Smart-Farming-World

Cross-vendor networking of machines in agricultural crop production with the help of a service platform

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Framework of Smart-Farming-World and its partners

Project framework

- Funded by the federal ministry of Economic Affairs and Energy
- Part of the technological program "Smart Service World"
- Runtime: 03/2016 – 05/2019
- Project volume: € 4.3 m
- Funding volume: € 2.3 m

LOGIC WAY
- Lead partner
- Software and Electronics

T··
- Cloud development
- Safety and security

GRIMME
- Farming machinery
- Use case provider

CLAAS
- Farming machinery
- Use case provider

fir an der RWTH Aachen
- Business Model Design
- Value analysis

DFKI
- Sensor nodes
- Artificial intelligence

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

Smart Service Welt
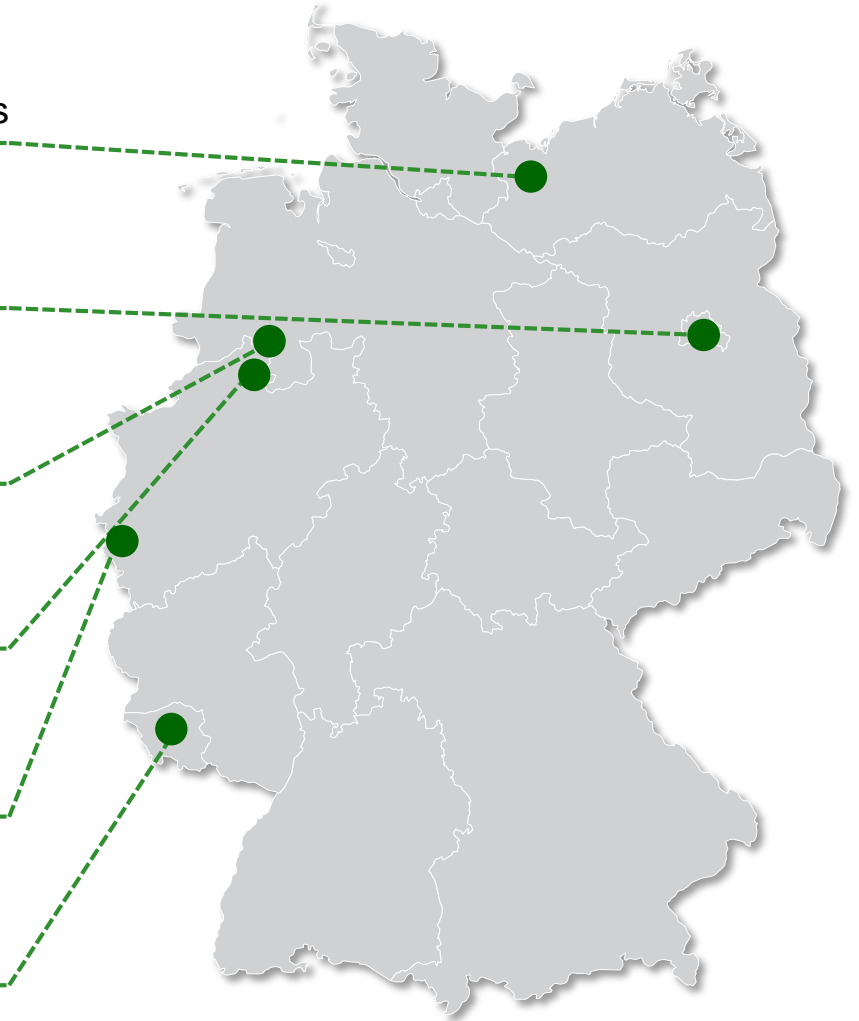
Smart Farming

# The Smart Farming platform enables the exchange of data and connects the participants of the ecosystem

Smart Farming service platform

Business context
(regulation, laws, contracts, data protection)

Organizational structure

- Operators
- Management
- Farmers
- OEM
- Consultant
- Hersteller von FMIS
- Developer
- Service Partner

Generic services

App Store	Pricing
Certification and qualification	Accounting and payment
...	...

