The Internet of Food and Farm

Sjaak Wolfert (Wageningen University & Research), Harald Sundmaeker (ATB Bremen)

Extracting Value from Next General Digital Infrastructure, IoT week, Bilbao, 6 June 2018

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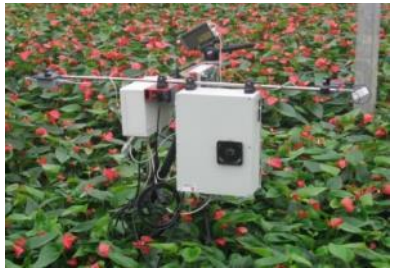
Advancements in Farming



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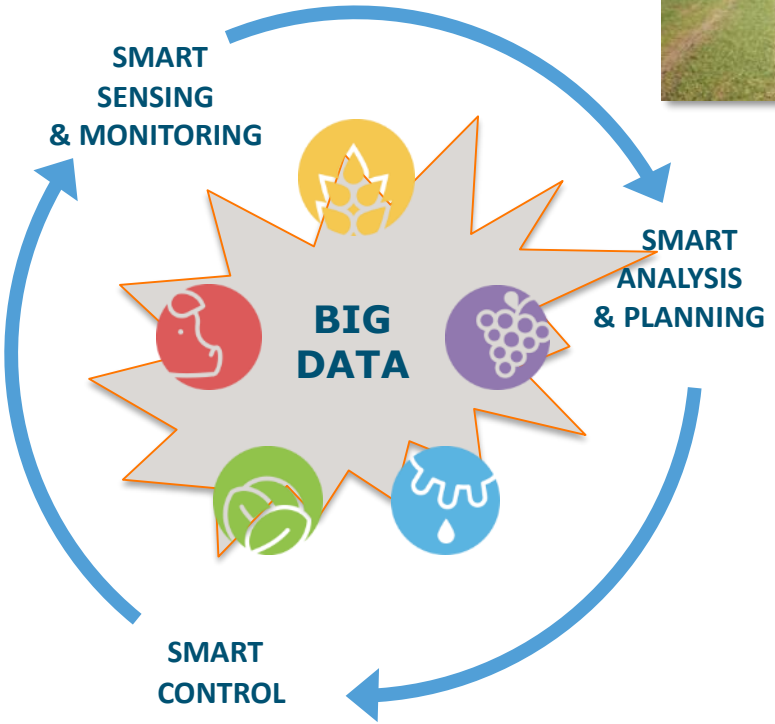


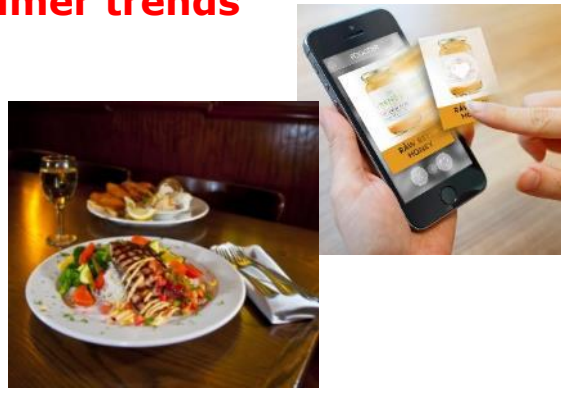
Involving entire supply chain and beyond

