## Deliverable D400.1

# Detailed experimentation plans and initial work plans, including App development

## WP 400

| | |
|---|---|
| **Project Acronym & Number:** | FIspace – 604 123 |
| **Project Title:** | FIspace: Future Internet Business Collaboration Networks in Agri-Food, Transport and Logistics |
| **Funding Scheme:** | Collaborative Project - Large-scale Integrated Project (IP) |
| **Date of latest version of Annex** | 03.10.2013 |
| **Start date of the project:** | 01.04.2013 |
| **Duration:** | 24 Months |

| | | |
|---|---|---|
| **Status:** | Final | |
| **Authors:** | Michael Zahlmann | Kühne + Nagel |
| | Rod Franklin | Kühne + Nagel |
| | Daan Goense | DLO |
| | Sokratis Barmpounakis | NKUA |
| | Marinanne Hagaseth | Marintek |
| | Gerhard Schiefer | CentMa |
| | Huub Scholten | Wageningen University |
| | Cor Verdouw | DLO |
| | Hande Koc | Arcelik |
| | Lorea Gomeyz Garcia | ATOS |

| | | |
|---|---|---|
| **Contributors:** | Sanne Heyting | DLO |
| | Gert Kessel | DLO |
| | Come Kempenaar | DLO |
| | Timon Veenstra | LimeTree |
| | Nicole Bartels | LimeTree |
| | Rene van Bruggen | Kverneland |
| | Alex Kaloxylos | NKUA |
| | Eleni Antoniou | OPEKEPE |
| | Anastasia Thoma | OPEKEPE |
| | Marona Katsikou | OPEKEPE |
| | Odysseas Mitsonis | Innovators |
| | Asmund Tjora | Marintek |
| | Robert Reiche | EuroPool Systems |
| | Harald Sundmaker | ATB |
| | Norman Gülcü | ATB |
| | Tim Bartram | GS1 G |
| | Sabine Kläser | GS1 G |
| | Tim Sadowski | GS1 G |
| | Angela Schillings-Schmitz | GS1 G |
| | Jens Friedrich | GS1 G |
| | Aylew Kassahun | Wageningen University |
| | Rob Hartog | Wageningen University |
| | Robbert Robbemond | DLO |
| | Haluk Gökmen | Arcelik |
| | Ramón Alcarria | UPM |
| | Carles Hurtado | PlusFresc |
| **Reviewers:** | Cyril Alias | Universität Duisburg /E. |
| | Lorea Gomez Garcia | ATOS |


| | |
|---|---|
| **Document Identifier:** | FIspace D400.1 V_0.8 |
| **Date:** | 28.06.2013 |
| **Revision:** | 001 |
| **Project website address:** | http://www.FIspace.eu |

# Abstract

As a use case project in Phase 2 of the FI PPP, FIspace aims at developing and validating novel Future-Internet-enabled solutions to address the pressing challenges arising in collaborative business networks, focussing on use cases from the Agri-Food, Transport and Logistics industries. FIspace will focus on exploiting, incorporating and validating the Generic Enablers provided by the FI PPP Core Platform with the aim of realising an extensible collaboration service for business networks together with a set of innovative test applications that allow for radical improvements in how networked businesses work in the future. These solutions will be demonstrated and tested through early trials on experimentation sites across Europe. The project results will be open to the FI PPP program and the general public, and the pro-active engagement of larger user communities and external solution providers will foster innovation and industrial uptake planned for Phase 3 of the FI PPP.

The project will lay the foundation for realizing the vision and prepare for large-scale expansion, complying with the objectives and expected results of the Phase II use case projects. To achieve these outcomes the project will focus on the following four primary work areas, for which the main concepts and approach are outlined below:

1. **Implement the FIspace as an open and extensible Software-as-a-Service solution** along with an **initial set of cross-domain applications** for future B2B collaboration, **utilizing the Generic Enablers** provided by the FI PPP Core Platform
2. **Establish Experimentation Sites across Europe** where **pilot applications are tested in early trials** from the **Agri-Food and the Transport and Logistics** domains
3. **Provide a working Experimentation Environment** for conducting **early and large-scale trials** for Future Internet enabled B2B collaboration in several domains, and
4. **Prepare for industrial uptake and innovation enablement** by pro-active engagement of stakeholders and associations from relevant industry sectors and the IT industry.

This document is being submitted as specified in the FIspace Description of Work (DoW) as part of deliverable D400.1 - detailed experimentation plans and initial work plans, including App development. The document provides an overview of the experimentation plans of the eight trials proposed for the FIspace project and includes a detailed set of work plans for the work package. Included in the document is an overview of the domain/trial specific apps that are proposed for development in the project and that provide the unique functionality required by each trial to perform the business activities described in their experimentation plans.

## Project Consortium

- DLO; Netherlands
- ATB Bremen; Germany
- IBM; Israel
- KocSistem; Turkey
- Aston University; United Kingdom
- ENoLL; Belgium
- KTBL; Germany
- NKUA; Greece
- Wageningen University; Netherlands
- PlusFresc; Spain
- FloriCode; Netherlands
- Kverneland; Netherlands
- North Sea Container Line; Norway
- LimeTri; Netherlands
- Kühne + Nagel; Switzerland
- University Duisburg Essen; Germany
- ATOS; Spain
- The Open Group; United Kingdom
- CentMa; Germany
- iMinds; Belgium
- Marintek; Norway
- University Politecnica Madrid; Spain
- Arcelik; Turkey
- EuroPoolSystem; Germany
- GS1 Germany; Germany
- Mieloo & Alexander; Netherlands
- OPEKEPE; Greece
- Innovators; Greece

## More Information

Dr. Sjaak Wolfert (coordinator)
LEI Wageningen UR
P.O. Box 35
6700 AA Wageningen

e-mail: sjaak.wolfert@wur.nl
phone: +31 317 485 939
mobile: +31 624 135 790
www.FIspaces.eu

## Dissemination Level

| | | |
|---|---|---|
| **PU** | Public | X |
| **PP** | Restricted to other programme participants (including the Commission Services) | |
| **RE** | Restricted to a group specified by the consortium (including the Commission Services) | |
| **CO** | Confidential, only for members of the consortium (including the Commission Services) | |

# Change History

| Version | Notes | Date |
|---|---|---|
| 001 | Creation of the document | 28.06.2013 |
| 002 | First Draft | 20.06.2013 |
| 003 | Revised First Draft | not issued |
| 004 | Second Draft | 25.06.2013 |
| 005 | Third  Draft | 26.06.2013 |
| 006 | Fourth Draft | 28.06.2013 |
| 008 | Final Draft for Review | 29.06.2013 |
| 1.00 | Released for Review | 29.08.2013 |
| | | |

# Abbreviations

| | |
|---|---|
| App | Application |
| B2B | usiness to Business |
| BPM | Business Process Management |
| D | Deliverable |
| DoW | Description of Work |
| e.g. | Exempli gratia = for example |
| EC | European Commission |
| EDI | Electronic Data Interchange |
| ESB | Enterprise Service Bus |
| EU | European Union |
| FI PPP | Future Internet Public Private Partnership |
| FIA | Future Internet Assembly |
| FP7 | Framework Programme 7 |
| GA | Grant Agreement |
| GE | Generic Enabler |
| GLN | bbbbbbb |
| GPS | Global Positioning System |
| GUI | Graphic User Interface |
| i.e. | id est = that is to say |
| ICT | Information and Communication Technology |
| IP | Intellectual Property |
| IPR | Intellectual Property Rights |
| ISO | International Standardization Organization |
| KPI | Key Performance Indicator |
| LSC | Logistics Service Client |
| LSP | Logistics Service Provider |
| M | Month |
| MIP | Met Information Provenance |
| PC | Personal Computer |
| QR-code | Quick response code |
| RFID | Radio Frequency Identification |
| RTD | Research and Technological Development |
| SDK | Software Developer Kid |
| SLA | Service Level Agreement |
| SME | Small and Medium Sized Enterprise |
| ST | Sub-Task |
| T | Task |
| TIC | Tailored Information for Consumers |
| TTS | Time Temperatur Sum |
| WP | Work Package |

# Table of Contents

# List of Figures

# List of Tables

# Disclaimer

# 1 Introduction

Insights gained in Phase 1 of the FI-PPP emphasize the need for novel ICT solutions that allow radical improvements for collaboration in business networks. Numerous sectors demand such solutions including the Agri-Food and Transport and Logistics industries, which are the focus of the FIspace project. This project leverages the outcomes of two complementary Phase 1 use case projects: FInest & SmartAgri-Food. The aim of the project is to pioneer fundamental changes in how collaborative business networks work in future.

Modern business is characterized by cross-organizational business networks where several actors need to interact in order to achieve common, as well as individual, business goals. When conducting business in such highly networked, often border-crossing, dynamic and competitive environments, it becomes crucial for the involved actors – which can include commercial enterprises of any size, public authorities, associated service providers (e.g., financial institutions or insurance companies), etc. – to collaborate in an efficient, effective, secure and trustworthy manner, i.e., to exchange information and communicate among each other in order to coordinate their business activities.