Specific services

Harvesting optimization	Fleet management
Machine software update	Machine troubleshooting
...	...

Operational structure
(Example machine software update)

Release update → Transfer update → Confirmation update → Update of the machine → Check update → feedback

Software-defined Smart Farming platform
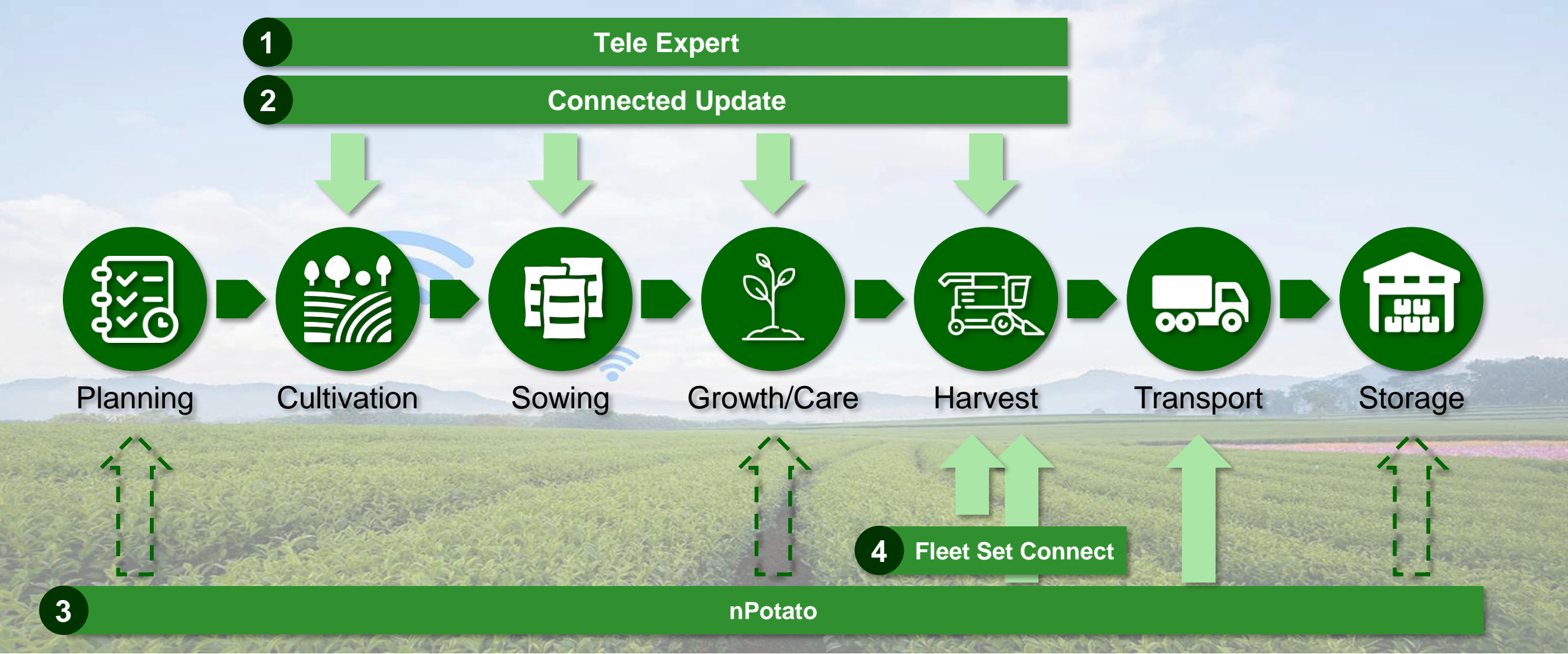
Smart Products & Infrastructure

- The general framework of the smart farming platform is based on the **model of digital infrastructures** of acatech.

- On the smart farming platform, the **data of all involved process partners** can be exchanged and linked.

- Generic services allow **faster development** of specific services by using basic functionalities which can be re-used several times in different application areas.

