D2.3 INSTALLATION, CUSTOMIZATION AND INTEGRATION REPORT

WP 2

December 28th, 2017

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LIST OF ABBREVIATIONS

ICI – Installation, Customization and Integration

IoF2020 – The Internet of Food and Farm 2020

IoT – Internet of Things

KPI – Key Performance Indicator

M – Month

MVP – Minimum Viable Product

PM – Person Month

TRL – Technology Readiness Level

UC – Use Case

WP – Work Package

PROJECT SUMMARY

The internet of things (IoT) has a revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.

The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better-quality produce are within reach. Pesticide and fertilizer use will drop and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.

Nineteen use-cases organised around five trials (arable, dairy, fruits, vegetables and meat) develop, test and demonstrate IoT technologies in an operational farm environment all over Europe, with the first results expected in the first quarter of 2018.

IoF2020 uses a lean multi-actor approach focusing on user acceptability, stakeholder engagement and the development of sustainable business models. IoF2020 aims to increase the economic viability and market share of developed technologies, while bringing end-users' and farmers' adoption of these technological solutions to the next stage. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. Therefore, key stakeholders along the food value chain are involved in IoF2020, together with technology service providers, software companies and academic research institutions.

Led by the Wageningen University and Research (WUR), the 70+ members consortium includes partners from agriculture and ICT sectors, and uses open source technology provided by other initiatives (e.g. FIWARE). IoF2020 is part of Horizon2020 Industrial Leadership and is supported by the European Commission with a budget of €30 million.

EXECUTIVE SUMMARY

In order to demonstrate the effectiveness of IoT solutions in a large spectrum of different agricultural domains and applications, IoF2020 has carefully selected 5 trials comprising 19 Use Cases (UCs), set in different regions of Europe. This is a key aspect to reflect the diversity of the agri-food domain, and perform evaluations in conditions, which are close to real scale and operational ones.

Each use case has delivered an *Installation, Customization and Integration report* (ICI report) after their first technical deployments stating and elaborating on the deployment sites, deployed components, technical challenges and end user training and feedback. The Use Case ICI reports are grouped and published jointly as D2.3, together with the first *Annual Implementation and performance monitoring report* (D2.4, M12).

For the IoF2020 project, all use cases already identified possible technologies and IoT solutions to be implemented in the project preparation phase, and these plans were further detailed in the deliverable *D2.2 Trial Implementation Plan* containing descriptions of the work plans and technical architecture of each use case. The solutions selected for the use cases are situated around TRL5 and ready for testing in the real working environment. Therefore, the initial deployment of components was planned during M05-M12 in the project. This ICI report describes how the different elements/modules/components of the different solutions have already been deployed and brought together at the different deployment sites of each UC. To identify possibilities for cooperation and re-usability of solutions also the technical challenges encountered during the first deployment are asked from the UCs, along with their progress in the solution. As the IoF2020 project revolves around a lean multi-actor approach, with frequent minimum viable product (MVP) cycles, the involvement and feedback of end-users is crucial. Therefore, already for this first deployment, the UCs are asked to specify if and how they have trained the end-users to use the equipment in order to assure proper use of equipment and software, and receive high quality feedback.

After analysing the collected data, almost all use cases (85-90%) have succeeded in having a first deployment in M05-M12 and are therefore reaching the project objectives. WP2, together with the other WPs, continuously supports the use cases to push their limits and to clearly show the integration of IoT technologies, promising innovative solutions, and demonstrate the business case in a multi-actor environment. In the future months the UCs will need to show their first project results and first MVP, followed by an evaluation and support cycle by the WPs. For those use cases that already appear to be lagging behind in the reported progress at M12, actions have already started. The ICI report will provide valuable information for WP3 to identify synergies across the use cases and enhance the interoperability of IoT solutions among UCs. Simultaneously, the UCs are motivated to further increase the number of end-users that have received training and to collect more feedback to

have the bottom-up approach which characterizes the IoF2020 project and ensures the user acceptability of the IoT solutions. The extensive photo material that this ICI report contains will also be taken up by WP5 to further communicate about IoF2020.

