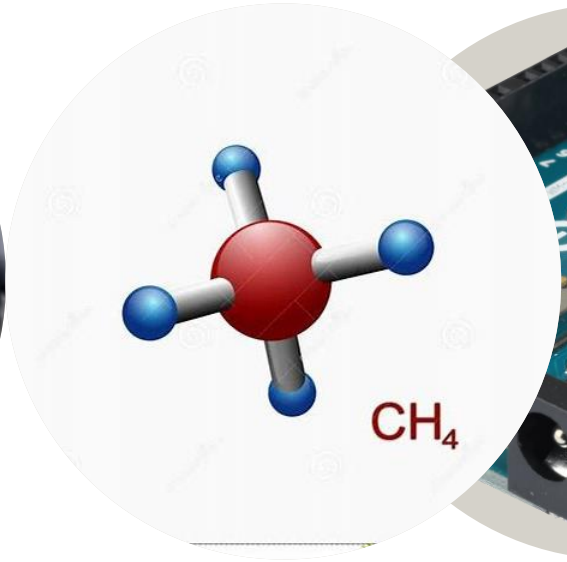
A flexible data architecture to automate collection of (near) real-time methane sensor data at commercial dairy farms

Claudia Kamphuis, Yvette de Haas, Erik van den Bergh



WAGENINGEN
UNIVERSITY & RESEARCH

100years
1918 — 2018

The ‘Klimaat envelop’-study

Project funded by Dutch ministry of LNV

Climate agenda to which NL have committed to:
reduce methane emission by 49% in 2030
primary industry are involved, including livestock sector

Developing reducing strategies for animal production systems, including dairy cattle