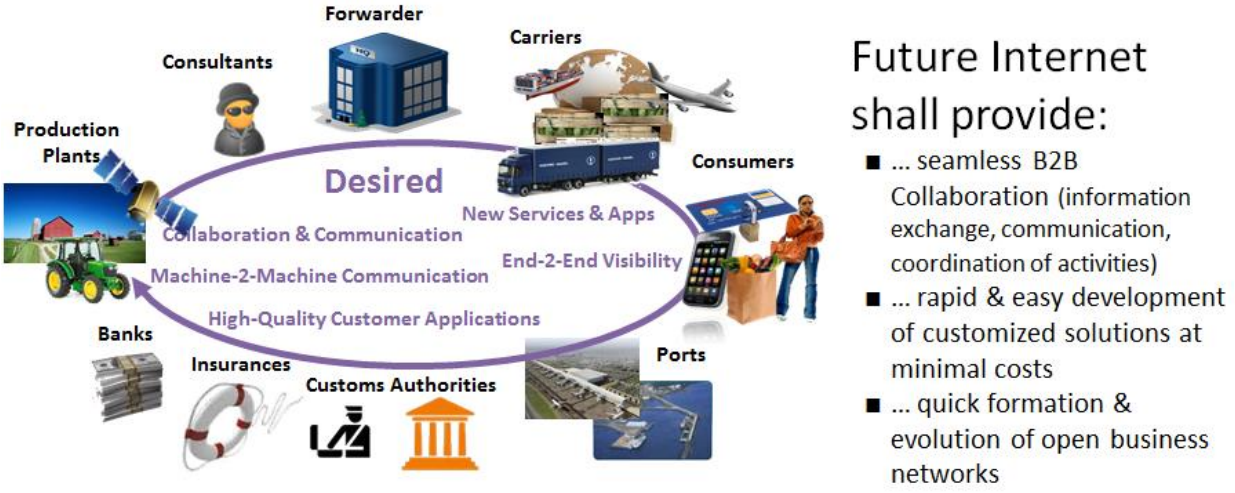



Figure 1: Desired Collaborative Business Network and the needs for the Future Internet

Current ICT solutions do not provide adequate support for collaborative business networks. The vast majority of existing and currently employed IT solutions focus on supporting the internal business activities of individual actors, while interaction with business partners is limited to manual efforts using e-mail, phone, and fax, or only partially supported through EDI. In addition, monitoring and managing of business processes still heavily relies on human involvement, leading to high latencies between the occurrence of a business event in the real-world and its observation by IT systems, and thus other stakeholders along the value chain. This results in the unsatisfying situation where there is only limited end-to-end visibility in collaborative business networks, with unacceptably high manual coordinating efforts required by each involved stakeholder leading to the establishment of mainly closed partner networks. Closed networks particularly disadvantage SMEs who generally do not have the financial or technical means for entering these networks and collaborating with larger organizations.

Novel ICT infrastructures that enable seamless B2B collaboration and facilitate the creation of dynamic and open business networks are needed – not to merely overcome today's technical deficiencies, but in order to pave the way towards truly collaborative business networks in the future. Such a future can be realized by exploiting the capabilities of Future Internet technology developed within the FI PPP programme. These technologies allow, for instance, the gathering of real-world data via smart sensors (Internet of Things), cost-efficient development of value-added applications by orchestrating existing ones (Internet of Services), and ubiquitous access via Cloud infrastructures.

## 1.1 Project structure and key activities

In order to achieve its goals, FIspace leverages and capitalizes on the outcomes of two successful Phase I use case projects – FInest and SmartAgriFood –, as well as the Generic Enablers available from the FI PPP Technology Foundation ("Core Platform") projects (FI-WARE and its successor).

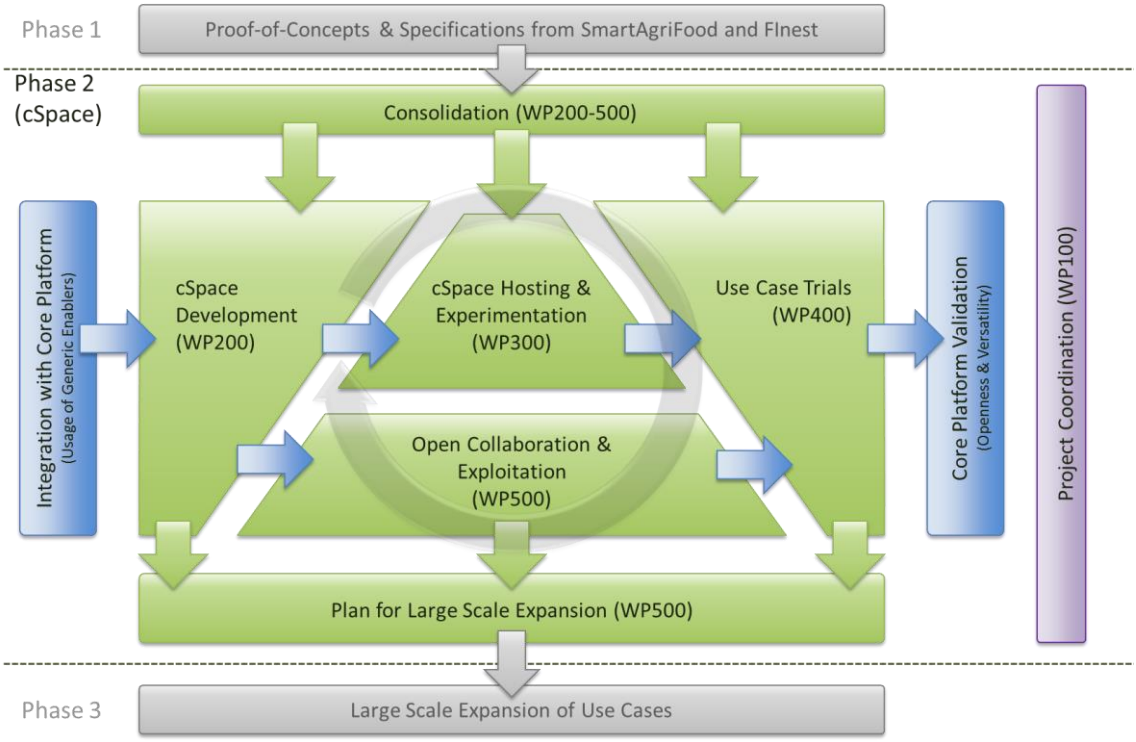



Figure 2 The work in FIspace follows three major work streams:

***Workstream 1:*** The major work stream in FIspace is devoted to **solution development, trial experimentation and use case expansion** (depicted from top to bottom of Figure 3). It is subdivided into:

- **FIspace Development (WP200)**, which addresses the iterative design, implementation and testing of the software components implementing the FIspace service, while incorporating feedback from users and developers, thereby ultimately enabling the App ecosystem;

- **FIspace Hosting & Experimentation (WP300)**, which is responsible for setting up compute infrastructures, deploying the FIspace software components (developed in WP200) and Apps (developed in WP400) including the deployment of the required Core Platform Generic Enablers, as well as for providing experimentation support and enablement to the use case trials (in WP400);

- **Use Case Trials (WP400)**, which defines cross-domain use cases and defines, sets up, and executes use case trials to demonstrate the FIspace capabilities and benefits in the real-world; this WP thus includes the development of Apps and the connection of trial-specific, local infrastructure (e.g., in-the-field systems and devices) to the FIspace software components (hosted by WP300). Two types of Apps will be developed: (1) general purpose **baseline Apps** (i.e., Apps are required by stakeholders across several domains), (2) **domain Apps** needed for conducting specific use case trial experiments.

- **Open collaboration & Exploitation (WP500)**, which will foster early uptake of results and drive establishing an eco-system around FIspace, including dissemination, exploitation and standardization; this WP will also coordinate and prepare guidelines and plans for large scale expansion of platform usage, involving relevant stakeholder groups.

## 1.2 WP400

### 1.2.1 Use case trials and domain Apps (WP 400)

WP 400 focuses on leveraging and extending work performed in Phase I of the FI PPP program to setup trial sites for real world use cases and to exploit those sites for conducting initial use case experiments (with the support of WP 300) to determine and demonstrate whether the FIspace solution and the underlying Generic Enablers being utilized are capable of delivering benefits and utility in the real-world.

Based on the needs of the use case trials themselves, baseline and domain Apps will be developed (as part of WP 400) so that the trials can be performed and the ecosystem business model envisioned for the FIspace service tested. In addition, where needed, trial-specific, local infrastructure (such as in-the-field sensors and devices) will be set-up and linked to the FIspace components hosted by WP300.

Overall, WP 400 is decomposed into 3 primary types of tasks as depicted in Figure 3:

- **Design, setup, and execution of use case trials**: This includes defining cross-domain use cases and the set-up and execution of use case trials. Overall eight use case trials are proposed:
  - **Farming in the Cloud (Task 420)** addresses (1) the intelligent application of pesticides to improve crop protection information sharing, and (2) the improvement of greenhouse operations through the use of IoT devices for monitoring and controlling environmental conditions.
  - **Intelligent Perishable Goods Logistics (Task 430)** looks at (1) the shipment of fish from Norway to continental Europe and the impact that effective planning and re-planning can have on the product, (2) the impact of supply chain deviations on fresh fruit and vegetables, (3) the improvement of the entire supply chain process of flowers to a retailer.
  - **Smart Distribution & Consumption (Task 440)** is concerned with (1) tracking and tracing of meat from the farm to the consumer, (2) the linked management of inbound materials and outbound finished goods optimized w.r.t. consumer demand, (3) providing consumers with information about the products that they have purchased.
- **Development of general purpose and domain specific applications (Task 450):** The requirements for these Apps are defined in Tasks 420–440. The Apps will demonstrate the extensibility and domain-specific benefits of FIspace during the use case trials.
- **WP Coordination**, which is overseen by **Task 410**.

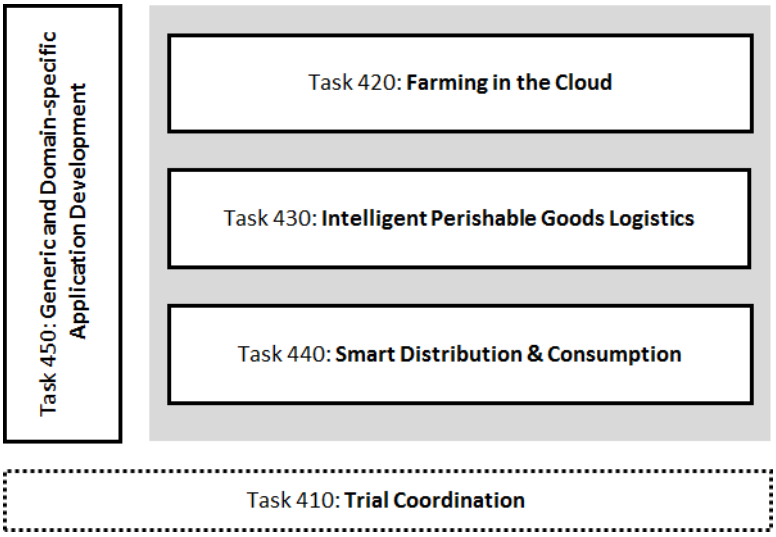



Figure 3: High-level structure of WP400 “Use case trials and domain Apps”

### 1.2.2 Task410: Trial Coordination

This task is concerned with the overall management and control of use case trials, experimentation site selection, development of baseline and domain Apps, preparation for the large scale rollout of the use case trials, and cross trial coordination of activities.