- Specific services are based on the data and/or linkage of **several process participants** and offer the different user groups specific value-added services that are tailor made to their needs.

- Specific services are divided in applications that are running in the cloud and applications that run **directly on the terminals of the harvesting machines** (edge devices).

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The technical development of the platform is separated in the two parts cloud-applications and edge-applications

(Logic Way, 2017)
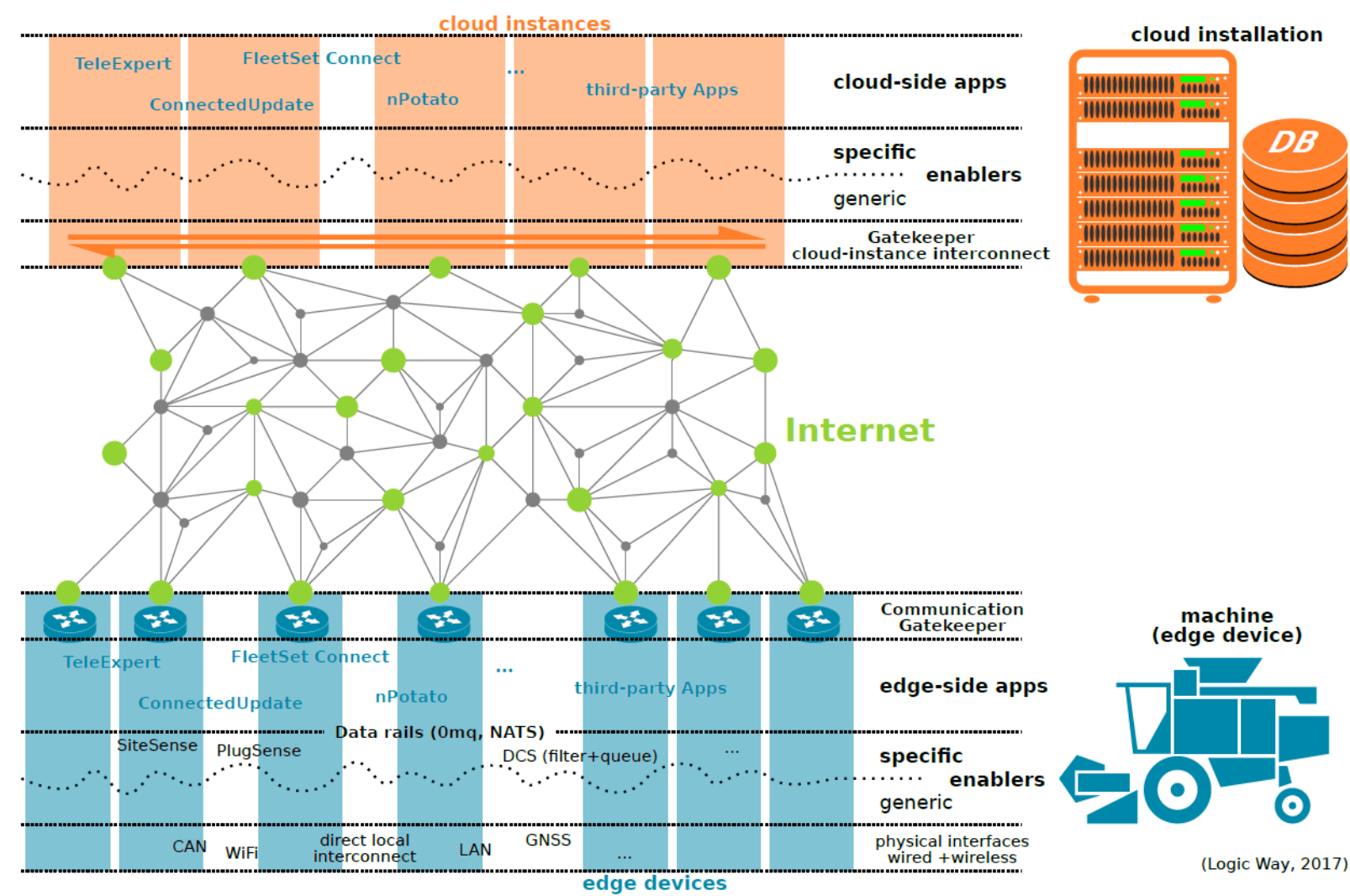
- Due to the poor network coverage in rural areas especially in eastern Germany the data processing is divided into **cloud and edge applications**.