through breeding and feeding

through housing and manure storage

The ‘Klimaat envelop’-study: measuring methane at 18 dairy farms

CH4

CH4

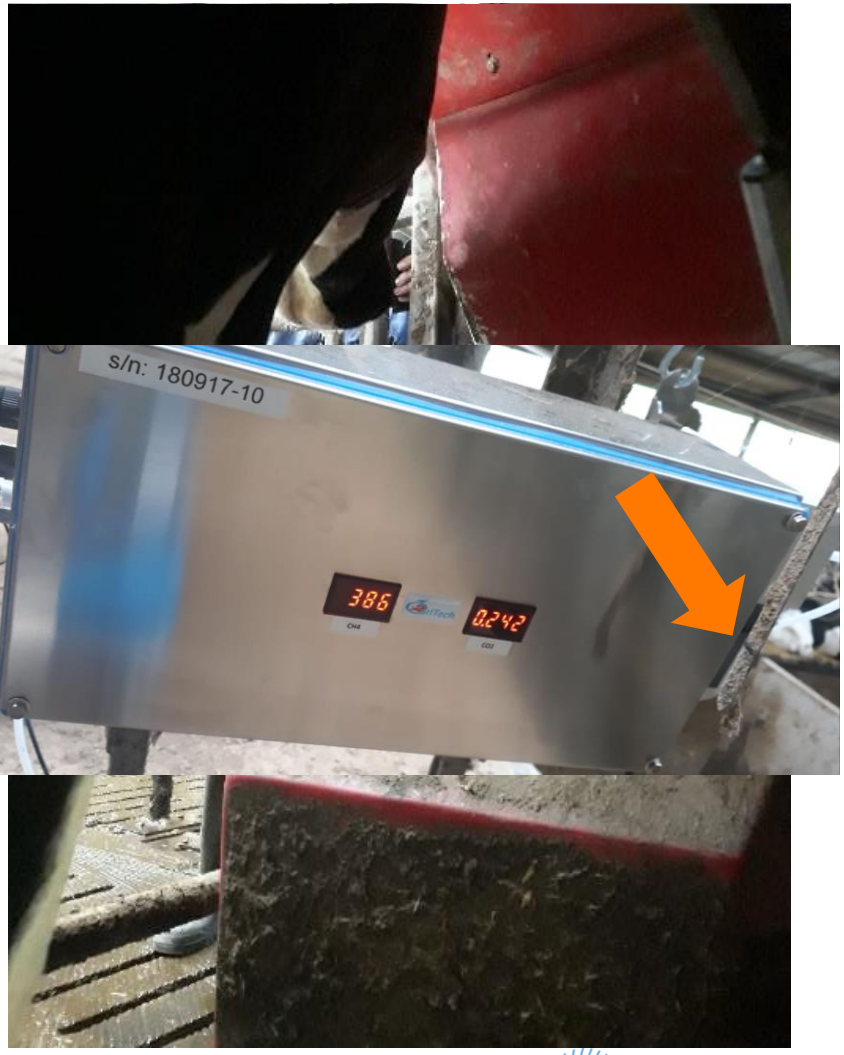
CH4

CH4

WAGENING
UNIVERSITY & RESEARCH

100years
1918 — 2018

Collecting methane sensor data



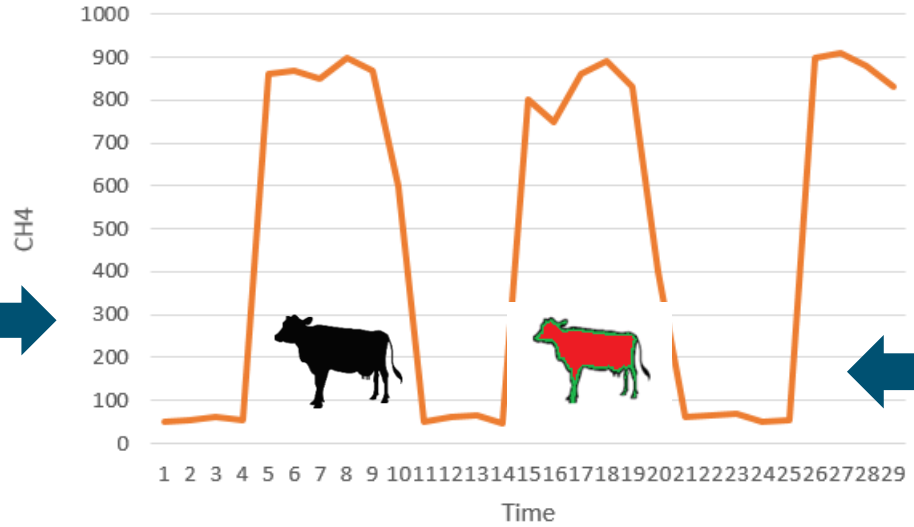
WAGENINGEN
UNIVERSITY & RESEARCH

100years
1918 — 2018

Collecting methane sensor data

But

Difficult to combine sensors due to error-prone key identifiers



Collecting methane sensor data

But

Difficult to combine sensors due to error-prone key identifiers

Difficult to upscale to more farms

costs are relatively high, and depends on LTE (WIFI) coverage

Data quality check done after data storage

Collection methane sensor data **2.0**

NB-IoT

Data push

Azure

WDCC – KB DDSDS

Installing at 5 farms

Collection methane sensor data **2.0**: advantages

RFID makes AMS data redundant

Arduino has several advantages

- allows for upgrading to more data streams
- direct combining of data → error-prone key identifier redundant
- Arduino has a long-life battery → independent form electricity

Collection methane sensor data **2.0**: advantages

RFID makes AMS data redundant

Arduino has several advantages

Data collection via NB-IoT

- independent of WIFI (LTE-coverage)
- works on farms with poor or no LTE-coverage
- allows upgrading to more farms (all Dutch farms)