Smart Farming

Tracking & Tracing

Smart Logistics

Consumer trends



Personalized

Domotics

Health

Fitness/Well-being

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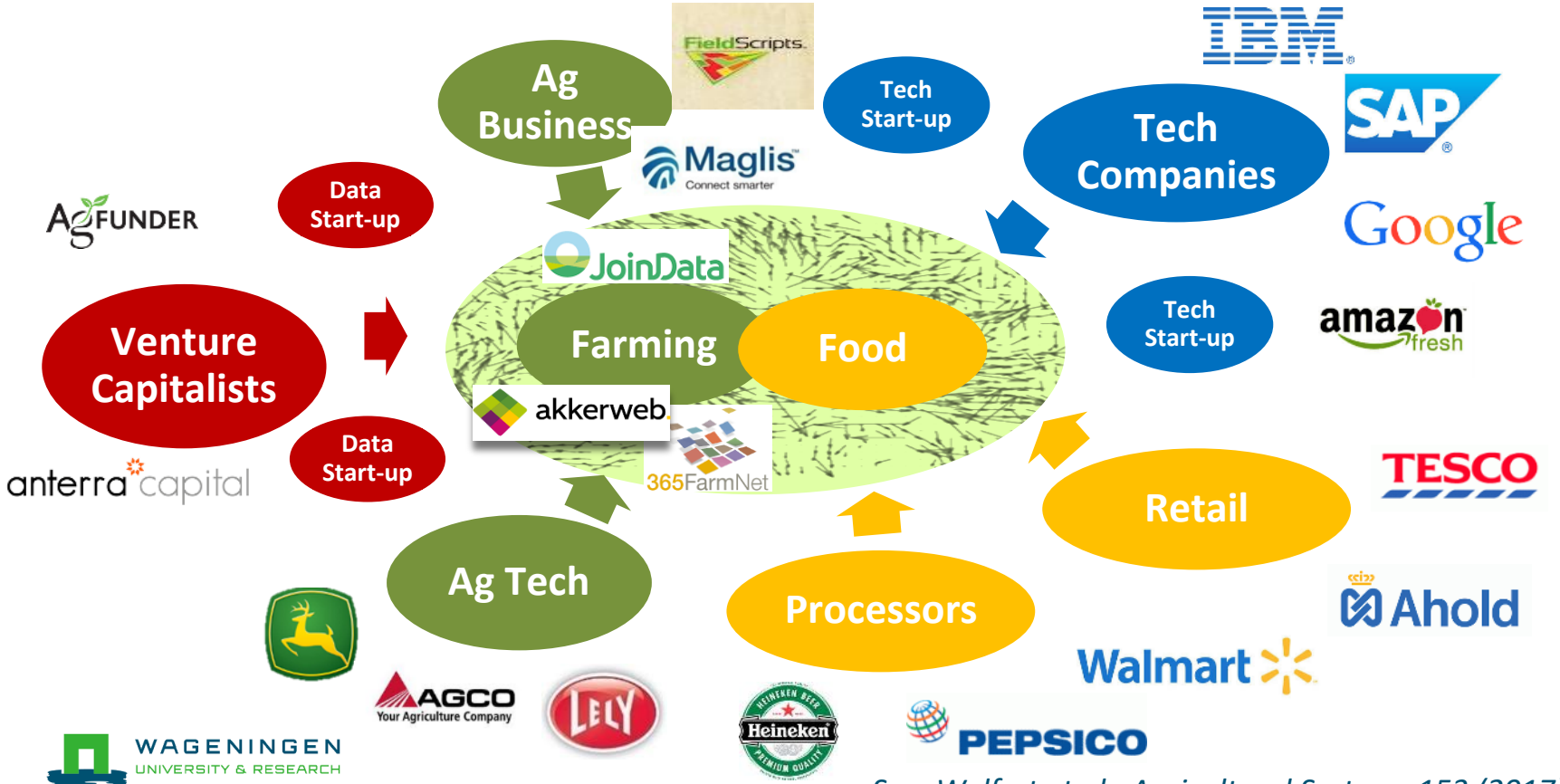
The battlefield of data in Farm & Food



See: Wolfert et al., Agricultural Systems 153 (2017) 69–80

Current issues and challenges

- **Governance**
  - privacy, security, trust, ...
- **Business models**
  - fair share, new opportunities
- **Infrastructure**
  - open versus closed
- **Ecosystems**
  - establishing critical mass, avoid lock-ins

...which are often intertwined!