To conclude, the ICI report clearly reports the first deployment and installations of each UC, with evidence through photos and step-by-step visuals. This report will be used, together with the *D2.4 Annual Implementation and Performance Monitoring Report,* by the different WPs to further shape their activities and provide the UCs with the needed support to reach the project objectives. WP2 in the meantime keeps following the use cases from a close perspective through the monthly UC- and trial meetings and the yearly progress report.

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1. INTRODUCTION

This *D2.3 Installation, Customization and Integration Report* aims to report each of the 19 Use Cases' initial deployment by evaluating their performed installations in Y1 of IoF2020. D2.3 is delivered at the same time as *D2.4 Annual Implementation and Performance Monitoring Report* which gives a broader view on the Use Cases' progress also in terms of work plan progress, business model development, data gathered, etc. D2.3 specifically aims to identify each of the 19 Use Cases' current status of installation, by reporting their deployment sites, deployed components, occurred technical challenges and feedback mechanisms. The D2.3 is of crucial importance for WP2 because it allows a first thorough overview of the UCs' status of installation and shows extensive visualisations of the test sites and installed components and important information for the other WPs, like technical information for WP3 and dissemination materials for WP5. In addition, the presented technical challenges and component descriptions allow for more extensive collaborations between use cases through the identification of common problems and solutions. Together with D2.4 this report will thus contribute in directing and formulating new strategies for the future of the project in order to maximize its impact, based on the lessons learnt from the UCs' activities and results from the first year.

The first part of the deliverable is dedicated to the description of the ICI report template that was distributed to the UCs in order to collect the needed information, after a short overview of the methodology used by WP2 to construct the template. Due to the confidentiality of the data provided by the UCs, the 19 ICI reports (around 400 pages) are included in the more extended confidential version of the D2.3 where they are the core of the deliverable and grouped according to the five trials (Arable, Dairy, Fruit, Vegetable, and Meat). If the reader is interested in obtaining more information about a specific UC, it is suggested to directly contact the coordinator of the UC of interest. The contact details of the UC coordinators can be found on the project website (www.iof2020.eu). The last chapter of the deliverable includes the overall conclusions. Together with the extensive analysis of the UC progress in D2.4, this will lead to a feedback cycle for the UCs to improve the impact and installations in the next three years and hopefully even longer.

2. METHODOLOGY

2.1. METHODOLOGY FOR THE USE CASE ICI REPORT TEMPLATE CREATION

As was the case for the other WP2 deliverables, WP2 has prepared a first draft with chapters of the ICI report template, covering the use case installation summary, installation descriptions per deployed component on each deployment site, technical challenges and end user training and feedback. The first draft was delivered to WP1, WP3, WP4 and WP5 so they could provide valuable inputs, comments, and suggestions for Use Case ICI report improvement. This demonstrates the collaboration between work packages by acting as a joint force, and ensures on the one hand that the maximum of relevant information is included in the WP2 deliverables that can help the other WPs in supporting the UCs, and on the other hand minimizes the number of reports the UCs have to fill in to collect this information.

After receiving feedback from the work packages, WP2 performed a consolidation of all inputs and published the final version of Use Case ICI report template (see Annex 1). Prior to the distribution to the use case coordinators, WP2 has inserted available general information about UCs. Finally, UCs were given two months for completing the report.

Ultimately, the finalized ICI report documents were checked by WP2 and will be distributed to relevant WPs for further processing and use of provided information.

More information about the working procedure for the WP2 deliverables can be found in D2.4 Annual implementation, section 2.1.

2.2. METHODOLOGY FOR FILLING IN THE USE CASE ICI REPORT CONTENT

IoF2020 has included 19 different use cases divided into 5 big trials: arable, dairy, fruits, vegetables, and meat. The performed installations, customizations and integrations are discussed separately for each use case for every each trial. To cover the different aspects of the ICI report, different chapters were used.