Collection methane sensor data **2.0**: advantages

RFID makes AMS data redundant

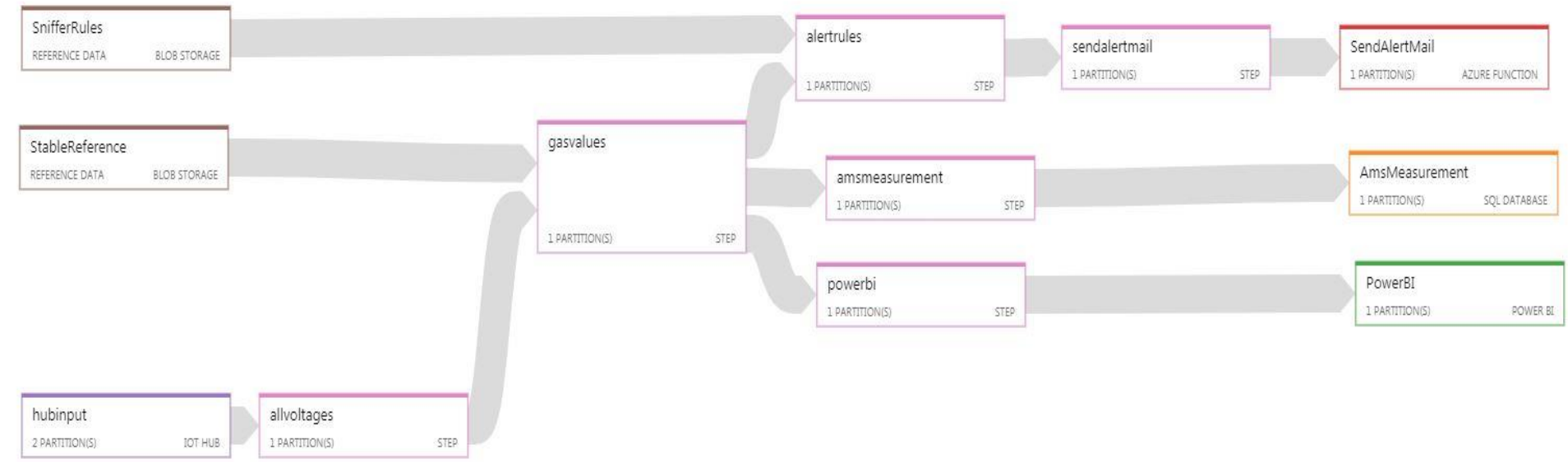
Arduino has several advantages

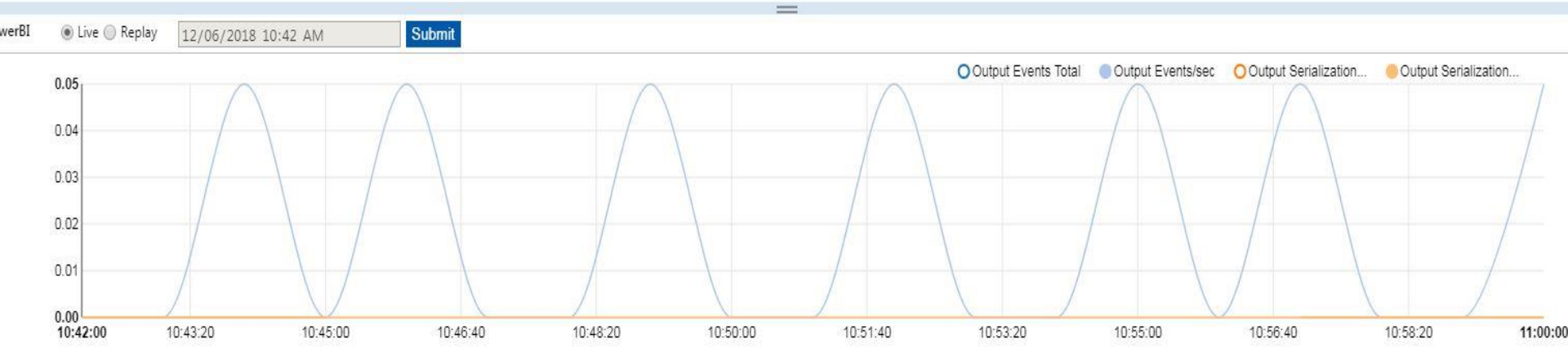
Data collection via NB-IoT

Data push vs. data pull

- continuous transfer of small packages of data
- control and quality check near real-time