A PUBLIC PRIVATE PARTNERSHIP IN IOT & AGRI-FOOD

SJAAK WOLFERT, SCIENTIFIC PROJECT COORDINATOR

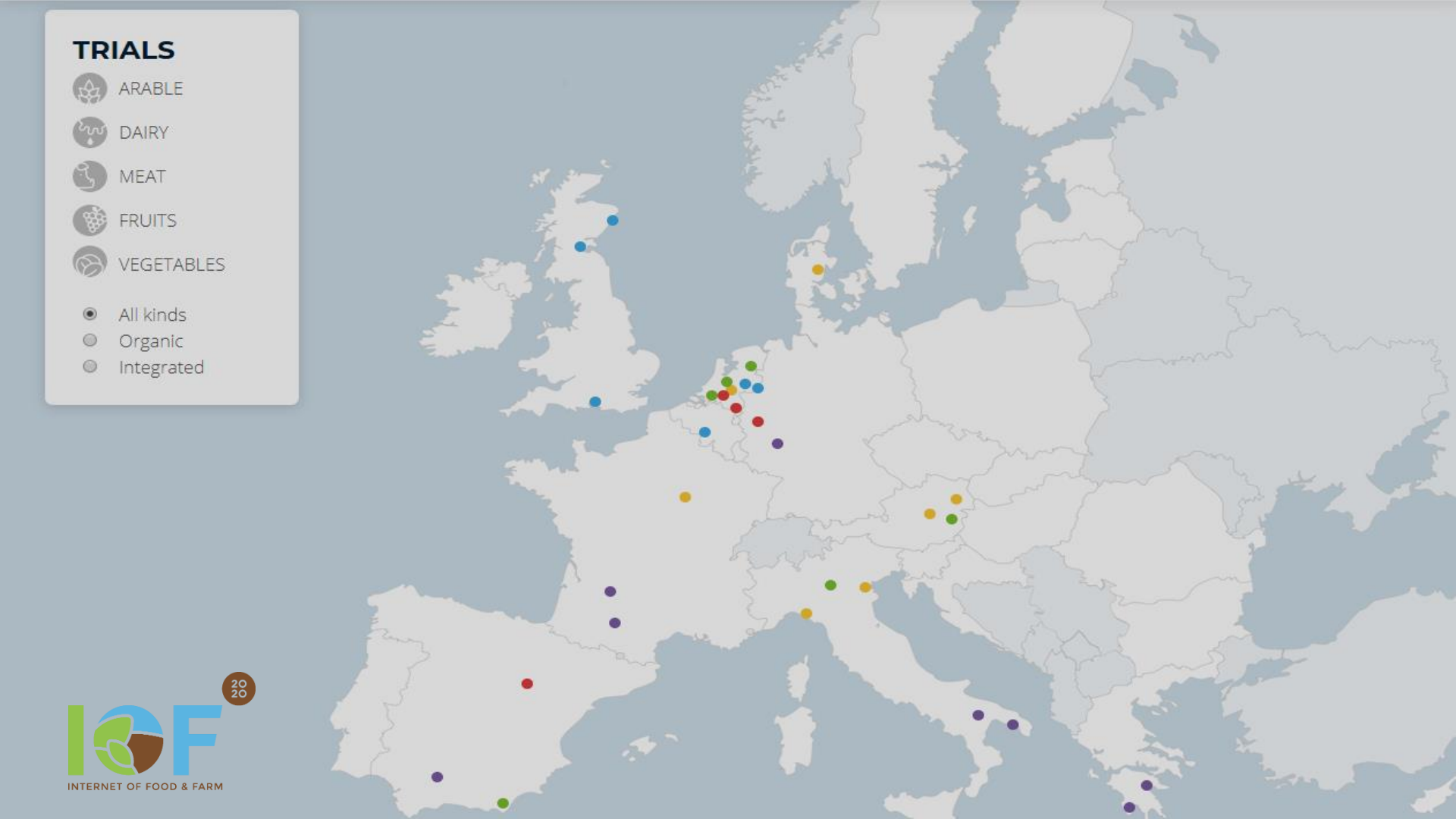
Internet of Food and Farm 2020

Innovation Action: 2017 - 2020
30 M€ funding by DG-CNCT/AGRI

Objective:

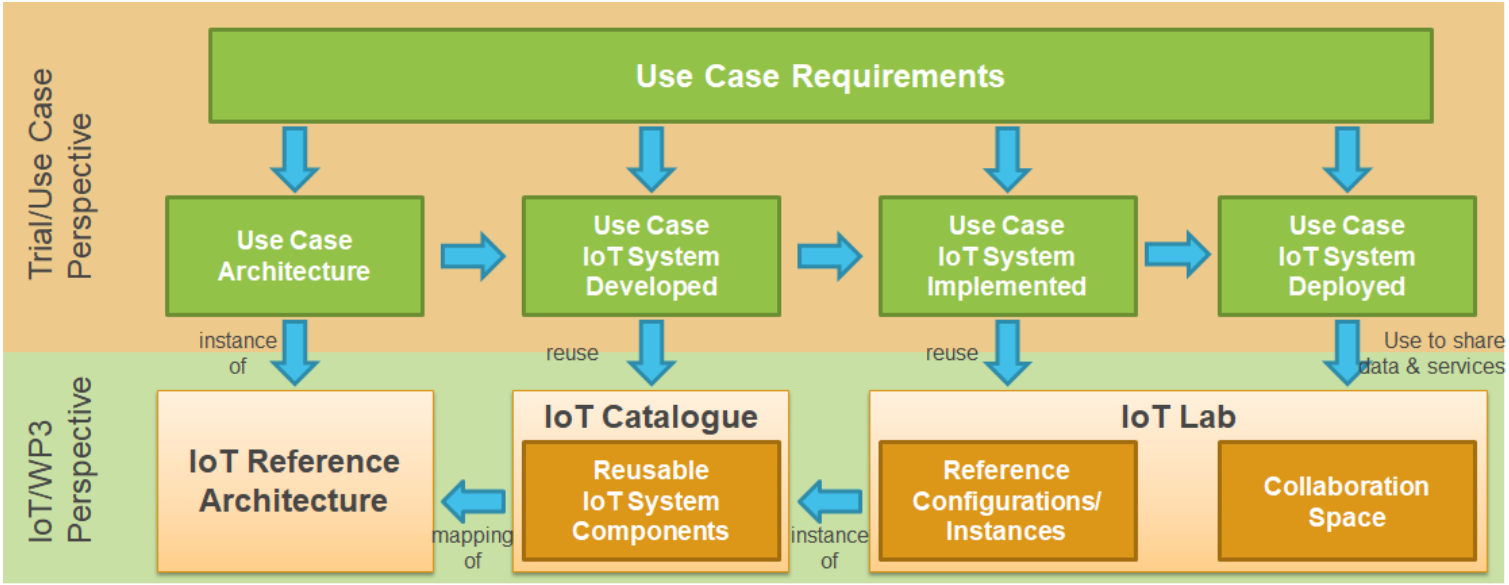
Large-scale uptake of IoT in the European farming and food sector

- Business case of IoT
- Integrate and reuse available IoT technologies
- User acceptability of IoT
- Sustainability of IoT solutions