The general use case header with name, coordinators and period is given first, followed by a summary of the ICI report for the use case (Figure 1. Use case description).

Figure 1. Use case description

The second chapter contains the installation description. Per deployment site, the UC is asked to first describe the site in terms of type (agriculture / food site), existing infrastructure (before IoF2020), performed installations (for IoF2020 in 2017) and planned installations (for IoF2020 in 2018 and later) (see Figure 2. Deployment site details). Each section was required to be max. 200 words.

Then, the UC is asked to fill in details about each of the components that are already installed at the different deployment sites (see Figure 3. Deployed component details). The UC is asked to support the reported progress with photos, print screens, specifications, leaflets, etc. In case any changes are made compared to the work plan, the UC needs to elaborate on the reason for these changes. Component names and numbers are required to be consistent with the Use Case Work Plan (D2.1.2) section 4 – Technical Requirements.

Figure 2. Deployment site details

Figure 3. Deployed component details

The technical challenges that were encountered or foreseen are asked for in the next chapter of the ICI report (Figure 4. Technical challenges). The challenge or problem is described and any (potential) solutions to overcome this problem. An overview is given about the acquired knowledge on the issues and whether or not this can be useful for other use cases. The use cases are asked to give minimum three technical challenges, with a focus on those that can be encountered by other use cases as well.

Technical challenge 1	
Technical challenge	
Description of the challenge/problem	
Solutions to overcome this problem	
Progress in the solution	The status of the solution: solved or still ongoing
Acquired knowledge	By which partner this knowledge is acquired
Description	The steps that were taken to gain knowledge on the issue and to solve the problem are given here
Knowledge transfer / collaboration with other use cases	Explanation on whether the challenge is common with other use cases or whether the acquired knowledge can be useful for other use cases. The possibilities for knowledge transfer are given as well

Figure 4. Technical challenges

The last chapter of the ICI report asks for a description of the training and feedback for the end-users of the technical equipment (Figure 5. End user training and feedback). The UC are asked to be consistent with the names used in Section 5 of the Use Case Work Plan (D2.1.2, actors involved) and to elaborately describe these activities for each actor or end-user involved. Training for stakeholders is needed to ensure proper use of equipment and software and to get high quality feedback.

End-user 1		
Actor name/ type of end-user		
Features provided	Description of the different features provided, the interfaces, the data that can be uploaded or downloaded, etc.	
Use of the system	Description how the end-user uses the system, how often, etc.	
End-user training		
Training needs	Description on which training is needed for the end-users so they can properly use the system	
Training progress	The performed training activities for each of the stakeholder groups, the training material that was used, the number of trainings that were performed (incl. dates, photo's etc).	
Training performed	Which partner executed the training and at which moment in time	
Planned training	The planned training activities for each actor, how frequent the training will be repeated to maintain the right level of data quality and involvement	
End-user feedback		
Received feedback	The end-user feedback already received from each stakeholder on the specific parts of the technical infrastructure, how and when this feedback was received and how this feedback was taken into account, which customization steps were taken etc.	
Feedback collected	Which partner collected the feedback and at which moment in time	
Planned feedback collection	Description on how actively the end user-feedback will be searched (how frequent, which means, etc.) and how customizations will be performed based on this feedback	

Figure 5. End user training and feedback.

3. CONCLUSIONS

The content of this deliverable describes the installations performed in the first year of the IoF2020 project by each of the use cases. Per use case, the different deployment sites are described with a clear division between existing infrastructure (before IoF2020), installations performed during Y1 of IoF2020 and installations that are still planned. Per site, the different deployed components are described, with photos, specifications and step-by-step visuals of the installations. The technical challenges that the use cases have encountered are mentioned as well as possibilities for other use cases to learn from the developed solutions. Finally, the end user training and feedback that has already occurred is described and the use cases mention their future plans in this direction.

