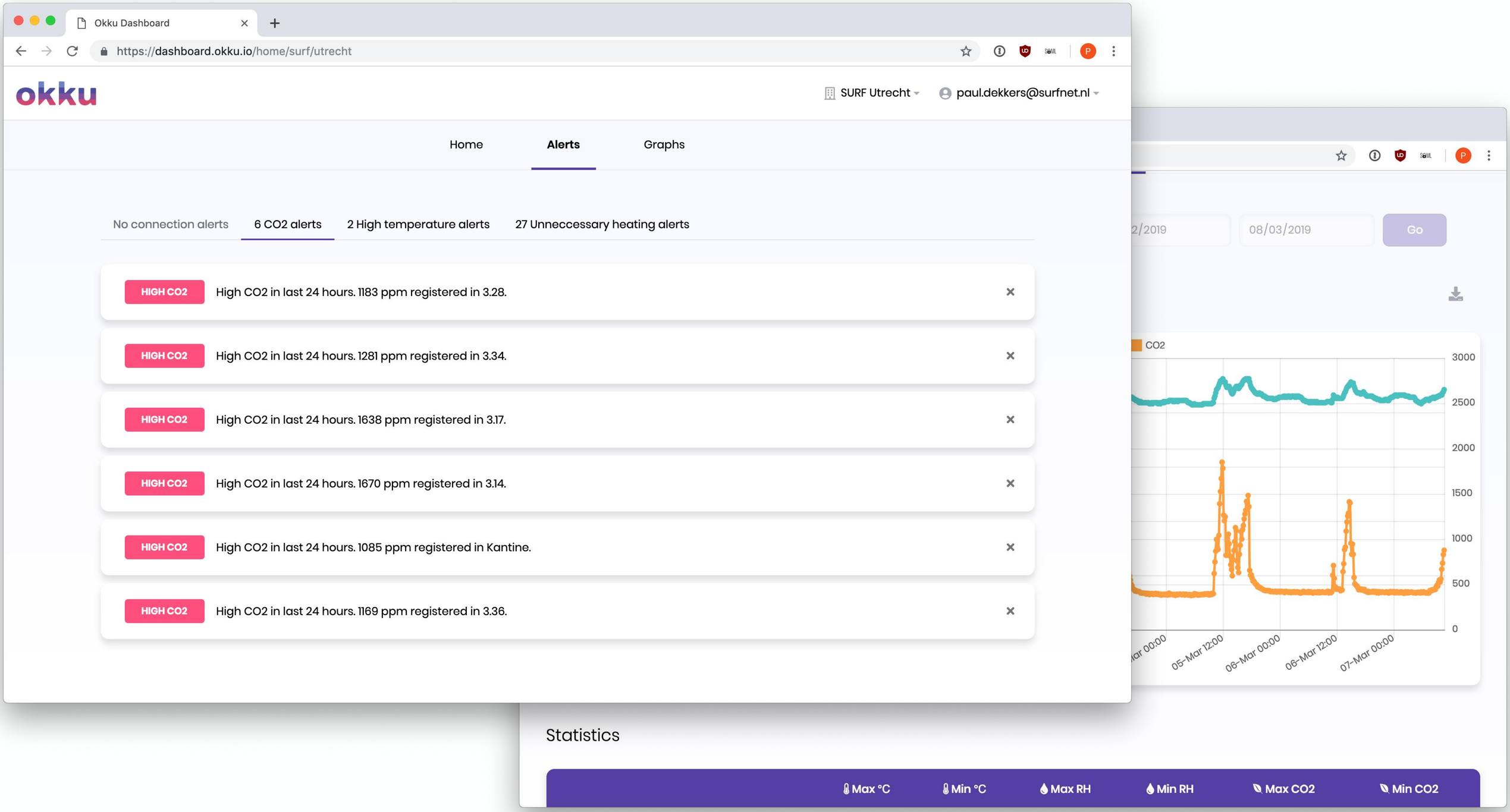
3e verdieping | 4e verdieping

SENSOR FLEET STATUS 61 of 61 connected.

UNNECCESSARY HEATING 27 rooms unneccessarily heated

HIGH TEMPERATURE 2 high temperature alerts recently.

HIGH CO2 6 high CO2 alerts recently.