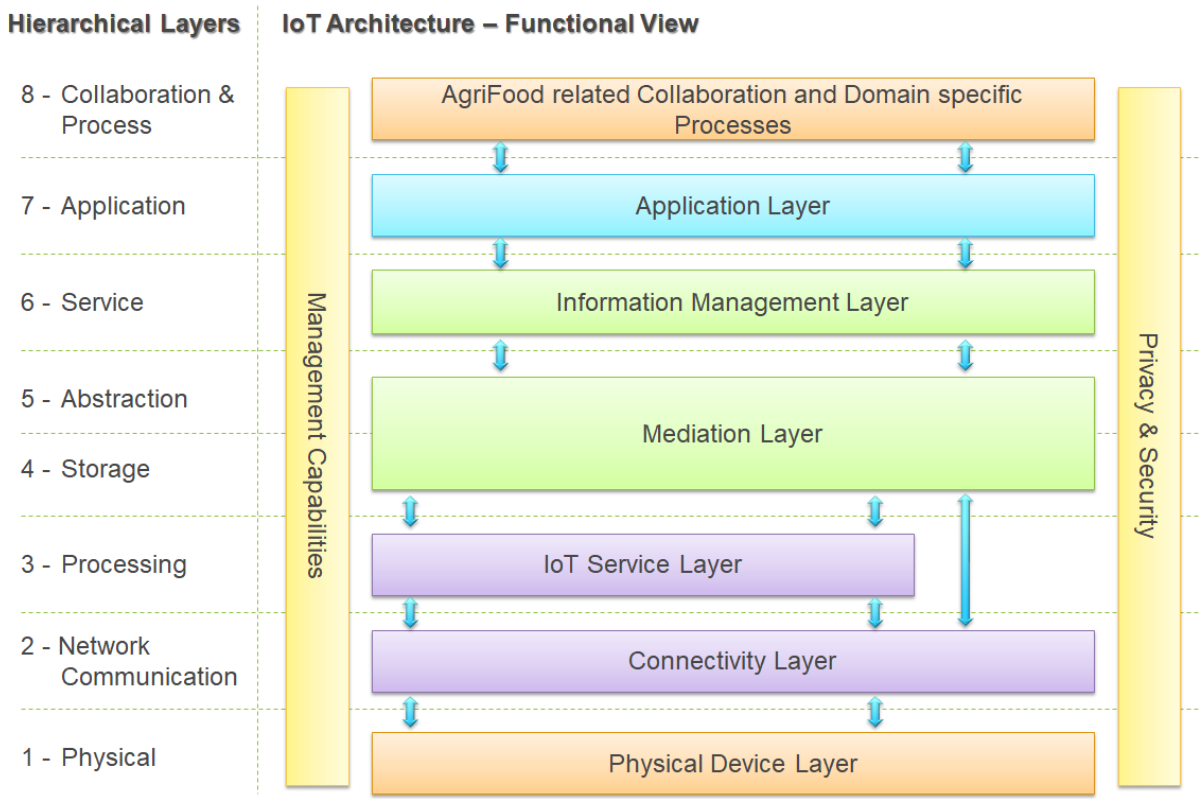

TRIALS
ARABLE
DAIRY
MEAT
FRUITS
VEGETABLES
All kinds
Organic
Integrated
INTERNET OF FOOD & FARM
2020

Conclusion – IoF2020 Architectural Process

- Ensure replicability, reuse and interoperability of IoT based ‘systems of systems’ validated in the 19+ IoF2020 UCs



Potential Functional view of an IoT Architectural Reference Model for identifying functional components

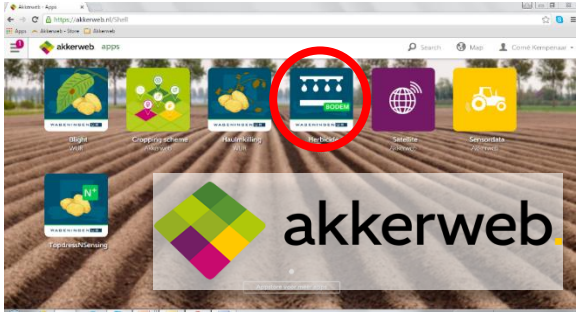


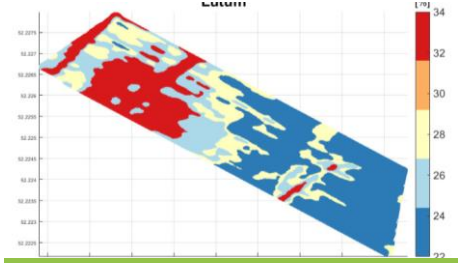
UC1.1. WITHIN-FIELD MANAGEMENT ZONING

Soil map based variable rate applications and machine automation in potato production

