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

- Lead partner
- Software and Electronics
- Cloud development
- Safety and security
- Farming machinery
- Use case provider
- Farming machinery
- Use case provider
- Business Model Design
- Value analysis
- Sensor nodes
- Artificial intelligence
The Smart Farming platform enables the exchange of data and connects the participants of the ecosystem

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

- 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

3. nPotato

4. Fleet Set Connect

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 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.
# Use Case 1: Tele Expert – Product User Story

<table>
<thead>
<tr>
<th>Without our Product or Service</th>
<th>With our Product or Service</th>
<th>Here is the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many journeys per service technician</td>
<td>Remote diagnosing</td>
<td>Less machine downtime and improved service efficiency</td>
</tr>
<tr>
<td>After fault diagnosis on site, technicians have to drive back to get the parts and install them after a new journey</td>
<td>Service technicians can diagnose the problem remotely to have a better insight of the problem to solve it faster</td>
<td>Faster Repair and less specialized technicians required</td>
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<td>Long problem search</td>
<td>Access to centralized knowledge</td>
<td>New opportunities for service dealers due to better performance</td>
</tr>
<tr>
<td>Machines become increasingly complex and not all service technicians are experts especially in electronics and software problems</td>
<td>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</td>
<td></td>
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| Target Users: Service partners in rural areas |
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.

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 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.

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.
## Use Case 2: Connected Update – Product User Story

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<tbody>
<tr>
<td><strong>Many journeys per service technician</strong>&lt;br&gt;Bug fixing of software problems takes very long due to “analog” updating process</td>
<td><strong>Remote software update</strong>&lt;br&gt;Service technicians can install bug fixes remotely and do not need to be physical at the machine</td>
<td><strong>Less time until bug fixes are installed in the fleet</strong></td>
</tr>
<tr>
<td><strong>No deployment of new features</strong>&lt;br&gt;Machines are sold with a specific feature set and no possibility to install new software based features</td>
<td><strong>Update possibility</strong>&lt;br&gt;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!”</td>
<td><strong>Savings for the dealers and manufacturers due to less travel activities</strong>&lt;br&gt;<strong>New opportunities for farmers to test digital functionalities</strong></td>
</tr>
</tbody>
</table>

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

**Here is what we aim to improve**

- Increased product quality
- Reduced costs related to scrap

**Involved partners**

**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.
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)
Use Case 3: nPotato – Product Insights
Use Case 3: nPotato – Product Insights
Major Challenge
The complexity of modern harvesting machines makes it hard for the operator 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 these settings to the respective control units of the secondary machines to increase the whole fleet performance.

Here is what we aim to improve
- Increased machine throughput
- Decreased costs for training

Involved partners
- CLAAS
- 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.
# 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.

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**Target Users:** Medium to large size farms or contractors (300 - ∞ ha)
… 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!
www.smart-farming-welt.de

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- www.youtube.com – ClusterSmartLogistik
Image sources


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