- The primary outcomes of this task are:
- Consolidated definitions for trial experiments to be conducted.
- Consolidated set of **baseline and domain Apps requirements.**
- Coordinated **use case trial experiments and outcomes.**
- Joint analysis of capabilities and benefits of FIspace and Core Platform GEs in the real-world.
- Rollout plans for large scale development.

### 1.2.3 Task 420: Farming in the Cloud

This task is concerned with the actual planning and execution of two use case trials focused on the use of the FIspace to improve product yields through the use of sensor based technologies to measure environmental factors that have an impact on yield and feed this information back to management systems to take action that improves plant growth factors.

The use case trials that will be conducted are:

- **Crop Protection Information Sharing** – use of field sensor and satellite data to intelligently manage the application of pesticides for maximum protection.
- **Greenhouse Management & Control** – use of sensors to monitor key growth factors (UV radiation, moisture and humidity, soil conditions, etc.) and to feedback data to control systems to modify the growth environment for maximum yield.

The primary outcomes of this task are:

A detailed **definition of the specific trials experiments** to be conducted along

- with identification and setup of appropriate trial sites for the experiments on “Farming in the Cloud”.
- Definition of **requirements towards baseline and domain Apps** that must be developed to support “Smart Food Production” use cases.

**Analysis of trial experiment results** on “Smart Food Production” along with analysis of performance of FIspace and Core Platform GEs.

### 1.2.4 Task 440: Smart Distribution & Consumption

This task is concerned with the actual planning and conduct of three use case trials focused on the use of the FIspace to improve the flow of goods to consumers and the experience that the consumer receives by being better informed about the goods that they are purchasing. The use case trials that will be conducted are:

- **Meat Information Provenance** – assuring consumers and supply chain participants that meat quality is maintained throughout the supply chain.
- **Import and Export of Consumer Goods** – better management of inbound materials so that only the right material is available at the right time based on consumer demands; management of outbound distribution operations to ensure that the finished product is properly positioned to meet consumer demands.
- **Tailored Information for Consumers** – provisioning of accurate information to consumers concerning products they are interested in purchasing and that they have purchased.

The primary outcomes of this task are:

- A detailed **definition of the specific trials experiments** to be conducted along with **identification and setup of appropriate trial sites** for the experiments on “Smart Distribution & Consumption”.
- Definition of **requirements towards baseline and domain Apps** that must be developed to support “Smart Distribution & Consumption” use cases.

**Analysis of trial experiment results** on “Smart Distribution & Consumption” along with analysis of performance of FIspace and Core Platform GEs.

### 1.2.5 Task 450: Baseline App & DomainApp Development

This task is concerned with the development of general purpose **baseline Apps** (i.e., Apps are required by stakeholders across several domains), as well as **domain Apps** needed for conducting specific use case trial experiments.

This task will provide the following major outcomes:

- **Design and implementation of general purpose "starter" Apps**, including contract management, transport planning, predictive monitoring and product information services.

## 1.3 D400.1

### 1.3.1 Detailed experimentation plans and initial work plans, including App development

The M3 deliverable of WP 400, D400.1, is requested to provide the foundation for the experimentaion work to be performed in further stages of the FIspace project. It contains detailed experimentations plans enabling the coordination with other work packages. Further, experimentation protocols are defined in order to follow up the experiments in a controlled and traceable fashion. The definition and description of the experimentation environment, including site requirements and required domain applications, are developed as part of this deliverable. FIspace and FI WARE services considered to be involved in the trial experiments are evaluated in alignment with other project work packages. Each of these topics is elaborated for each trial separately. Finally, the harmonization and collaboration activites among the trails of WP400 is documented.

It should be noted by the reader that *to align this deliverable with the Baseline Apps functionalities proposed in D400.6, involved partners have made an initial analysis of the Baseline Apps and trials relationship. This is a work in progress, so some trials have made a more detailed analysis and alignment with the baseline apps than others. All the trials will perform the deep inspection an analysis of the baseline apps in the following steps.*

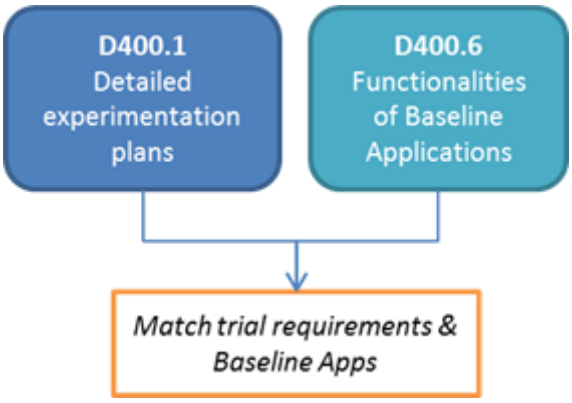



Figure 4 Trial alignment of baseline app requirements

# 2 The FIspace trials

The FIspace project establishes working experimentation infrastructures across Europe where FIspace pilot applications for selected real-world business scenarios from the Agri-Food and the Transport and Logistics sectors are developed and tested. These trials leverage and extend the work performed in Phase I of the FI PPP, in particular from the use case projects SmartAgriFood and FInest.

## 2.1 Farming in the Cloud

The "Farming in the Cloud" task addresses food production issues at the farm level and covers two use case trials:

1. Crop Protection Information Sharing – use of field sensor and satellite data to intelligently manage the application of pesticides for maximum crop protection
2. Greenhouse Management & Control – use of sensors to monitor key growth factors (UV radiation, moisture and humidity, soil conditions, etc.) and to feedback data to control systems to modify the growth environment for maximum yield and optimal quality

## 2.2 Intelligent Perishable Goods Logistics

The "Intelligent Perishable Goods Logistics" task addresses monitoring and environmental management issues of perishable goods as they flow through their supply chains so that waste is minimized and shelf life maximized covering three use case trials:

1. Fish Distribution and (Re-)Planning – focuses on the planning of logistics and transport activities, including transport order creation, transport demand (re)planning and distribution (re)scheduling
2. Fresh Fruit and Vegetables Quality Assurance – looks at the management of deviations (transports, products) that affect the distribution process for fresh fruit and vegetables (transport plan, food quality issues), either deviation from the plan or other external events requiring re-planning.
3. Flowers and Plants Supply Chain Monitoring – the monitoring and communication of transport and logistics activities focusing on tracking and tracing of shipments, assets and cargo, including quality conditions and simulated shelf life. Focus is with Cargo and Asset Quality Tracking ("intelligent cargo"), Shipment Tracking ("intelligent shipment") and lifecycle information tracking of cargo characteristics/Cargo Integration along the chain.

## 2.3 Smart Distribution and Consumption

The "Smart Distribution and Consumption" task is about helping consumers to obtain better information on the goods they purchase, and producers to better control the flow of their goods to the consumer, covering three use case trials:

1. Meat Information Provenance – ensuring that consumers, regulators and meat supply chain participants all have accurate information concerning where a meat product originated (production farm) and how it was affected by its distribution (quality assurance).
2. Import and Export of Consumer Goods – the intelligent management of inbound materials to a production site and the smart distribution of finished goods to consumers.
3. Tailored Information for Consumers – the provisioning of accurate information to individual consumer's needs and feedback of this information to the producers

## 2.4 Trial Geographic Coverage

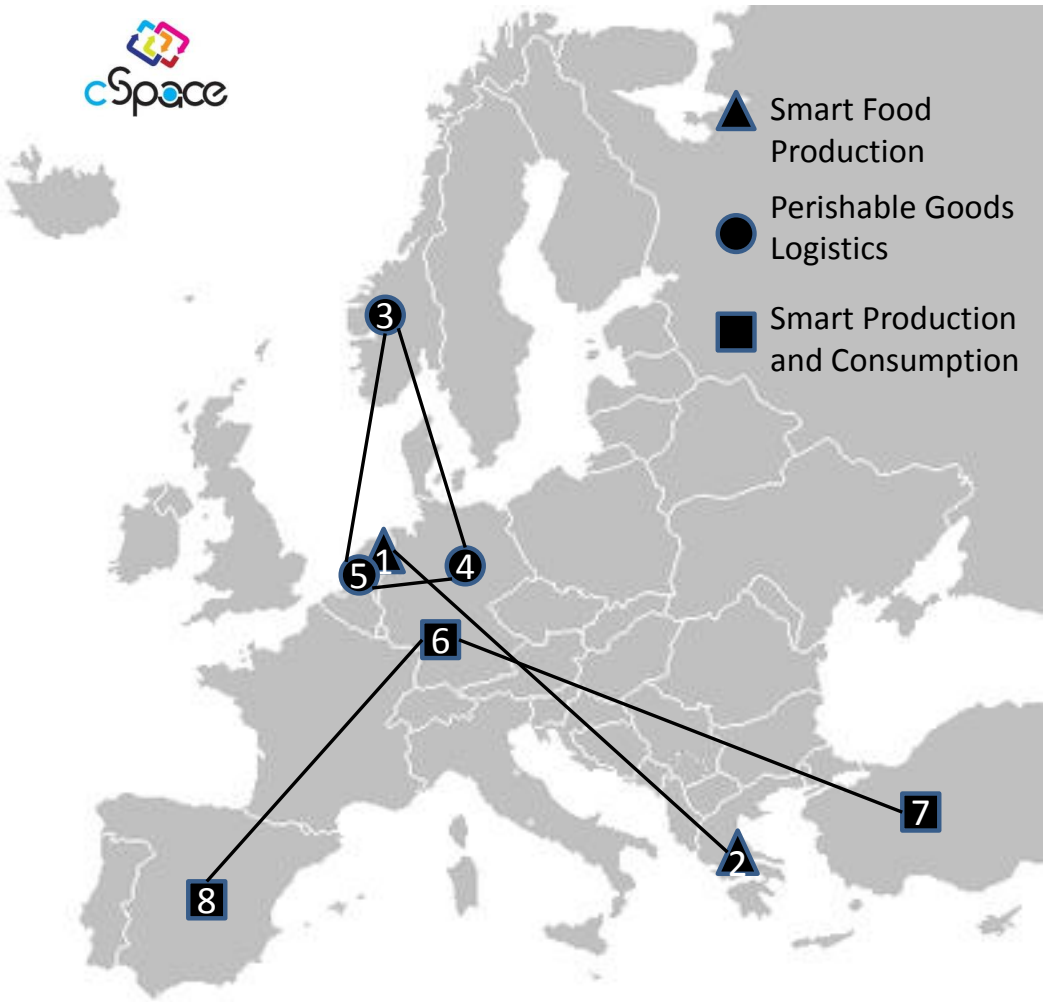



Figure 5: FIspace use case trial experimentation sites

By nature, trials in the Agri-Food and Transport and Logistics domains are not bound to one geographical location since they focus on moving goods from production sites to end users. However, the experimentation infrastructure for each early trial involves some key stakeholders that are located in specific countries as represented in Figure 5. These use case trials will be conducted in a linked fashion utilizing shared infrastructures where possible to demonstrate the cross domain/use case capabilities of the FIspace and the supporting FI-WARE GEs.