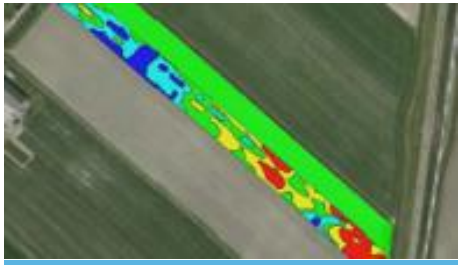
Coordinators: Peter Paree (ZLTO) & Corné Kempenaar (WUR)

Product Impressions





SOIL MAP SERVICE



VARIABLE RATE APPLICATION MAP

AUTOMATION & MACHINE COMMUNICATION

IoF2020 - Trial: The internet of Arable Farming

Use case 1.1: Within-field management zoning

European Large-Scale Pilots Programme

Partners

ZLTO (NL); Kverneland Group (NL); KPN (NL); Bayer CropScience AG (DE); Van den Borne Aardappelen (NL); Grimme Landmachinen-fabrik GmbH & Co (DE); Wageningen University & Research (NL).

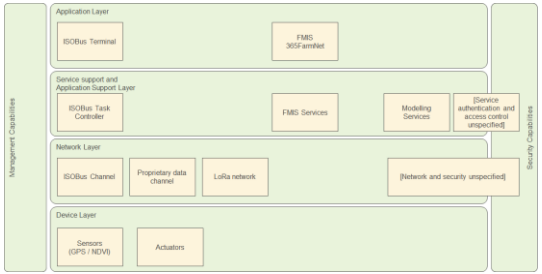
Domain application areas addressed

Management zoning of arable fields; Crop protection; Yield prediction. (Farming, Logistics)

Short description and location

Sensing and actuating devices are used to gather data, mainly related to potatoes, predict yields, define management zones, monitor and optimize growing potatoes' behaviour, optimize use of herbicides, and optimize farm management. (NL, DE)

Architecture View



SW/HW Infrastructure

Cropfield sensors platform, Agriculture combination (e.g., tracktor), Manufacturer Cloud with cloud storage, FMIS Cloud, Prediction Model Cloud

IoT Applications

Weather forecast service, Growing crops, Akkerweb agro-eco algorithms; GIS, zoning and T&T modules; Control fertilize machines; Control irrigation systems; Measure soil temperature and water potential

IoT Platforms and Software

Initiatives and platforms: FIWARE, FIspace, EPCIS, AgroSense, Apache Cassandra, Apache Flink, Apache Spark

IoT Technologies and Standards

Lora Network, 365FarmNet, Zoner, Crop-R and Akkerweb platforms, Cloudfarm FMIS, ISOBUS.

IoT Devices

30 sensors for soil moisture, Veris soil scanner, machine control, yield sensors, indoor climate, crop quality, 4 weather stations, 3 GEO-localization units, NDVI Sensor

CREATE-IoT U4IoT ACTIVAGE PROJECT IoF INTERNET OF FOOD & FARM MONICA SYNCHRONICITY AUTOPILOT

Co-funded by the European Commission

UC2.2.
HAPPY COW

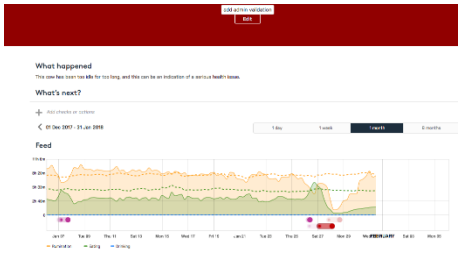
Keep your herd healthy with an artificial intelligence monitoring system