In order to help the reader to identify the UCs throughout the results analysis, a list of all the 19 UCs is here inserted:

- Trial 1: The Internet Of Arable Farming
  - UC1.1: Within Field Management Zoning
  - UC1.2: Precision Crop Management
  - UC1.3: Soya Protein Management
  - UC1.4: Farm Machine Interoperability

- Trial 2: The Internet Of Dairy Farming
  - UC2.1: Grazing Cow Monitor
  - UC2.2: Happy Cow
  - UC2.3: Herdsman +
  - UC2.4: Remote Milk Quality

- Trial 3: The Internet Of Fruit
  - UC3.1: Fresh Table Grapes Chain
  - UC3.2: Big Wine Optimization
  - UC3.3: Automated Olive Chain
  - UC3.4: Intelligent Fruit Logistic

- Trial 4: The Internet Of Vegetables
  - UC4.1: City Farming Leafy Vegetables

- o UC4.2: Chain-integrated Greenhouse Production

- o UC4.3: Added Value Weeding Data

- o UC4.4: Enhance Quality Certification System

- Trial 5: The Internet Of Meat

  - o UC5.1: Pig Farm Management

  - o UC5.2: Poultry Chain Management

  - o UC5.3: Meat Transparency And Traceability

From the ICI report of all the use cases, we can conclude that almost all use cases (85-90%) achieved the goal of having a first installation on-site in the first year of IoF2020. The confidential version of the ICI report is a lengthy document with over 400 pages including a lot of visual material of the components and installations. The UCs that did not deliver a sufficient ICI report are the same UCs that were identified in D2.4 to have insufficient progress. (UC 2.4, 4.4, 5.3). These use cases are under increased surveillance by the WPs and are constantly pushed to increase their impact and speed up their work.

Counting the number of deployment sites mentioned, this reaches already 77% of the goals for IoF2020 (see Figure 6), and from the use case work plans we know that more deployment sites are still planned in the existing use cases. While a few of the mentioned deployments sites are still test beds, the vast majority of sites are end-users sites on a farm or food site. Also not all the mentioned sites have an installation already, which explains the discrepancy with the 72 deployment sites mentioned in the D2.4. The high number of sites however shows the extensive integration of IoT technologies in the agri-food domain in IoF2020.
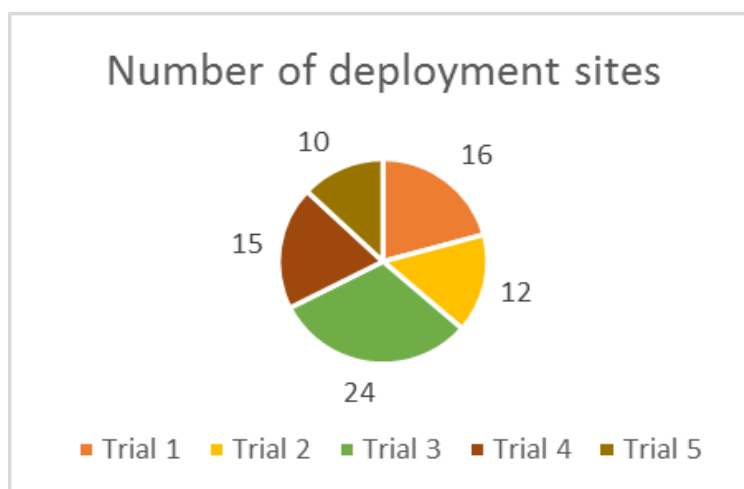