- All applications have installations on the **terminals/communication modules** of the machines and the respective **cloud instance.**

- A **safe and secure communication** infrastructure is set up via an internet connection with communication gatekeepers, protocols and token systems.

Smart-Farming-World develops four use cases for different parts of the agricultural value chain with a focus on agricultural machinery

1 Tele Expert

2 Connected Update

Planning → Cultivation → Sowing → Growth/Care → Harvest → Transport → Storage

4 Fleet Set Connect

3 nPotato

: Focus of the use case

: Possible integration processes of the use case

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Image sources: [2]

Use Case 1: Tele Expert – Factsheet

Major Challenge

The maintenance and repair of agricultural machinery is especially during harvesting seasons very time critical for farmers. Especially implements are critical for the harvesting process but have no communication infrastructure in a lot of cases.

Core Product Features

Cross-vendor remote service applications for harvesting machines and implements increase the response rate of own and contracted service technicians.
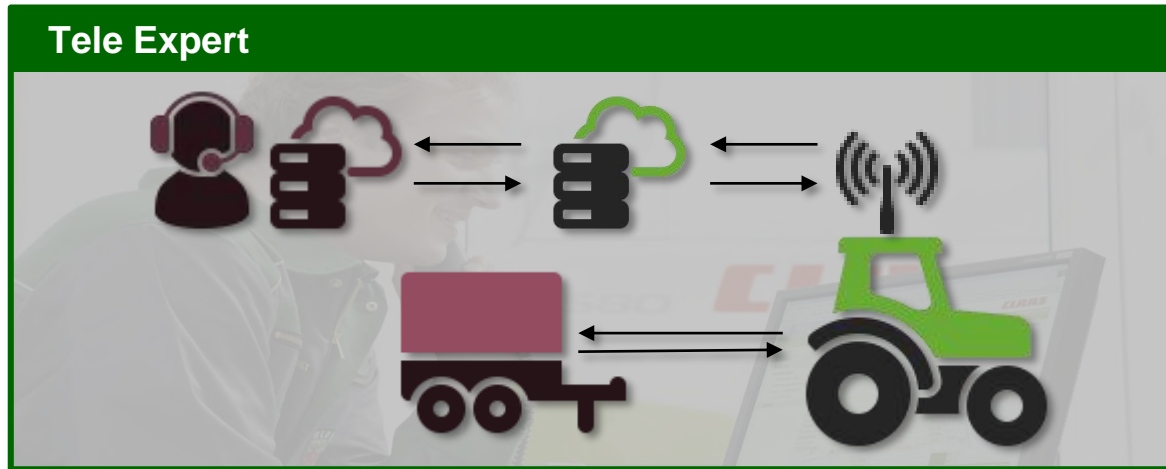
Here is what we aim to improve

Faster troubleshooting in urgent cases

Reduced service costs for manufacturers and service partners

Involved partners

CLAAS   GRIMME   T   LOGIC WAY   fir an der RWTH Aachen

Use case outlook

CLAAS already launched a similar remote service product in November 2017 for its own products. Tele Expert will extend its functionality and makes it possible to use remote service technologies for other manufacturers. Grimme integrates the development in their aftersales operations starting in 2019.