Coordinators: Niels Molenaar, Connecterra

Product Impressions

How IDA looks like in practice

Estrus insights



Health insights

Value chain integration

IoF2020 - Trial: The Internet of Dairy Farming

Use case 2.2: Happy Cow

European Large-Scale Pilots Programme

Domain application areas addressed

Real-time 3D monitoring of dairy cow activity; Animal Health Management; Cow Fertility Management.
(Farming)

IoT Applications

Cloud-based decision support system, analytics cow centric behaviour, prediction algorithm; Control transport; Control cow daily growth; control health conditions; environmental sensing

Short description and location

Improving dairy farm productivity through 3D cow activity sensing and cloud machine learning technologies.
(NL)

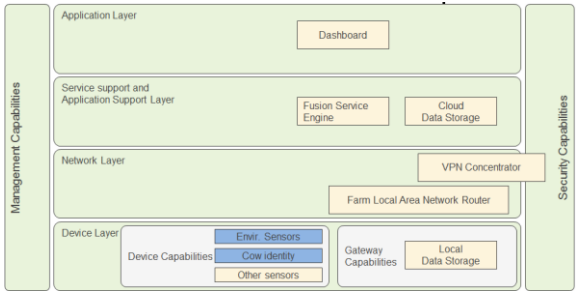
IoT Platforms and Software

Base Station Device oData, Connecterra IoT platform, connection to 365FarmNet.

Partners

Connecterra (NL); Wageningen University & Research (NL); ZLTO (NL); VetEffect (FI), 365 Farmnet (DE)

Architecture View



SW/HW Infrastructure

Cloud Service Platform (Data Storage, Business Intelligent dashboard, Fusion Service Engine), Farm Server (IoT Dashboard, IoT adapters, local data storage, IoT Middleware); Sensor platform; Climate Control Platform

IoT Technologies and Standards

XMPP-IoT, HTTP, Sub-1GHz, BLE, 6LoWPAN

IoT Devices

500-700 neck/leg transmitters with accelerometer RF sensors for dairy cow activity in 3D space 50-60 intelligent routers; 1 Accelerometer per animal; MEMS Temperature, Humidity, and Pressure sensor per animal and farm; BLE sensor per animal