Okku Dashboard
https://dashboard.okku.io/home/surf/utrecht
okku
SURF Utrecht
paul.dekkers@surfnet.nl
Home
Alerts
Graphs
No connection alerts
6 CO2 alerts
2 High temperature alerts
27 Unneccessary heating alerts
HIGH CO2
High CO2 in last 24 hours. 1183 ppm registered in 3.28.
HIGH CO2
High CO2 in last 24 hours. 1281 ppm registered in 3.34.
HIGH CO2
High CO2 in last 24 hours. 1638 ppm registered in 3.17.
HIGH CO2
High CO2 in last 24 hours. 1670 ppm registered in 3.14.
HIGH CO2
High CO2 in last 24 hours. 1085 ppm registered in Kantine.
HIGH CO2
High CO2 in last 24 hours. 1169 ppm registered in 3.36.
2/2019
08/03/2019
Go
CO2
3000
2500
2000
1500
1000
500
0
05-Mar 12:00
06-Mar 00:00
06-Mar 12:00
07-Mar 00:00
Statistics
Max °C
Min °C
Max RH
Min RH
Max CO2
Min CO2

SURF Utrecht - Mapiq | Okku Dashboard

https://dashboard.okku.io/home/surf/utrecht

okku

SURF Utrecht | paul.dekkers@surfnet.nl

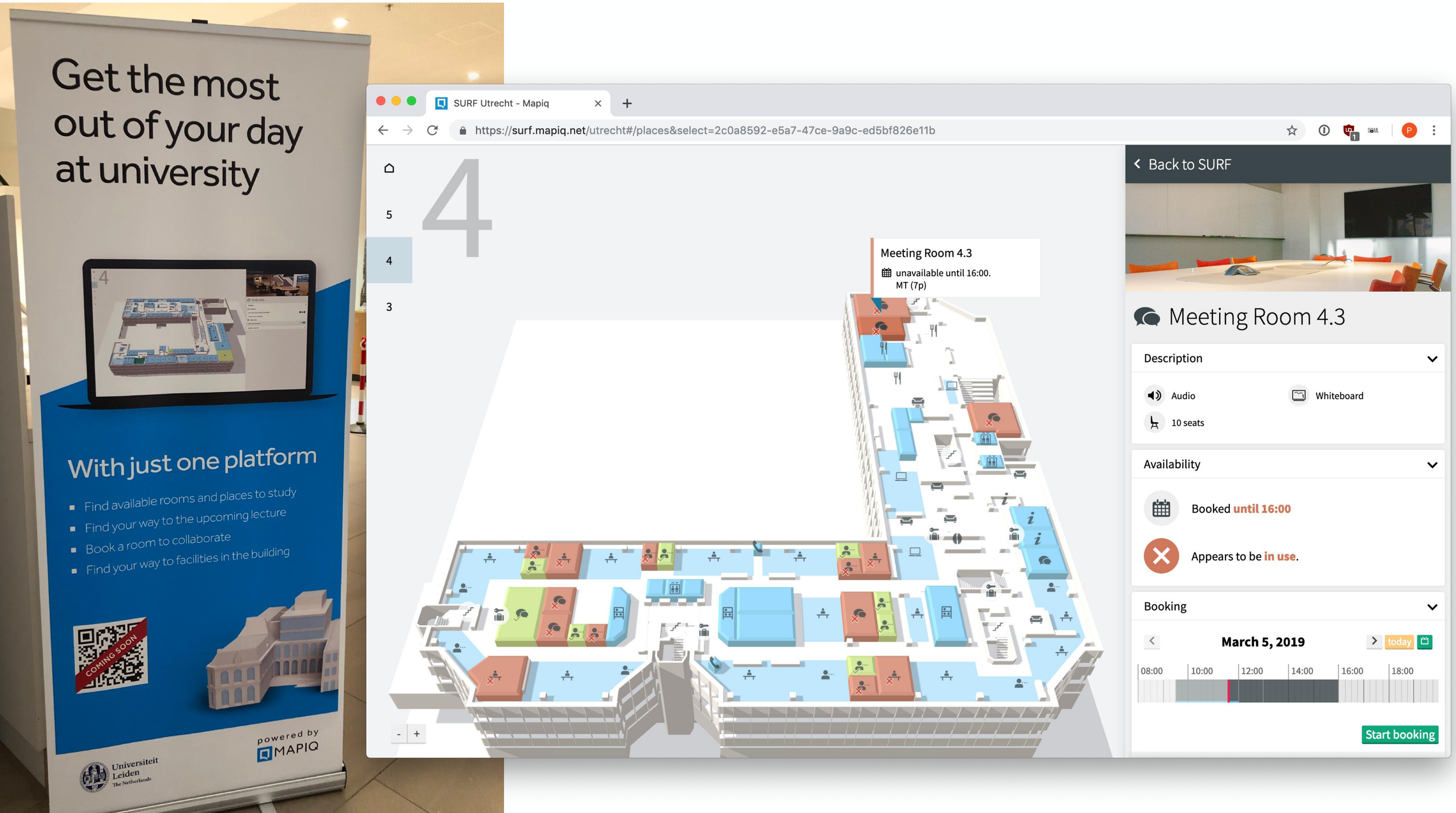
Home | Alerts | Graphs

3e verdieping | 4e verdieping

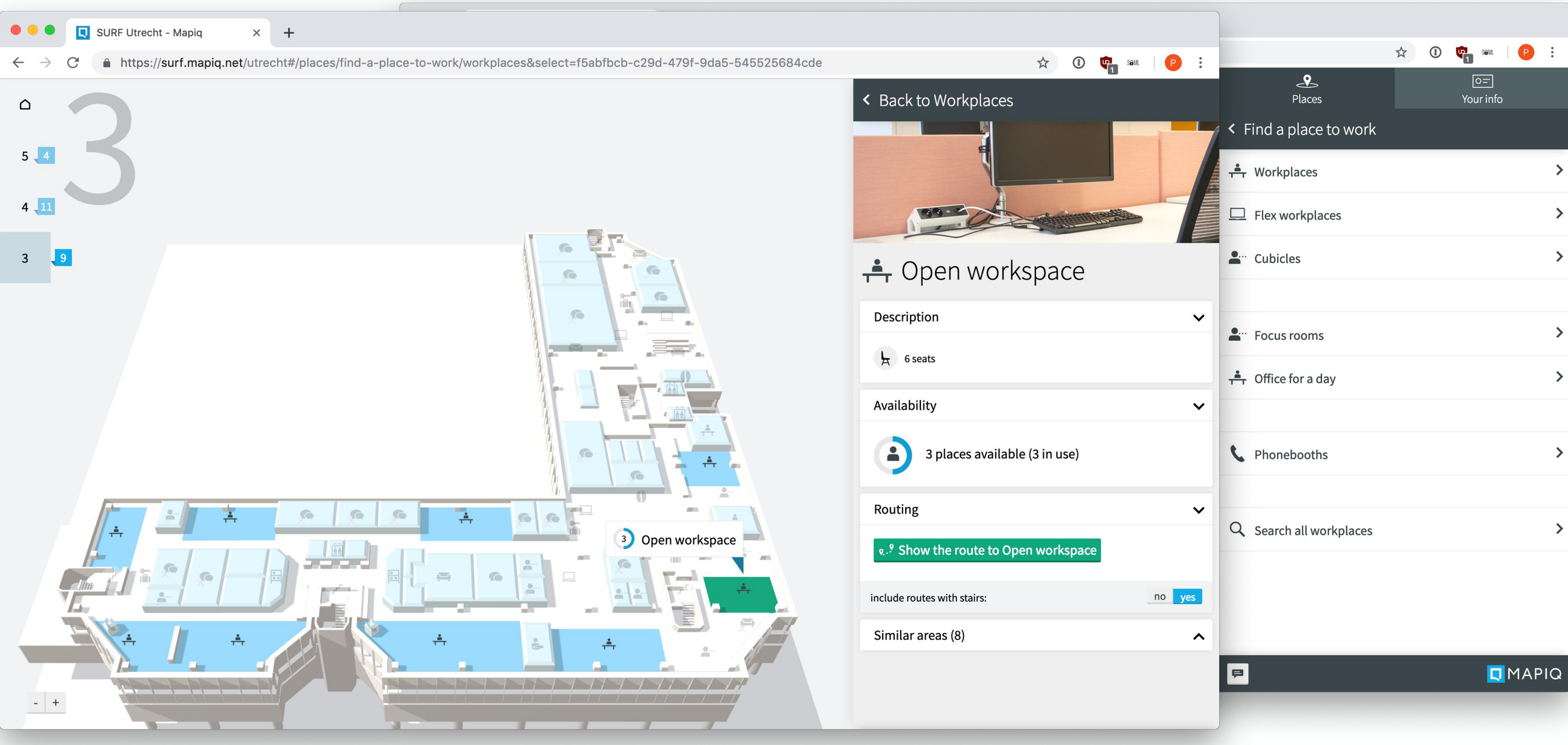
Room **3.12**

Last known data at Tue 5-Mar-19 11:39

Temperature	22 °C
Humidity	32%
Motion	0
CO2	772 ppm


Get the most out of your day at university
With just one platform
Find available rooms and places to study
Find your way to the upcoming lecture
Book a room to collaborate
Find your way to facilities in the building
COMING SOON
powered by MAPIQ
Universiteit Leiden The Netherlands
SURF Utrecht - Mapiq
https://surf.mapiq.net/utrecht#/places&select=2c0a8592-e5a7-47ce-9a9c-ed5bf826e11b
5
4
3
4
Meeting Room 4.3
unavailable until 16:00.
MT (7p)
Back to SURF
Meeting Room 4.3
Description
Audio
Whiteboard
10 seats
Availability
Booked until 16:00
Appears to be in use.
Booking
March 5, 2019
today
08:00
10:00
12:00
14:00
16:00
18:00
Start booking

Find a place to work… (based on Calendar, LoRaWAN sensors)



Smart Campus and sensors, improved experience

- **Work environment**
  air quality, cleanup
- **Energy usage** (feedback to facility management)
- Easier to find an empty workspace
- … people
- … parking spot
- **Improve study results** (all of this, plus link via LBS to lectures visited)
- **Physical safety** (study evacuation drills/people movement)
- …

Questions?

paul.dekkers [at] surfnet.nl