Tele Expert

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Image sources: [1]

Use Case 1: Tele Expert – Product User Story

Without our Product or Service

Many journeys per service technician
After fault diagnosis on site, technicians have to drive back to get the parts and install them after a new journey

Long problem search
Machines become increasingly complex and not all service technicians are experts especially in electronics and software problems

With our Product or Service

Remote diagnosing
Service technicians can diagnose the problem remotely to have a better insight of the problem to solve it faster

Access to centralized knowledge
Experts from a central helpdesk of the manufacturer are able to help the service technician in the field very quick in case of difficult problems due to full data access

Here is the difference

Less machine downtime and improved service efficiency

Faster Repair and less specialized technicians required

New opportunities for service dealers due to better performance

**Target Users: Service partners in rural areas**

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Use Case 2: Connected Update – Factsheet

Major Challenge

Currently the software updating process of harvesting machines is a difficult and complex process for all participants due to the lack of a secure communication infrastructure and standardized protocols.

Core Product Features

Connected Update allows it to update the software of harvesting machines remotely to install bug fixes or install new product features.
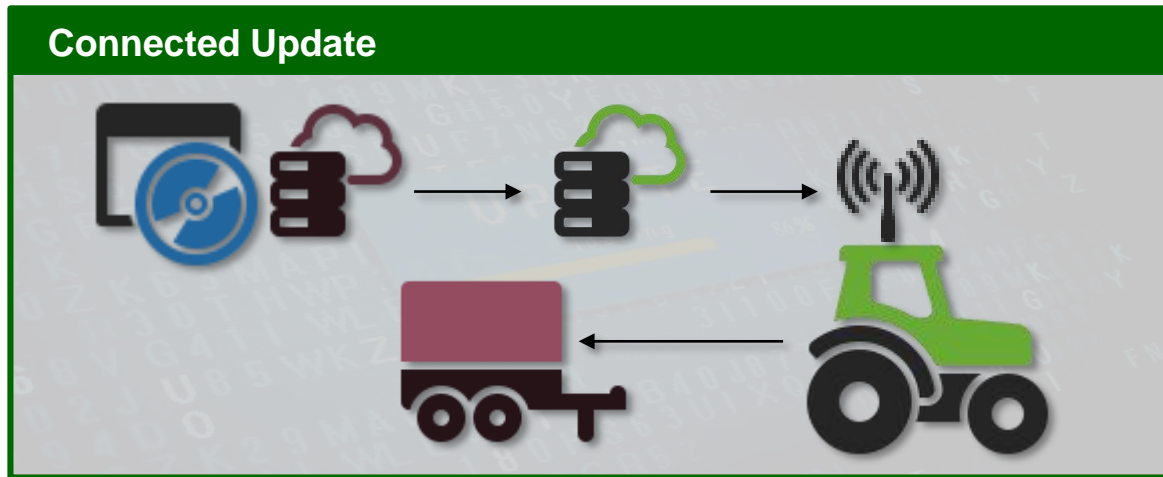
Connected Update

Here is what we aim to improve

Faster deployment of bug fixes and new product software features

Reduced service costs for manufacturers

Involved partners

CLAAS   **GRIMME**   **T** · · ·   **LOGICWAY**   **fir** an der RWTH Aachen

Use case outlook

Connected Update is closely connected to the Tele Expert use case. CLAAS and Grimme will use the remote update functionality not only to deploy bug fixes faster, but also to push new digital functionalities into the market. Both companies will start to use the technology with real customers in 2019.

Image sources: [3]

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Use Case 2: Connected Update – Product User Story

Without our Product or Service

Many journeys per service technician
Bug fixing of software problems takes very long due to "analog" updating process

No deployment of new features
Machines are sold with a specific feature set and no possibility to install new software based features

With our Product or Service

Remote software update
Service technicians can install bug fixes remotely and do not need to be physical at the machine

Update possibility
New software based product functionalities can be installed remotely and make it possibly for farmers to test them before buying them
"*Always the most recent machine!*"

Here is the difference

Less time until bug fixes are installed in the fleet

Savings for the dealers and manufacturers due to less travel activities

New opportunities for farmers to test digital functionalities

Target Users: Service partners in rural areas and farmers with big interested in new digital features

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Use Case 3: nPotato – Factsheet

Major Challenge

The potato harvesting process with harvesting machines is a complex process that needs precise information about the fruit and the current harvesting conditions. Wrong settings can harm the potato and decrease the profit drastically.