CREATE-IoT U4IoT ACTIVAGE PROJECT IoF INTERNET OF FOOD & FARM MONICA SYNCHRONICITY AUTOPILOT

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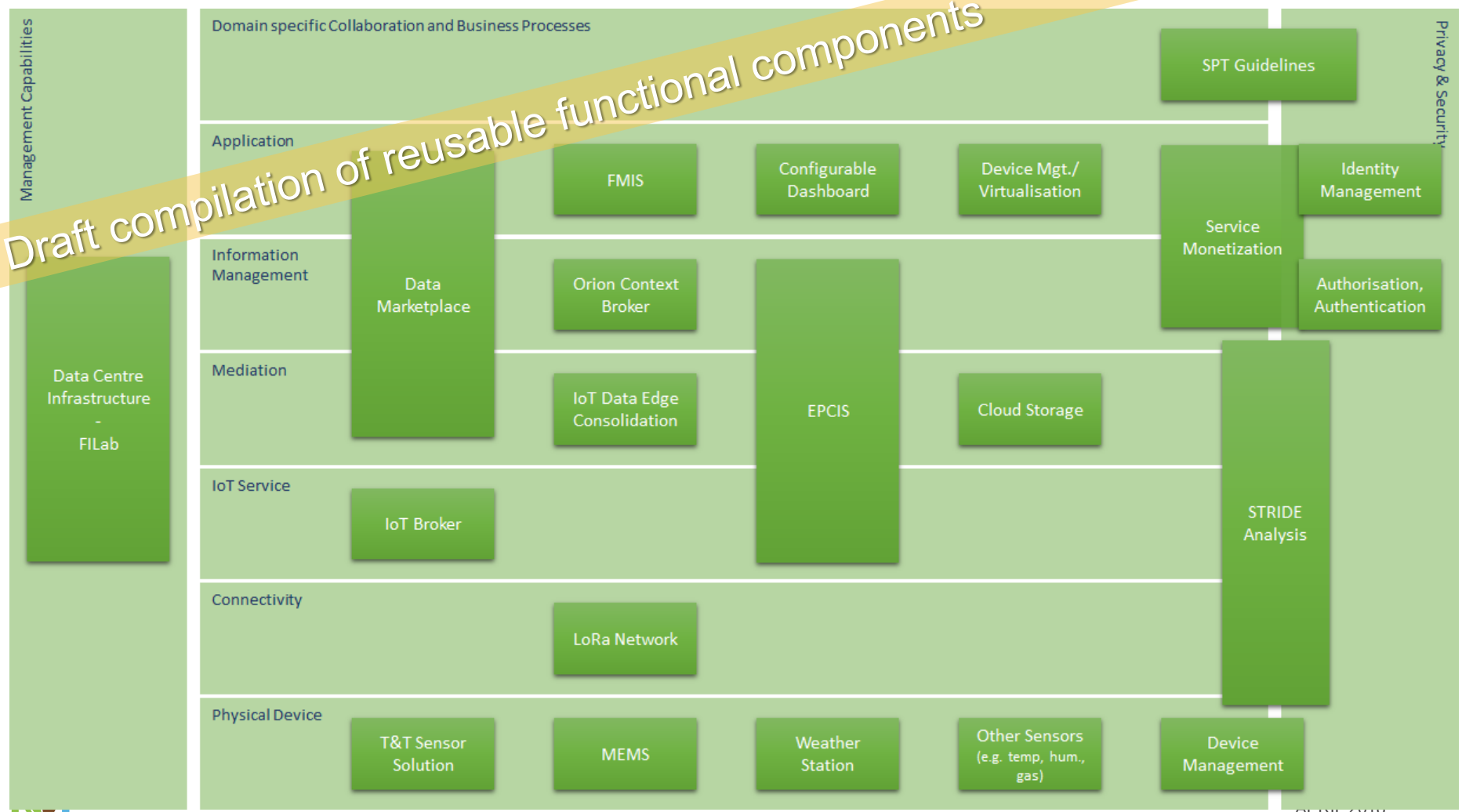
Draft compilation of reusable functional components
Management Capabilities
Domain specific Collaboration and Business Processes
Privacy & Security
SPT Guidelines
Application
FMIS
Configurable Dashboard
Device Mgt./ Virtualisation
Service Monetization
Identity Management
Information Management
Data Marketplace
Orion Context Broker
Authorisation, Authentication
Mediation
IoT Data Edge Consolidation
EPCIS
Cloud Storage
Data Centre Infrastructure - FILab
IoT Service
IoT Broker
STRIDE Analysis
Connectivity
LoRa Network
Physical Device
T&T Sensor Solution
MEMS
Weather Station
Other Sensors (e.g. temp, hum., gas)
Device Management

OPEN CALL ‘NEW INNOVATIVE IOT USE CASES’

Challenges

1. New regions

- Eastern and Northern Europe
- Re-use existing use cases

2. Post-farm and other sectors

- From farm → supply chain (logistics, processing, retail, consumption)
- Other crops, animals, etc.

Important Information

- Multi-actor use cases (no single-parties!)
- IoT value chain (tech providers, service integrators, end-users)
- Business/organizational aspects
- Total budget: 6 M€; per use case 300-500 k€
- See: www.iof2020.eu/opencall

Thank you for your attention!

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