Based on the needs of the use case trials themselves, general purpose and domain specific Apps for the FIspace will be developed in order to perform the trials / experiments, and test / validate the features and business model of the FIspace as outlined above. For this, the development and testing of two types of FIspace Apps is planned, which will be developed by project partners together with additional contributors obtained via the Open Call of the project: (a) an initial set of general purpose Apps that provide general business and / or domain-specific capabilities exploiting the features and envisioned future support requirements for business collaboration, and (b) a set of pilot Apps that support the tasks of the specific scenarios elaborated in the trials.

## 2.5 FIspace Trial Descriptions

### 2.5.1 Trial 421 Crop Protection Information Sharing

Numerous actors contribute to the food on consumers' tables: suppliers of crop protection material, farmers growing crops, processors, and retailers. These actors have at present independent, mostly proprietary solutions to supply each other and the consumer with information. Transparency and fluid information transfer is lacking.

There is a great need for tracking and tracing information about inputs, including crop protection agents and the quality of food. This is relevant for consumers' food awareness and, in case of food emergencies, for a rapid response. Many sources of information are also required to support farmers in decision-making, for example on the application of plant disease agents. FIspace will connect actors along the agri-food supply chain, enhance licence agreement orchestration, and enable seamless creation of different tailored services for, and amongst, stakeholders.

The trial demonstrates the use of Future Internet technologies with functionalities to address social, business, and policy objectives (e.g., optimization of the use of plant protection agents), create environmental benefits, transparency, and food security. Protection of potatoes against *Phytophthora*, which requires at present approximately ten spraying actions, will be used as a first use case for this trial.

The Future Internet provides possibilities for real-time support for farmers (Figure 6). Real-time weather information from sensors and rain radar will be made available and integrated in real-time, as will medium range weather forecast. *Phytophtora* development will be forecasted based on this information and data on cropping history and crop development. A disease warning will be generated should analysis indicate that this is necessary. Recipe formulation with the optimal type of crop protection agent, scheduling of the operation with respect to weather conditions and resource availability and task formulation will start as soon as a disease alert is given. The actual measured crop density is used for real-time dose adjustment based on parameters determined during recipe formulation. Actually applied dosages, sensor information and machine status will be logged and made available by IoT sensors. Sensor data will thus be available for real-time situational support as a service in the cloud, and may even be offered to the public, e.g., by providing information on recently treated fields for hikers with allergies in the form of a "Spray Alert for Hikers" App. Data from such remote monitoring can also be used for fault diagnostics and tracking and-tracing purposes by authorised users.

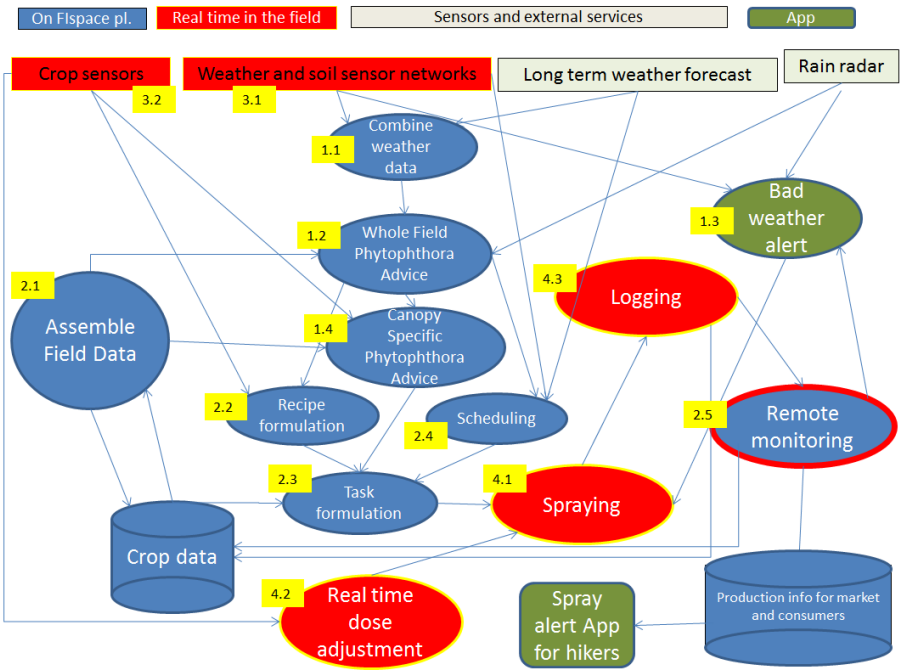



Figure 6: Layout Crop Protection Information Sharing Trial

The trial will be set up by four partners: DLO-ASG, as trial leader, will add new information requirements to the reference model for arable farming, mapping this on the Object Storage GE. Weather forecast, rain radar data and data from soil and weather sensors will be made available following the Publish and Subscribe mechanism. Scheduling algorithms for field operations are made available as a SaaS solution. DLO-PRI will make algorithms for disease warning and recipe formulation available as a SaaS solution. Their algorithm for real time dose adjustment will be implemented by Kverneland as a Resource on an IoT Device on the tractor-sprayer combination. DLO-PRI evaluates the overall effectiveness of the Crop Protection Information Sharing concept. Kverneland provides the IoT Devices for Task Control, Tractor, Spraying, and Crop Sensors, which use the ISO11783 communication protocol (ISOBus). A Gateway is to provide information for the IoT backend and Object Store. Several Generic Enablers such as Security, Privacy and Trust and System and Data Integration are used. AgroSense, will realize Task Formulation and take care of all the required Client interaction with the FIspace platform.

For the execution of the trial five farmers are involved (vd Borne, PPO, Wage, Claassen and KMWP) from which three will evaluate the whole Crop Protection Information Sharing concept. These farmers are pioneering in the application of modern ICT technology and Precision Agriculture and are an important source of information for farmers that intend to adopt these technologies.

Kverneland and DLO-ASG participate in ISO working groups for standardization of Electronics in Agriculture. The results of this Smart Crop Protection trial will thus lead to drafting updates and developing new standards, such as for wireless communication. This provides a basis for wide spread use of FIspace services. Fleet Management, Job Control, Remote Machine Diagnostics and even Environmental Control by auditing agencies are logical extensions and possible apps for the open call in the third phase of the FI PPP project.

### 2.5.2 Trial 422 Greenhouse Management Management & Control

All businesses seem to be different when their activities are looked at in detail. What makes the integration from separate entities into one generic entity with smaller entities, related to one each other, is the application of a logical framework that provides useful abstractions from the particular to the general. Seemingly unrelated activities, such as terminal management, farm operations and greenhouse operations, become common under such a framework, which also allows them to be supported general purpose Future Internet and Business Collabortion services.

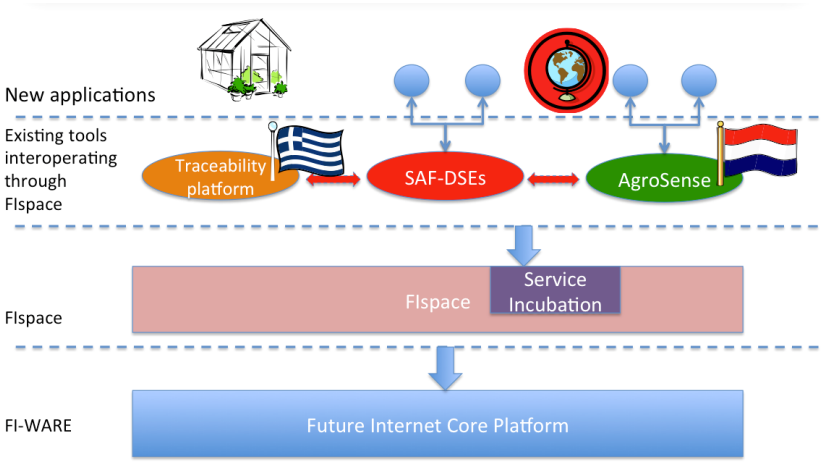



Figure 7. Greenhouse Management & Control Trial overview

The Greenhouse Management & Control trial involves several Business Actors collaborating via FIspace platform in order to accomplish specific business scenarios. The scenarios concern a State Agency for Agricultural Policies, existing Greenhouse and Farm Management Information Systems, which use sensor equipment in Greenhouse environments, meteorological base stations, one Product Traceability Platform etc.

In the context of the particular trial several scenarios are involved, all of which will be executed in order to demonstrate various aspects of the Business-to-business functionality that FIspace will provide. Legacy systems like the ones mentioned above will be integrated into the FIspace so that they are able to interconnect and exchange information. The different scenarios to be executed are:

- Advice Request
- Contract search
- Managing complaints
- Product recall
- Task Planning

### 2.5.3 Trial 431 Fish Distribution and (Re-) Planning

The Fish Distribution trial is concerned with the planning of logistics and transport activity in the fish industry, a crucial process for ensuring performance across the whole supply chain. The main challenges addressed are low predictability and late shipment booking cancellations, mostly due to lack of collaboration or access to information, affecting directly the resource and asset utilization of service suppliers. Furthermore, data quality at the planning phase is essential for enabling effective monitoring of transport execution.

The trial will be built on the export of fish from Norway (see Figure 8). Fish exporters produce fish continuously, sell it to retailers/wholesalers overseas, then contact a cargo agent for carrying out the logistics operations, including planning, booking/contracting of transport services, customs declarations, follow up, and tracking and tracing of cargo.