Figure 6. Number of deployments sites mentioned in the ICI report

From the ICI reports we can further identify the different types of deployed components that were described (Figure 7). These numbers do not represent the total amount of IoT devices (units) implemented, but only the different types of components the UCs identified themselves and reported in the ICI report. Note that the UCs did not always report these components in the same manner (sometimes a component was not identified as such, similar components on different sites were mentioned only once or in other instances they were mentioned per site). These numbers do however give a view on the diversity of deployments and technical infrastructure that is covered by IoF2020. Because more deployment sites will be included and more installations are planned in the future, the reported numbers are expected to increase.
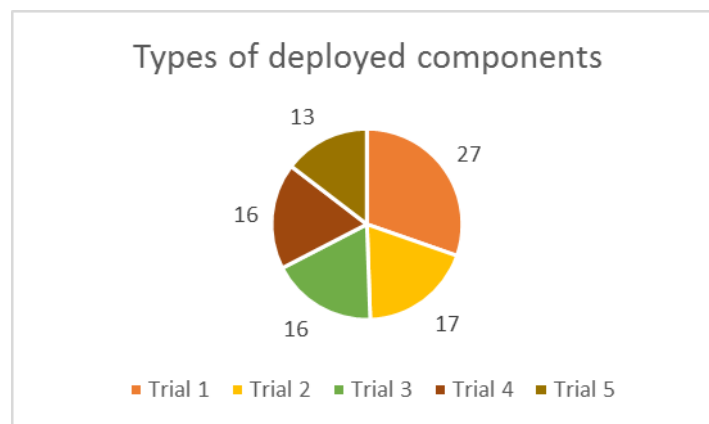

Figure 7. Types of deployed components mentioned in the ICI report.

The use cases mention in total 55 technical challenges they encountered or still foresee (Figure 8). The solution of most of these technical challenges (approximately 90%) is still in progress. Some problems can be solved relatively easily e.g. power cuts, robustness of equipment in stables, software problems, missed data due to insufficient training, etc. Some problems however are more difficult to solve, e.g energy management of IoT devices, tractor companies having their own data management system, etc. Clearly, although there is a large potential of IoT technologies in the agri-food domain, specific or generic technical challenges still occur and the use cases are working towards solutions that go from TRL 5 to TRL 8 during the course of the project.
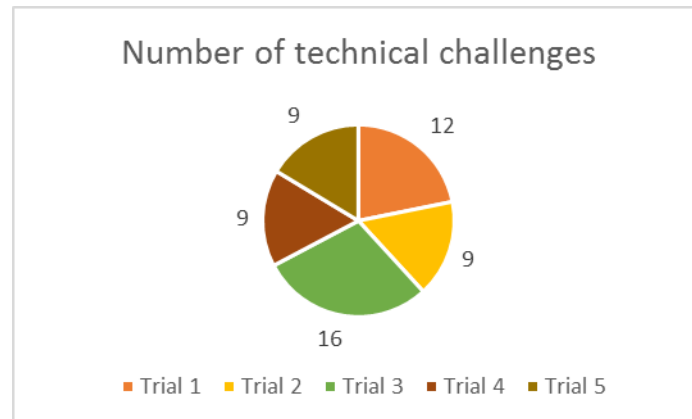
Figure 8. Number of technical challenges mentioned in the ICI report.

Concerning end user training and feedback, as the first installations took place during M05-M12 for most of the use cases, this first installation was often tested and used by the use case partners alone. This not to burden the end users with the first installation problems and bugs, and to ensure that a workable solution is delivered to the farmers and other stakeholders. Several use cases already report end user training and collected feedback. The total number of end users is difficult to determine, since in some cases specific end users were mentioned by the UCs while for others this was not the case. However, in general it can be concluded that the multi-actor approach of the IoF2020 project was certainly applied. WP2 will continue to motivate and evaluate the UC on this topic of end-user involvement also in the next years. End user training ensures good use of the technical equipment and correct interpretation of the delivered data, which in turn leads to coreect assessment of the impact. In turn, the collection of the end user feedback ensures that the solutions are adapted to the needs in the sector and ensures a lean multi-actor approach.