Core Product Features

A digital transmitter in shape of a potato provides a detailed digital twin of the current impacts on real potatoes. Recommendations for action are given by real-time data processing and lead to optimally adjusted machines to increase the product output.

nPotato

Here is what we aim to improve

Increased product quality

Reduced costs related to scrap

Involved partners

GRIMME   DFKI   LOGIC WAY   fir an der RWTH Aachen

Use case outlook

nPotato will be launched with pilot customers in autumn 2018. The current development will be an aftersales product of Grimme to improve their harvesting machines. In addition, the idea of smart sensor nodes will be used in future projects to extend its application area to other parts of the food chain and other types of fruit.

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Image sources: [4]

Use Case 3: nPotato – Product User Story

Without our Product or Service

Field work decisions made on information from previous years

Potential risk of under/over estimation of field work resources due to no fact/data based decision support

Damages of the potato not detectable

Wrong settings of the harvesting machines have an impact on the potatoes and lead to not visible damages that decrease the profit margin later on

With our Product or Service

Access to data in real time

Dashboard for monitoring farm activities related to potato harvest in real time based on data from vehicles and nPotato

nPotato analyzes in real-time

Measuring of dynamic parameters to sent error messages directly to the driver to optimize machine settings

Here is the difference

Improved field work efficiency and executional optimization and precision due to the elimination of information latency
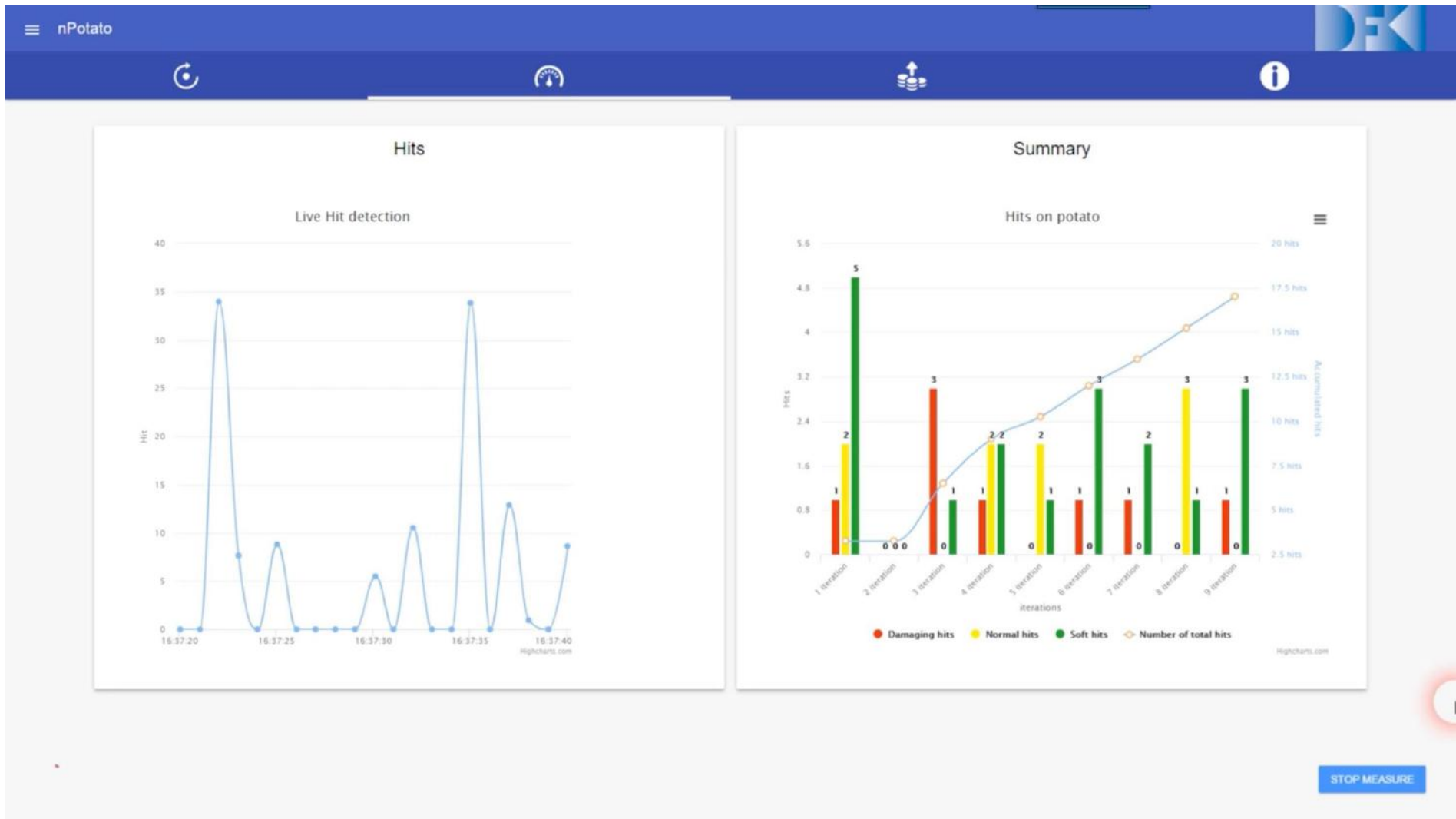
Generation of estimated real-time income curves, less damages of the potatoes and increased quality