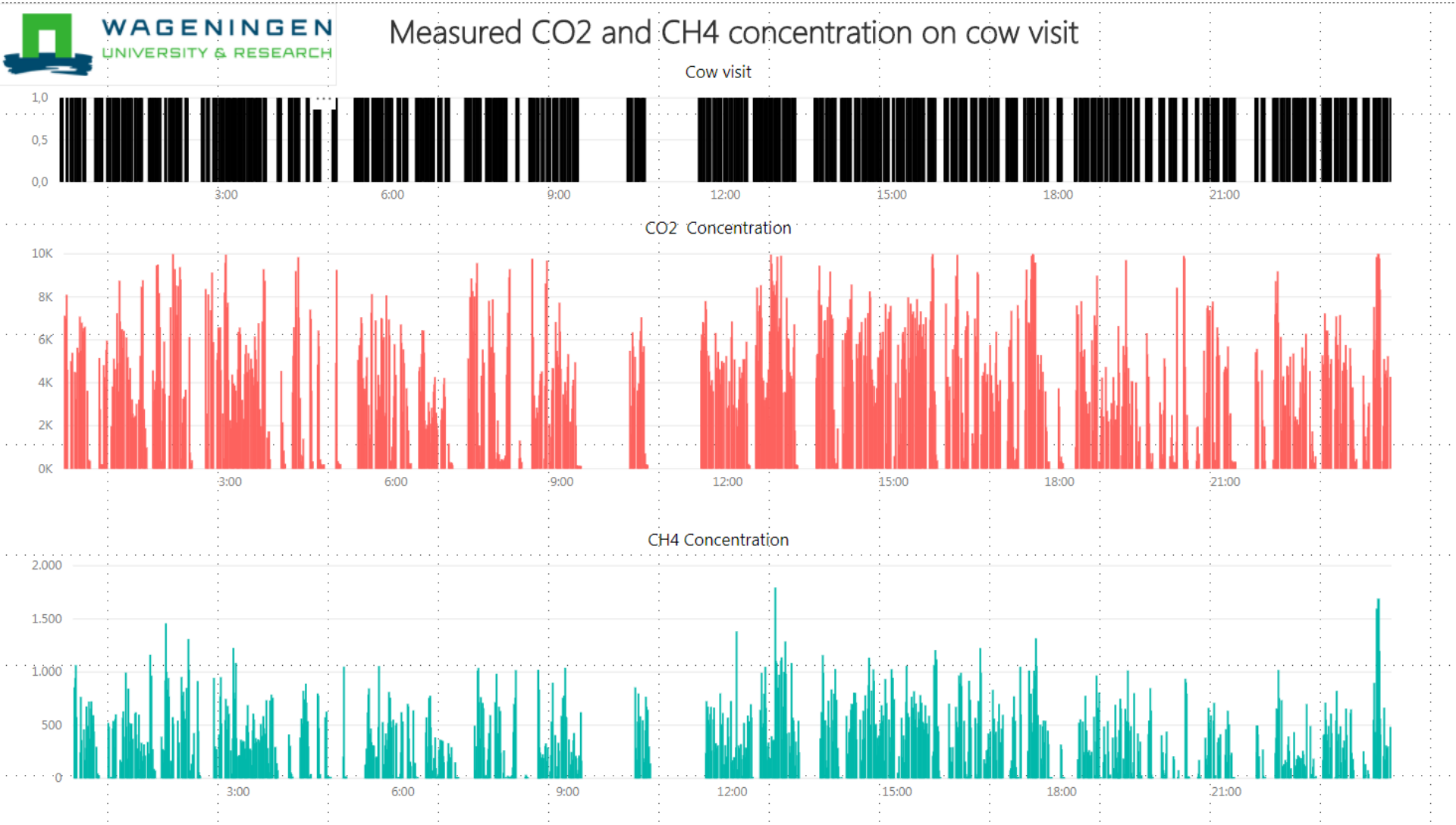
Azure and streaming analytics





PowerBI

Power BI



PowerBI

PowerBI


Wadden Sea
Wilhelmshave
Ems
Leeuwarden
Groningen
E22
Oldenb
A7
Drachten
Assen
A31
IJsselmeer
Emmen
Meppen
Lelystad
Zwolle
Lingen
Almere
A28
Amsterdam
E231
Apeldoorn
Enschede
E30
The Hague
Utrecht
Arnhem
Münste
A20
Rotterdam
A15
A1
Nijmegen
A43
s-Hertogenbosch
Breda
E31
E35
Tilburg
Herne
Middelburg
Duisburg
Dortmur
E312
Eindhoven
E34
Krefeld
Essen
Hagen
Ostend
Bruges
Antwerp
A21
Wuppertal
E25
Dunkirk
A10
Ghent
E19
E313
Düsseldorf
Leverkusen
E41
Hasselt
Kortrijk
Brussels
E314
Maastricht
Cologne
E40
Bonn
St-Truiden
Liège
Aachen
E29
E15
A25
Lille
Tournai
E429
A26
A23
E42
Charleroi
Namur
Verviers
Coblen
Arras
E411
A2
E44
© 2018 Microsoft Corpor

Collection methane sensor data **2.0**: work in progress

Installation really simple: plug in and play

Data shown here comes from one farm

- 5 farms installed now and data comes in

Work for 2019 includes

- install on all 18 dairy farms
- connect with more data sources
- Alternative for cowID with RFID

Acknowledgements

WDCC for funding

Gerrit Seigers (FB-IT) and Hendrik Jan van Dooren (ASG) for the hard work, and installation at farms

Erik van den Bergh (WDCC), Yvette de Haas (ASG), Erwin Zewald (FB-IT), Nico Ogink (ASG), and Michel de Haan (ASG)

WAGENINGEN
UNIVERSITY & RESEARCH

100years
1918 — 2018