To conclude, the ICI reports present the first succesful installations of the UC in IoF2020 and allows to identify working points for the next three years. While the number of deployment sites is already very high, the end user training and feedback will need to increase the next months and years after the first technical challenges have been solved by each UC. Combined with the analysis of the Annual progress report, the ICI report forms the basis for monitoring the progress of the UCs and provides crucial infromation for the WPs to continue to support the developments and disseminate the results to the outside world.

ANNEX 1

USE CASE <mark>X.X</mark>
INSTALLATION, CUSTOMIZATION AND INTEGRATION REPORT

WP 2

November 30th, 2017

LIST OF ABBREVIATIONS

WP – Work Package

IoF2020 – The Internet of Food and Farm 2020

UC – Use Case

TRL – Technology Readiness Level

M – Month

PM – Person Month

KPI – Key Performance Indicator

TABLE OF CONTENTS

1. USE CASE SUMMARY

U.C.X.X	**Use Case Name:** *Filled in by WP2*	*[Insert Trial Logo]*
	Use Case Coordinator(s) and e-mail: *Filled in by WP2*	
	UC Starting Date: *Filled in by WP2* **UC Ending Date:** *Filled in by WP2*	

Summary of the installation, customization and integration report for this use case

[Please make a summary of the installation, customization and integration report for your use case here in max 250 words. This should contain:

- *introduction and purpose of the use case*

- *the installations performed for IoF2020 in 2017 and to what end these were performed*

- *which technical challenges were encountered, and if applicable also solved*

- *feedback of the end-users*

- *the customization and integration steps that have already been performed*

- *what is still planned for 2018-…]*

2. INSTALLATION DESCRIPTION

Please fill in the details of the components that are already installed at the different deployment sites. Support the reported progress with photos, print screens, specifications, leaflets, etc. In case any changes are made compared to the work plan, please elaborate on the reason for these changes. Use component names and numbers consistent with the Use Case Work Plan section 4 – Technical requirements.

All photos can also be added to Basecamp: WP2 Trial Management -> your trial -> your use case -> Communication -> Photos (https://3.basecamp.com/3618432/buckets/2138405/vaults/695351594)

Note:

- The identifier of each component in the table below corresponds to the identifier in the Architecture Sketch in section 4.1 of the Use Case Work Plan.
- The identifiers of the deployment site correspond to the site number in section 4.8 of the Use Case Work Plan.

2.1. DEPLOYMENT SITE 1

Site 1
Site name:
Description of the agricultural / food site: *[Describe the site in terms of crop types, animal breeds, number of hectares or livestock, food types, processing steps, etc., max 200 words. Add photo(s) of the site.]*
Description of the existing infrastructure: *[Describe the site in terms of infrastructure already present (before IoF2020), equipment, software, data, etc., max 200 words. Add photo(s).]*
Performed installations: *[Summarize the installations that have been performed for IoF2020 in 2017, max 200 words]*
Planned installations: *[Summarize the installations that are still planned for IoF2020, max 200 words]*

Deployed Component 1	
Name of the component	
Description of the component	*[Describe the component and add a picture]*

Purpose to use this component	
Supplier brand/company	
# of units	
Specifications	*[Give a list of the component specifications]*
Installation performed	By *[name of the partner]* at *[date/time frame of installation]*
Installation report	*[Show step-by-step visuals of the performed installation. Give details about component testing, and describe how the specs were customized for the specific site if needed.]*

Deployed Component 2	
Name of the component	
Description of the component	*[Describe the component and add a picture]*
Purpose to use this component	
Supplier brand/company	
# of units	
Specifications	*[Give a list of the component specifications]*
Installation performed	By *[name of the partner]* at *[date/time frame of installation]*
Installation report	*[Show step-by-step visuals of the performed installation. Give details about component testing, and describe how the specs were customized for the specific site if needed.]*