Target Users: Medium to large size farms or contractors (100 - ∞ ha)

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Use Case 3: nPotato – Product Insights

Use Case 3: nPotato – Product Insights

Use Case 4: Fleet Set Connect – Factsheet

Major Challenge

The complexity of modern harvesting machines makes it for the operator very hard to find the best possible machine settings due to the current circumstances during the harvest, which lead up to 30% of wasted production in corn harvesting

Core Product Features

A superior machine or a harvesting consultant recognizes optimum settings for the harvest and transmits the settings to the respective control units of the secondary machines to increase the whole fleet performance.

Fleet Set Connect

Here is what we aim to improve

Increased machine throughput

Decreased costs for training

Involved partners

CLAAS **fir** an der RWTH Aachen

Use case outlook

Fleet Set Connect is currently in the advanced development department of CLAAS. An early stage demonstration of the use case is available since spring 2018 and field tests will start in 2019. The partners have developed different business models for possible future expansion stages of the technology.

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Image sources: [5]

Use Case 4: Fleet Set Connect – Product User Story

Without our Product or Service

High level of driver knowledge required

Machine settings of modern harvesting machines are becoming increasingly complex and are very difficult to handle

Loss of time and money

Wrong settings in fleets of combined harvesting machines lead to inefficient harvesting processes and a loss of time and money

With our Product or Service

Recommendations for action

Drivers of the harvesting machines receive recommendations from the superior fleet control (experienced driver or external consultant)

Optimal machine settings

Harvesting fleets are optimal adjusted with recommendations of the superior fleet control to optimize the throughput of the whole fleet

Here is the difference

Improved field work efficiency and less training requirements

Save time and obtain higher crop yield

Target Users: Medium to large size farms or contractors (300 - ∞ ha)

Smart Farming

… do you have an idea for another use case or an innovative smart service?

Smart-Farming-World is open for third party developments!

Get in touch with us!

Image sources: [6]

www.smart-farming-welt.de

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Image sources

[1]   http://www.claas.de/unternehmen/presse/downloadcenter

[2]   https://www.richardvanhooijdonk.com/wp-content/uploads/2015/10/smart-farming.jpg

[3]   https://ak8.picdn.net/shutterstock/videos/19094398/thumb/4.jpg?i10c=img.resize(height:160)

[4]   http://grimme.com/de/media

[5]   https://i.ytimg.com/vi/g70PNBGsqNQ/maxresdefault.jpg

[6]   http://www.cleantech.com/wp-content/uploads/2014/11/Ag-Webinar-Image-11_19_14.jpg