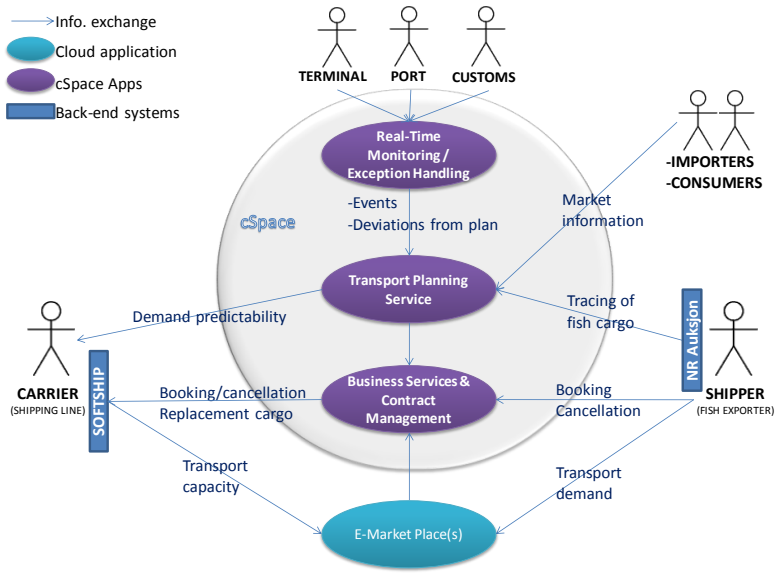



Figure 8: Layout of Fish Distribution and (Re-)Planning Trial

The trial will show-case the innovations of FIspace by addressing the following key activities in the supply chain:

- Distribution (re)scheduling: For the shipper, this includes finding a transport supplier, creating a shipment order, developing a transport execution plan, and rescheduling transport in case of deviation.
- Transport demand (re)planning: For the carrier, this includes demand planning/prediction, resource management and (re)planning of transport operation in case of deviations.
- Tracing of cargo: tracing of cargo at product level is essential for monitoring of transport, but also for detecting deviations at the planning phase (delayed cargo).

The trial will explore applications that can contribute to B2B collaboration for improving logistics operations, but also enabling open innovations. Two examples of test applications are:

- Improved Booking Reliability: improved upstream planning so that the carrier gets more visibility, more reliable booking, and early notification of changes. The trial will demonstrate how a better integration of the supply chain, in terms of information distribution and accessibility, can contribute to better planning and resource utilization.
- Handling of Late Cancellations: provide to the carrier quick access to online e-market place and ability to reschedule bookings, find replacement cargo or additional last minute cargo in a shorter

time window compared to what today's IT network can offer. Combined with pricing policies that encourage early booking and dissuade late booking cancellations, this solution is believed to have a strong positive impact on capacity utilization as well as cost efficiency, especially for the short sea shipping spot market.

The scenarios will feature primarily the carrier (container shipping operator) and cargo owners (fish exporters) or, alternatively, cargo agents. They will represent real-life situations, business activities, or types of events, and show how FIspace enables them to interact more effectively to increase supply-chain efficiency.

The business actors in the trial represent the carrier and shipper sides, and the trial will focus on how collaboration and integration among them. MRTK will coordinate the trial and be involved in development of the applications. The main project partner is NCL, one of Norway's largest short sea shipping companies, with a large network of fisheries and fish exporters/traders.

### 2.5.4 Trial 432 Fruit & Vegetables Quality Assurance

The network of interconnected actors in the 'Fresh Fruits and Vegetables Chain' includes the following stages of the food chain (Figure 9):

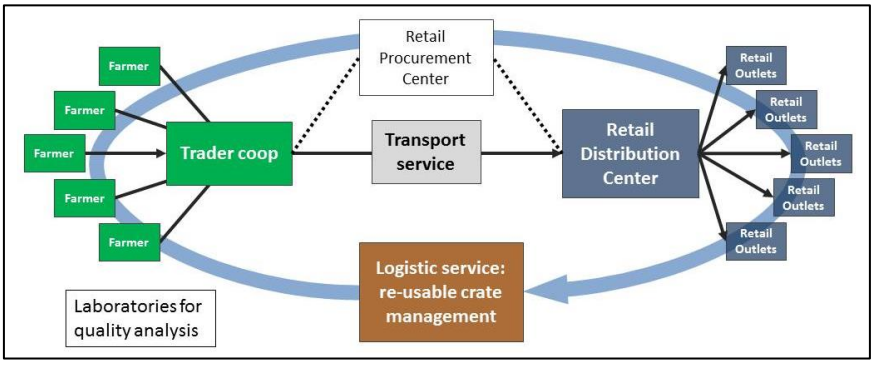



Figure 9 : Principal organization of the FFV food chain.

Starting from production on *farms*, products are collected by *traders* (often organized as farmers' cooperatives), and sold to *retail* which might involve *procurement centers* that are responsible for sourcing, *distribution centers* that collect products from different sources and allocate them to different retail outlets, and *retail outlets* organized as e.g. supermarkets that provide the link to the *consumers* as the final customer.

The organization of this network is supplemented by *laboratories* linked to farms and traders that provide food safety and food quality analysis, *logistics providers* that provide transport, *service providers* that provide re-usable packaging (Returnable Transport Items, RTIs) in form of crates and pallets, and *certification services* that provide guarantees on food safety and quality.

The trial has identified some stakeholders for the various stages of the food chain that are ready to get engaged in the formulation and evaluation of the prototypes from a business perspective.

### 2.5.5 Trial 433 Flowers and Plants Supply Chain Monitoring

This trial is concerned with monitoring transport and logistics processes and focuses on the tracking and tracing of shipments, assets and cargo, including quality conditions and simulated shelf life. The trial will demonstrate the continuous monitoring, control, planning and optimisation of business processes based on real-time information of real-world parameters. The experiment will test, in particular, dynamically updating rich virtual profiles of products, containers and shipments, providing multiple views for distinct purposes of usage; the combination of different types of sensor data; a timely and flexible availability of product and quality information to a variable network of downstream and upstream partners; and proactive control of distribution activities (i.e., triggering deviation management and planning).

The scope of the trial will demonstrate FIspace functionalities regarding:

- Cargo and Asset Quality Tracking ("intelligent cargo"): monitoring and control of quality status of the cargo and related assets and its relevance for customer's quality requests; communication of monitoring results to stakeholders;
- Shipment Tracking ("intelligent shipment"): monitoring and control of shipments from (primary) producers to end customers, and specification of its relevance for customer expectations;
- Lifecycle Information tracking on cargo characteristics along the supply chain: information collection and distribution along the whole chain ensuring correct information on the cargo accessible for any stakeholder involved in the products' lifecycle and especially consumers as the final customers.

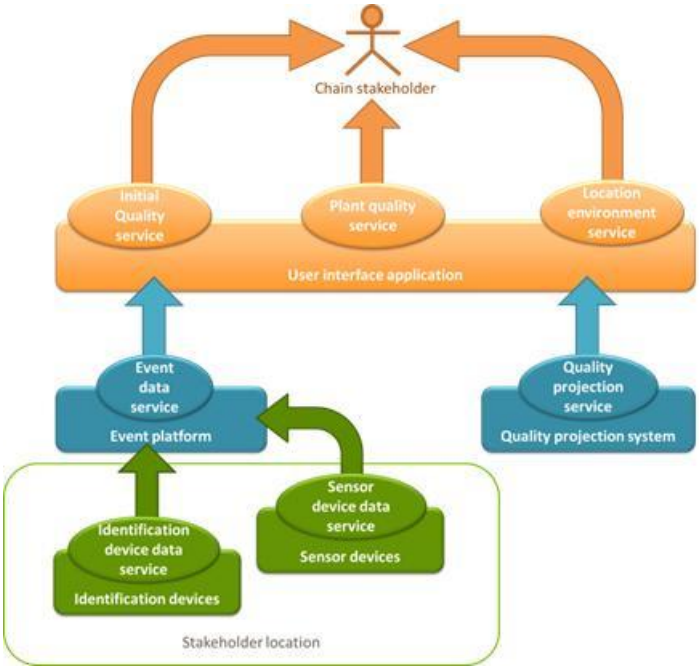



Figure 10: Layout of Flowers and Plants Supply Chain Monitoring Trial

The trial is aligned to the flowers and plants supply network (see Figure 10). This sector is characterised by high uncertainty of both demand and supply. Supply uncertainty is high because product is vulnerable to decay, weather conditions, pests, traffic congestion and other uncontrollable factors. Further, demand uncertainty is high because of weather-dependent sales, changing consumer behaviour, and increasing global competition. This results in high variability of supply capabilities and demand requirements in terms of volume, time, service levels, quality and other product characteristics. As a consequence, the timely, error-free and flexible monitoring of products, assets and shipments is a key challenge in floricultural supply chains.

Europe is the leading producer of flowers and plants in the world. Within Europe, The Netherlands is by far the largest producer, accounting for approximately 40% of the total production value. For this reason, the trial experiment will focus on Dutch floriculture. It will include the main supply chain actors, i.e. growers, traders (including wholesalers, exporters, and importers), auctions / producer organisations (including FloraHolland, the world's largest flower and plant auction), transporters, suppliers of Logistic Assets (containers, crates, etc.) and retailers. These supply chain business partners are involved via FLORECOM, which is an active industry association for supply chain information in the Dutch plants and flowers sector owned by the auction house FloraHolland (growers cooperative with about 6,000 members), the Association of Wholesale Trade in Horticultural Products (VGB) and the Trade Council Agricultural Wholesale Trade (HBAG). DLO-LEI will act as coordinator and technical architect of the trial. DLO-FBR will contribute by delivering quality decay models as a service.

### 2.5.6 Trial 441 Meat Information Provenance

At present, there are several systems that provide meat consumers with what is sometimes called *rich information* on meat. This includes the origin of the meat, meat type, company and date of slaughtering and further processing of the meat item bought by the consumer at some supermarket or other retailer. Several systems also extend this *rich information* to recipes on how to prepare the specific meat item. Consumers have already indicated that they want even more reliable information (i.e. certified by accred-

ited bodies), such as information on sustainability aspects of the meat supply chain, animal welfare and health aspects. Examples of information related to human health include information on allergenic characteristics, chemical additives and how to prepare that specific piece of meat.