2.2. DEPLOYMENT SITE XX

Site 2
Site name:
Description of the agricultural site: *[Describe the site in terms of crop types, animal breeds, number of hectares or livestock, etc., max 200 words. Add photo(s) of the site]*
Description of the existing infrastructure: *[Describe the site in terms of infrastructure already present, equipment, software, data, etc., max 200 words. Add photo(s).]*
Performed installations: [*Summarize the installations that have been performed for IoF2020, max 200 words]*
Planned installations: *[Summarize the installations that are still planned for IoF2020, max 200 words]*

Deployed Component 1	
Name of the component	
Description of the component	*[Describe the component and add a picture]*
Purpose to use this component	
Supplier brand/company	
# of units	
Specifications	*[Give a list of the component specifications]*
Installation performed	By *[name of the partner]* at *[date/time frame of installation]*
Installation report	*[Show step-by-step visuals of the performed installation. Give details about component testing, and describe how the specs were customized for the*

	specific site if needed.]

Copy the tables for each deployment site and each deployed component per site.

3. TECHNICAL CHALLENGES

Please describe here the technical challenges that you have encountered or still foresee. Describe the challenge or problem and what solutions there are to overcome this problem. Also give an overview of the acquired knowledge on the issue and whether or not this can be useful for other use cases.

Give minimum 3 technical challenges, with a focus on those that can be encountered by other use cases as well.

Technical challenge 1	
Technical challenge	
Description of the challenge/problem	
Solutions to overcome this problem	
Progress in the solution	*[Is the problem solved or still ongoing?]*
Acquired knowledge	By *[name of the partner]*
Description	*[Describe the steps that were taken to gain knowledge on the issue and solve the problem]*
Knowledge transfer / collaboration with other use cases	*[Is this challenge common with other use cases or could the acquired knowledge be useful for other use cases? Please describe what knowledge transfer is possible]*

Technical challenge 2	
Technical challenge	
Description of the challenge/problem	
Solutions to overcome this problem	
Progress in the solution	*[Is the problem solved or still ongoing?]*
Acquired knowledge	By *[name of the partner]*

Description	*[Describe the steps that were taken to gain knowledge on the issue and solve the problem]*
Knowledge transfer / collaboration with other use cases	*[Is this challenge common with other use cases or could the acquired knowledge be useful for other use cases? Please describe what knowledge transfer is possible]*

Copy the table for more technical challenges.

4. END USER TRAINING AND FEEDBACK

Please describe the training needs and activities for the end-users of the technical equipment (be consistent with the names used in section 5 of the Use Case Work Plan), as well as the end user feedback. Describe this elaborately for each actor involved (see section 5.2 of the Use Case Work Plan).

Training for stakeholders is needed to ensure proper use of equipment and software, and to get high quality feedback.

End-user 1	
Actor name/ type of end-user	
Features provided	*[Describe the different features provided, the interfaces, the data that can be uploaded or downloaded, etc. Please add a picture of the interfaces]*
Use of the system	*[Describe how the end-user uses the system, how often, etc.]*
End-user training	
Training needs	*[Describe what training is needed for the end-users so they can properly use the system]*
Training progress	*[Describe the* • *performed training activities for each of the stakeholder groups,* • *describe the training material that was used,* • *give the number of trainings that were performed (and the resp. dates), show photos, etc.]*
Training performed	By *[name of the partner]* on *[date of training]*
Planned training	*[Describe the* • *planned training activities for each actor,* • *describe how frequent you will repeat the training to maintain the right level of data quality and involvement.]*
End-user feedback	
Received feedback	*[Describe the* • *end-user feedback already received from each stakeholder on the specific parts of the technical infrastructure* • *how and when this feedback was received* • *and how this feedback was taken into account, which customization steps were taken etc.]*
Feedback collected	By *[name of the partner]* on *[date]*
Planned feedback	*[Describe how actively you will seek the end-user feedback (how*

collection	frequent, which means, etc.) and how customizations will be performed based on this feedback.]

Copy the table for each (type of) end-user/actor involved.