During the last two years within FI-PPP Phase I project, SmartAgriFood, such a system is tested in a BonPreu supermarket in Barcelona, Spain and implemented in several German supermarkets (e.g. Aldi-Nord, Aldi-Süd, Lidl, NORMA, Aldi NL, while Germans largest supermarket EDEKA is working on it). Furthermore, in other countries (e.g. US, Japan, Australia) similar systems are and will be developed. With the German system, consumers can get a substantial part of the information they want on meat. But the system is also restricted, as it is very cumbersome to scale it up and, moreover, it serves consumers only, while considerable effort and costs are for the meat supply chain partners. In case of food alerts (e.g. BSE, horsemeat scandal, aflatoxine, dioxine) tracking & tracing is very difficult, as passing of information (from farm to retailer and from retailer back to farm) is based on the principle *one-step-back, one-step-forward*, which means that every meat supply chain partner is enforced by regulations to know where his input comes from and where his outputs go to. Reconstructing the flow of information is a giant task and can take up to several days, e.g. in the horsemeat scandal several days or even weeks. Any response to such a meat alarm is not only slow, but also very imprecise, concerning too much meat of too many supply chain partners. In contrary, in case of a meat alert ICT should enable a fast and surgical response in case of meat alert. Not only tracing of meat, as in the horsemeat scandal, is difficult, but other examples of imprecise response are related to tracking: e.g. prohibitions to export, or to deliver, or to transport or to produce. Moreover, with the existing system information is stored and transmitted in all kinds of formats, following various standards. Meat supply chain partners cannot use this system to optimise their businesses and to respond to wishes of their supply chain partners and meat consumers.

In the new meat supply chain information system the MIP trial will improve the functionality for consumers and add several new functionalities for all supply chain partners. The new system will be based on the EPCIS standard (Electronic Product Code Information Service). All meat supply chain business processes will be stored in one or more repositories that are designed to store EPCIS events. EPCIS is a widely used standard for food and other products. Basing the new meat supply chain information system on EPCIS enables providing instant information on where all meat items are at any time in case of meat alerts. Furthermore, the system supports generating a list of all sources of meat safety issues, related to the meat alert.

In the MIP trial the end-result will be a reference architecture for a new meat supply chain information system that is tested and ready to be rolled out in FI-PPP phase 3 projects, as depicted in Figure 111. Furthermore, the trial will build a community of meat supply chain stakeholders to involve them and prepare them for extending the functionalities and to provide more information that is interesting for meat consumers and all stakeholders involved, including authorities and the society in general.

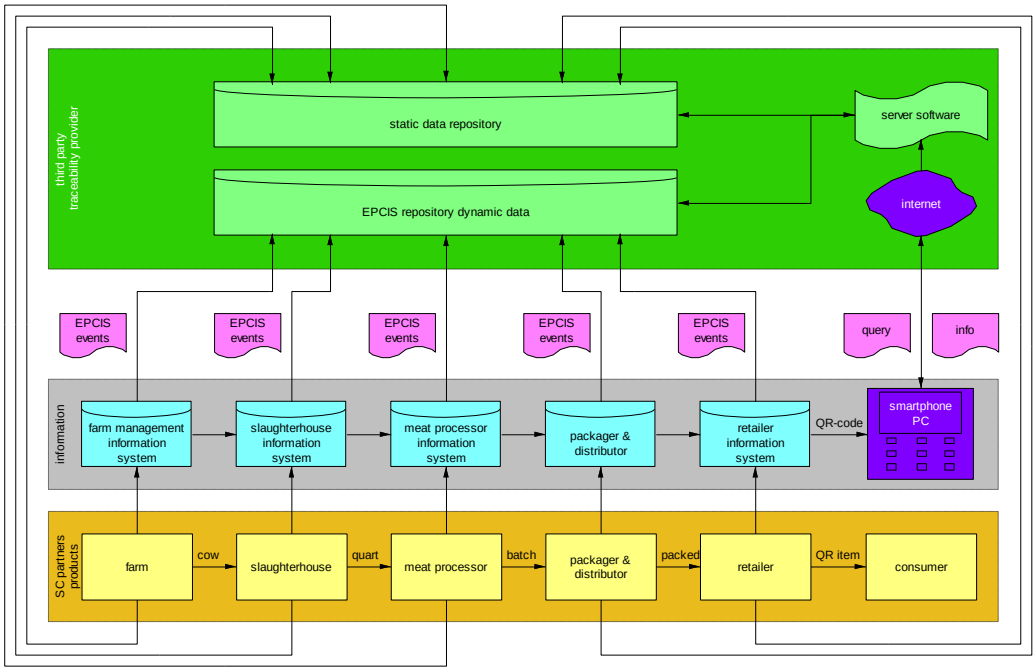


Figure 11: Reference architecture with the core parts to be implemented and tested in FIspace's MIP trial.

Not only the MIP trial will uses EPCIS as an enabling technology but also the *fresh fruit and vegetable quality assurance trial* (T432) and the *flowers and plants supply chain monitoring trial* (T433).

### 2.5.7 Trial 442 Import & Export of Consumer Goods

The import and export of consumer goods trial addresses a supply chain network which can be differentiated by several dimensions; by the nature of the markets (i.e. consumer expectations in the markets), by product ranges (relative importance i.e. priority of a product in that specific market), by sourcing types (production or trading) and also by the agreements and the content of the business done in collaboration with transport service providers and their capabilities. International transport is always constrained by the laws and enforcements by the legal authorities (i.e. customs), however impact of such mechanisms on the business flow will not be included in the scope of this trial.

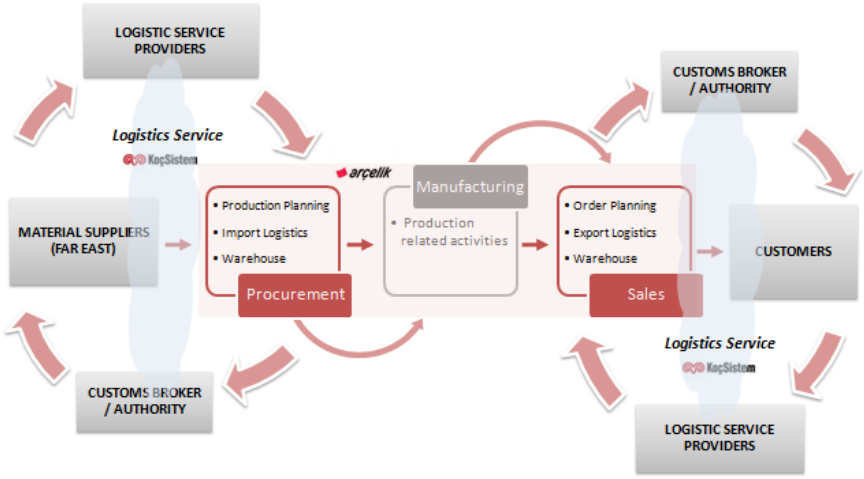



Figure 12 Layout of Import and Export of Consumer Goods Trial

As depicted in the figure given above, the process starts with a procurement order of raw materials from a material supplier located in the far-east and inbound transportation of the materials to the facility of Arcelik where they will be transformed into finished goods that in turn will be exported as consumer electronics goods to the UK.

The trial includes operational planning of logistics activity in line with the existing production plans (for inbound) and promises to customer (for outbound), purchasing/planning of logistics operations and the timely monitoring and coordinating the execution of the transport activities. The trial can easily be scaled up to the total supply chain and also other supply chains in Phase 3.

End-to-end collaborative supply chain planning, along with the enhanced visibility, is essential. Linking demand with supply throughout the entire supply chain is required for implementing tailor-made supply chain strategies in order to increase reliability and responsiveness to customer with a cost efficient and high quality manner. Cloud-based collaboration services and apps can lead to wide acceptance with a large number of small suppliers and dealers, as it significantly reduces the investment in such IT.

The trial focuses mainly on two main processes:

1. E-Planning process addresses the challenges encountered during the operational planning of the transport activity from the view point of a manufacturer. Scenario mainly focusses on the management of the transport service, i.e. transport order & booking and organizing the execution of an inbound process for Arcelik. The story is built planning of the transport of materials in collaboration with the material suppliers and transport service providers. Cloud-based collaboration services and apps allow a better visibility and potential to reach out new potential partners for collaborating without heavy manual intervention. Potentially it is expected to increase the visibility of SMEs in global business collaboration. Increased visibility of the processes and automated notifications for deviations can lead to a more intelligent supply planning which lead to more effective supply chains.

2. Automated shipment tracking process mainly focuses on the process of shipment status monitoring and timely deviation handling with automated notifications and triggers for re-planning. The scenario starts when the materials to be used for production leaves Arcelik's warehouse located in Turkey and continues till their journey to their end destination in UK. The transport chain planning and optimisation with effective and proactive deviation management is necessary to ensure effective production planning, on-time delivery in full and high on shelf availability at the destination with high customer satisfaction level. The trial will explore the benefits of future internet applications that can provide "fast and seamless" real-time information sharing through one channel and increased level of interaction between involved parties.

### 2.5.8 Trial 443 Tailored Information for Consumers

The aim of the TIC trial is to test and present how we can use all the potential of Future Internet and the FIspace platform to improve food awareness among consumers. For this experimentation, we will focus on developing a trial system that will help the consumer to be more aware of the food they buy in the supermarket and that they eat.

The main challenge is the capability to collect information from the cloud, from different providers and not from a central information repository, in order to furnish an open platform with all the gathered product data from several points of the supply chain, and provide innovative functionalities by means of FIspace Apps.

The TIC trial is mainly focused on the data management and provision to consumers. There are two main information dissemination approaches:

1. The push approach, which enables the retailer to make the consumers aware of information considered relevant for them.
2. The pull approach where consumers get tailored information of a product before/during and after their shopping and getting only the product attributes of their interest according to their consumer shopping profile.

In this Phase II, we will implement the Phase I functionalities (providing tailored product information) into the FIspace ecosystem and include additional features related to:

- Push Information Approach.
- Consumer feedback
- Augmented reality applied to providing tailored information.
- Shopping list management.
- Transform data into knowledge based on semantic rules.
- Food Safety alerts.

These functionalities are described in the following user story:

*Carl is a frequent shopper at Plus Fresc and he has Plusi fidelity card. He has received an email informing that Plus Fresc forms part of a new platform called FIspace that offers an App store where he can get/buy different Apps that offer new innovative functionalities.*

*Carl is allergic to wheat, and cares quite a lot about his weight, although he loves making desserts. Since now they are three at home he has to care about product price and tries to benefit from as much offers as he can.*

*Carl logs himself in the FIspace platform and accesses the store. He decides to download the PRODUCT INFO App, since each time he enters the shop he spends lots of time looking for products that are gluten free and this App will allow him not only to know which product are gluten free, but to get detailed product information by just scanning the QR code placed in the product). This information can include social, health or environmental aspects. There is also the possibility to scan those quality logos the product provides and obtain their real meaning, since sometimes it is a bit confusing. He enters the App and configures his profile, introducing the type of information he want to get, the preferred language, etc and the fidelity card number. He downloads also the TRAFFIC LIGHT App that will allow him to visualize with easy color codes the fat, saturates, sugar and salt of the product, based on the Food Standards Agency rules:*

| | | | |
|---|---|---|---|
| *per 100 grams* | *low (green)* | *medium (amber)* | *high (red)* |

| *per 100 grams* | *low (green)* | *medium (amber)* | *high (red)* |
|---|---|---|---|
| *fat* | *≤ 3,0 gr.* | *> 3,0 gr. and ≤ 20,0 gr.* | *> 20,0 gr.* |
| *saturates* | *≤ 1,5 gr.* | *>1,5 gr. and ≤ 5,0 gr.* | *> 5,0 gr.* |
| *sugar* | *≤ 5,0 gr.* | *> 5,0 gr. and ≤ 12,5 gr.* | *> 12,5 gr.* |
| *salt* | *≤ 0,3 gr.* | *> 0,3 gr. and ≤ 1,5 gr.* | *> 1,5 gr.* |

Table 1 Example „Traffic Light“ app information

*So as not to buy unnecessary products, Carl wants to prepare his shopping list before going to the supermarket. He is about to start writing it down when he remembers the FIspace platform, he enters and realizes there is a SHOPPING LIST App, and this App allows him, not only to make his shopping list by selecting the product, but by scanning its code, so he scans those products he has at home. He cannot forget to buy the ingredients of the cake for the birthday of his little daughter! But, did he need milk or cream? He enters the SHOPPING LIST App and accesses the recipes, he looks for the chocolate cake recipe and adds the ingredients to his shopping list. He realizes he can add products to the shopping list by family and subfamily categories. Therefore, he adds cream and the chocolate all his family likes the best; Plusfresc own branded 70% cocoa chocolate.*

*Now Carl is ready to go to the supermarket. Once he arrives, he sees a big banner announcing that customers can improve their shopping experience by FIspace innovative functionalities. He is ready to begin his shopping. Along the aisles, he finds products with a QR code. He reads QRs with his mobile, and through the PRODUCT INFO app he receives tailored information about the products he scans.*

*Finally, Carl reviews the shopping list and he ticks a box next to each product to be sure he has bought all of them. Unfortunately, Carl does not realize he has forgotten to buy rice. He validates his shopping and immediately the mobile beeps indicating he has missed the rice. Goodness! His wife was going to cook a paella for the birthday party and he could not forget this important ingredient.*

*Once Carls finishes his shopping he goes back home, and when he opens the milk, the taste is very strange, so he decides to send this complaint through the PRODUCT INFORMATION App. In few days, he receives an answer from Plusfresc thanking the feedback and including an e-voucher from the milk producer for four free of charge bottles of milk.*

*The next day Carl goes to the supermarket he sees a new banner announcing “AUGMENTED REALITY OFFERS”. What is that? Carl enters the FIspace store and discovers the AUGMENTED REALITY App. He downloads it, and when he enters, he receives a message saying “Today special offer in cereals” information Plus Fresc has predefined that the consumer will receive (in a “push” mode). Following the instructions in his mobile, Carl directs his mobile to the cereals and gets information about offers superposed to the image he is getting.*



*A couple of weeks after, he is at work and receives an email informing there is a security alert related to some tomatoes he has bought, so he is required to get them back to the shop in his next visit so as to give him his money back.*

# 3 Trial Experimentation

## 3.1 Experimentation Methodology

The trials follow a defined methodology in order to demonstrate the functionality of the B2B collaboration concept of the FIspace platform and to test the functionality of Core Platform GEs. The fundamental steps that are followed are:

1. Identify potential partners/stakeholders/companies and respective test sites
2. Identify the legacy systems from the partners that will participate and the functionality they will provide for connecting to FIspace
3. Define the requirements/preconditions of the scenarios as well as which legacy systems will participate per scenario
4. Define the requirements for each one of the domain specific applications that will be used in each of the scenarios
5. Develop the defined domain specific applications, connect them to potential FIspace and Fiware services
6. Execute the various scenarios
7. After executing the scenarios/tests generate test reports (results, failures, assessment of the quality of the testing effort etc.)
8. Make needed corrections, re-evaluate preconditions / specifications / requirements and re-conduct the scenarios on a large scale bases

## 3.2 Trial 421 Crop Protection Information Sharing

### 3.2.1 Experiment definition

#### 3.2.1.1 Functional tests

The business processes to be tested are divided in smaller functional units, Use Cases, which in first instance will be tested on their functionality. This means in this trial:

- a test on their ability to read required input data following the specified format
- deliver the output data in the required format at the required time
- deliver output data which makes sense. (*This FIspace trial is not intended to test the quality of the different modules, but output data must be in in order of magnitude which sounds/looks logical for the business user.)*
- React on events as will be generated by a Business Collaboration Object

#### 3.2.1.2 Employment tests.

Employment tests are intended to test the functionality of the FIspace platform. These include:

- The functioning of GE's, FIspace services and Base Apps, among which:
    - Ease of placing a new App on the FIspace platform
    - Ease of updating an App
    - Ease of "signing up" for an App as user.
    - Ease to change authorisation of data-use by third parties.
    - Effectiveness of authorisation

#### 3.2.1.3 Performance measurement.

To measure the performance of the FIspace environment the test protocols as formulated in the first phase will be used. They could cover the following aspects:

- Ease of requesting an advise on crop protection
- Timely delivery of an advice for a large number of fields.
- Timely delivery of real time performance data of implements

### 3.2.2 Business requirements

The generation of advices for Crop production, the execution of operations following these advices and proper documenting of how production took place, requires a large number of system functionalities (business processes). The past has learned that realisation of all those functionalities by one provider is impossible, or when tried, results in sub optimal functionalities of some system functions. The result is that the end user (farmer or contractor) has to use functionalities from different providers, which implies redundant data entry or dedicated software for data conversion.

Farmers want that system functionalities are provided by companies or organisations that can deliver such a functionality on a high quality level, but that data generated by system functions of other providers can be used seamlessly as input, and that the result can also be used for other functionalities. In case that a certain provider does not follow developments rapidly enough, it must be easy to switch to other business partners.

Such an approach results in the following requirements:

1. Data to be exchanged between business processes are based on a common understanding.
2. Data exchange follows clearly defined protocols
3. The result of a System function (App) is timely in respect of the depending Crop Production process.
4. It must be easy to subscribe and unsubscribe for System Functions (Apps)
5. The cost must be reasonable in respect of the total Crop Production business.
6. There must be a guarantee that crucial System Functions (Apps) stay available over a longer time period.

The business requirements 1-2 will be tested following the functional test as described in 3.2.1.1. Business requirment 3 will be tested following the performance test as described in 3.2.1.3. Business requirement 4 will be covered in the employment test as described under 3.2.1.2.

Requirement 5 requires a specific evaluation for which expected cost of the FIspace platform, base Apps and Generic Enablers are needed as input.

Business requirement 6 can't be tested in the FIspace experiments, but is an issue in effort to get business partners to cooperate

### 3.2.3 Match requirements with baseline Apps functionalities

From the proposed BaseLine Apps, the following apps might become relevant in a later stage for Crop Protection Information Sharing, though they are not critical for the trial:

- Real-time Business SLA management baseline App
- Business Profile App
- Marketplace Operations App

### 3.2.4 Domain Apps specific requirements

| Tabelle 1**Ref #** | **Group** | **Function** | **Category**[1)] | **Priority** |
|---|---|---|---|---|
| 1.1 | advise | Combine weather data | Hidden | 1 |
| 1.2 | advise | Whole Field Phytophthora Advise | Evident | 1 |
| 1.3 | advise | Bad weather alert | Evident | 3 |
| 1.4 | advise | Variety and canopy dependent dose advise | Evident | 2 |
| 2.1 | management | Assemble field data | Evident | 1 [2)] |
| 2.2 | management | Recipe formulation (Plan Operation) | Evident | 1 |
| 2.3 | management | Task formulation | Evident | 1 |
| 2.4 | management | Scheduling | Evident | 2 |
| 2.5 | management | Real time monitoring [3)] | Evident | 2 |

| | | | | |
|---|---|---|---|---|
| 3.1 | sensing | Measure weather and soil variables | Hidden | 2 |
| 3.2 | sensing | Measure crop reflection | Hidden | 1 |
| 4.1 | execution | Spraying | Evident | 1 |
| 4.2 | execution | Real time dose adjustment | Hidden | 2 |
| 4.3 | execution | Data Logging | Hidden | 1 |

Table 2 System functions that should be realised for improved Crop Protection against Phytophthora

[1)]Categories are:

- **evident**; must be available and visible to the user.
- **Hidden**; must be available, but is hidden for the user

[2)] Assembly of field data is limited to that data which is required for Crop protection in potatoes to control Phytophthora.

[3)] Real Time Monitoring is a container for: Fleet Monitoring, Task Update, Job control and Remote Diagnosis. A decision must be made which functionality will be developed and tested.

The whole Crop Protection Information Sharing Trial is divided in a number of system functions as described in Table 2 and visualized below in Figure 13.

All the components of the Crop Protection Information Sharing Trial shall be developed in three release cycles of six months which correspond with the six monthly deliverables. This leaves a six month period at the end of the trial period which is only used for final testing and eventually to realise software updates necessary for proper testing.

#### 3.2.4.1 System functions to be tested.

For each system function there is a living document BPM&UseCasesNnnnn in the sub folder “usecases” of the trial.

These system functions are divided in Tasks which will be tested individually and in later stages as a complete business process. For each task is specified:

- A Task Id
- Task Designator (the name)
- in which release cycle to be tested
- The Actor,
- The eventual Partner
- A short description of the task
- The required input data (further specified in the BPM&UseCase documents)
- The required output data (further specified in the BPM&UseCase documents)
- Eventual pre conditions.

In the first release cycle mainly the functional tests will be performed, as the FIspace platform, GE’s and Base Apps won’t be available. These will be tested in successive release cycles, as indicated in the tables describing the test.

### 3.2.5 FIspace and FIware services to be used

Essential functionalities which are needed to get the complete trial running in a real business environment are:

1. Subscribe and unsubscribe for a specific domain or baseline App
2. Control access to a specific domain or baseline App or service
3. Monitor use of domain or baseline Apps or services
4. Bill user for use of domain or baseline App or services
5. Pay provider for use of his domain or baseline App or service
6. A service to authenticate users
7. A service to check the authenticity of users.
8. Possibility to set up, or to participate in the use of, a data store.
9. A service to authorise users access to certain parts of data stored in the data store.
10. An event service.
11. A timer service.
12. A “condition is changed” service.

The basis for the above described Base Line Apps is provided by some of the Generic Enablers. A specification of required FIspace and other services is given in Table 20 in the Appendix.

### 3.2.6 Other Technical requirements.

In the Crop Protection Information Sharing trial we are dealing with the following devices.

- A Sensor Node; the (micro) controller which processes sensor input.
- A Gateway
- A personal computer system
- A tablet
- A smartphone
- A taskcontroller
- An Implement ECU
- A service platform
- A data store

| Function | Architectural component | Device | Gateway | Service platform SaaS | Service platform Daas | Local farm management system | Graphical user interface |
|---|---|---|---|---|---|---|---|
| **Combine weather data** | | | | X | | | |
| **Formulate crop protection advise** | | | | X | | | |
| **Bad weather alert** | | | | X | | | |
| **Determine Canopy Dependent dose** | | | | X | | | |
| **Assemble field data** | | | | (X) | X | X | X |
| **Recipe formulation (Plan Operation)** | | | | (X) | | X | X |
| **Task formulation** | | | | (X) | | X | X |
| **Scheduling** | | | | X | | | |
| **Real time monitoring** | | | | X | X | | |
| **Measure weather and soil variables** | | X | X | | | | |
| **Measure crop reflection** | | X | ? | | | | |
| **Spraying** | | X | | | | | |
| **Real time dose adjustment** | | X | | | | | |
| **Logging** | | X | X | | | | |

Table 3 mapping of system functions on type of platform

### 3.2.7 Business Collaboration objects definition

#### 3.2.7.1 FIspace platform

The ultimate perspective of Smart Farming is that the whole process chain for Crop production will, as far as data processing is concerned, proceed automatically, and does not depend on human interaction. Manual entry of executed field operations has proven to be the weakest chain in controlled agricultural production processes so far. The perspective of hundred per cent automatic business processes can however not be realised within the FIspace trial period.

The processes that can be controlled by a business process on the FIspace platform are detailed in the Appendix of this document.

#### 3.2.7.2 Generation of a Phytophthora control advice

The Green functions (can) run on the FIspace platform and can be controlled by a Business Collaboration Object. They need Field data that should be assembled from the Farm management data. This requires a service which is allowed to collect data from the “Crop and management data”in the FMIS or from a copy

of it stored on the FIspace platform. Actualising this data requires human interaction with the present state of technology which still will be used in an early stage of the trial. In a later stage the update of executed operations can be realised by the other business collaboration object described hereafter.

### 3.2.7.3 Monitoring of Agricultural Activities

A second Business Collaboration Object can be used for automatic logging of Agricultural Activities. It involves cooperation of three partners: 1) An Agricultural Activity Server Provider, who can use the FIspace platform to deliver his services and data storage. 2) A Data Logger functionality and a Gateway on Agricultural Equipment. The Data Logger functionality including Gateway will in many cases be delivered by an agricultural equipment manufacturer, but owned by the farmer or contractor. 3) The third partner is also the farmer or a contractor, but involves an FMIS of the farmer or CMIS of a contractor.

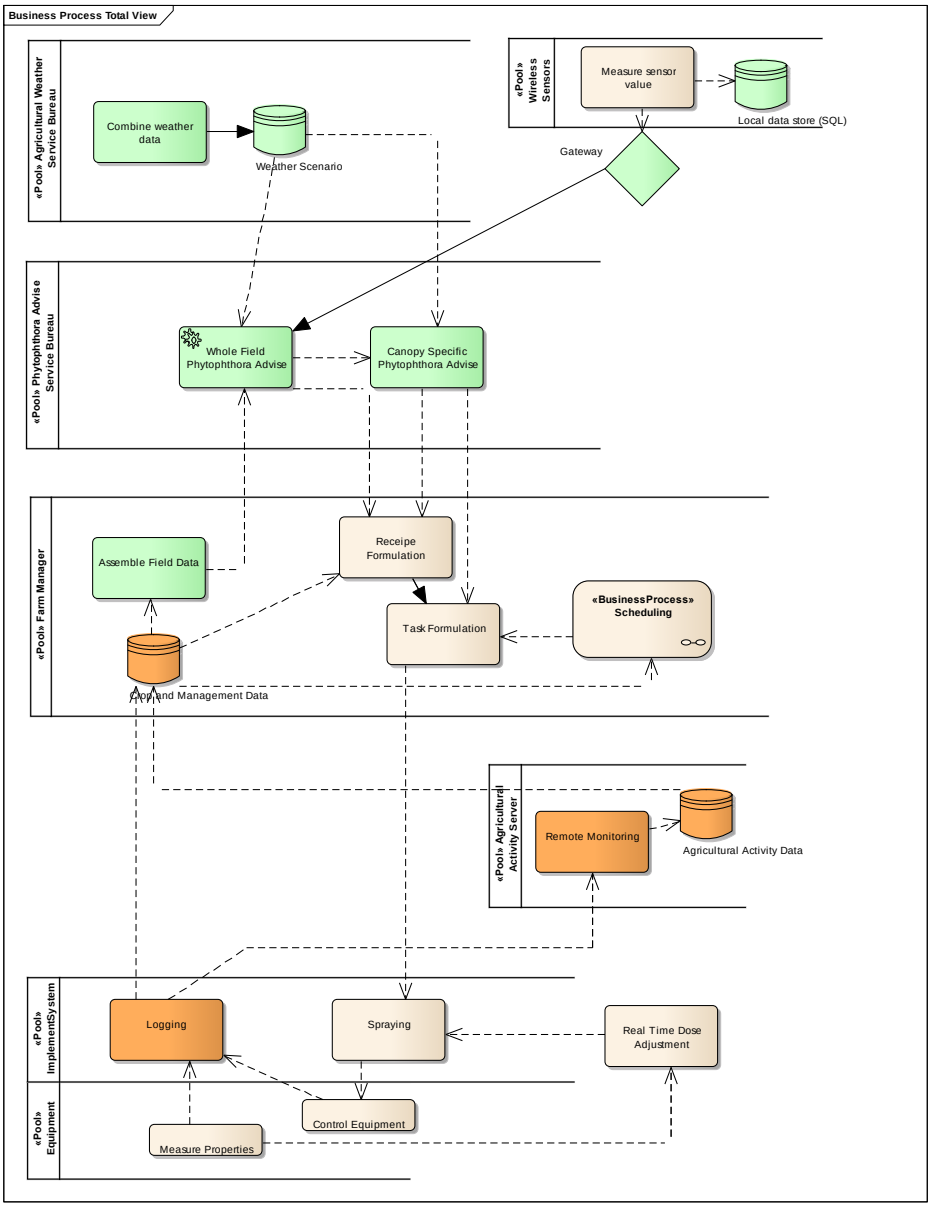



Figure 13 Main System functions in the Crop Protection Information Sharing. Green functions are candidate to be controlled in by a business collaboration Object, but requires the yellow indicated functionality outside the control on the FIspace platform

### 3.2.7.4 Description

The experimental sites will involve:

- **Campus of WUR and DLO in Wageningen**. The campus will be used for initial testing of the soil and micro climate sensors and the associated Gateway.

- **Experimental farm in Lelystad**. The experimental farm of PPO in Lelystad has potato fields for which Phytophthora advice will be requested, on which crop canopy data will be collected and where spraying will be carried out. This will already be used in the first and second year.
- **Experimental farm in Valthermond**. The experimental farm of PPO in Valthermond has potato fields for which Phytophthora advice will be requested, on which crop canopy data will be collected and where spraying will be carried out. This will already be used in the first and second year.
- **Manufacturing site of Kverneland in Nieuw Vennep.** This site will be used for initial testing of (wireless) connections of the farm machinery with other system functionalities.
- **Wage Farm in Wedde**. The farm of the family Wage has a number of potato fields for which Phytophthora advice will be requested, on which crop canopy data will be collected and where spraying will be carried out. This will already be used in the second year.
- **Van de Borne Farm in** . The farm of the family van de Borne has over 100 potato fields for which Phytophthora advice will be requested in the second year. Crop canopy data will be collected and spraying will be carried out. The number of potato fields on this farm is a challenge for the scheduling app.

#### 3.2.7.5 Requirements

The farms must have a FMIS, crop canopy sensors and a sprayer. All mentioned farms fulfil these requirements.

## 3.3 Trial 422 Greenhouse Management & Control

### 3.3.1 Experiment definition - Overview of the experiment

In this section we present an overview of the Greenhouse Management and Control experiment. In the figure that follows all the different actors, legacy systems, and scenarios are presented (Figure 14):

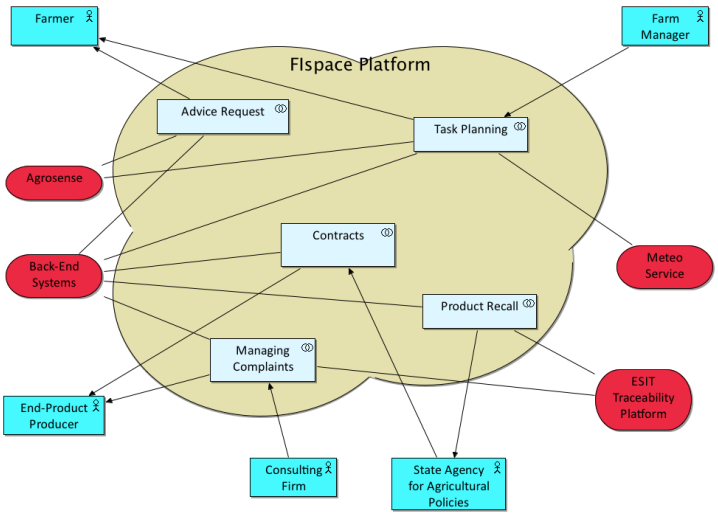



Figure 14. Greenhouse Management and Control overview

Inside the FIspace platform (cloud representation) the five scenarios are presented. In light blue out colour, one can see the different actors participating in the experiments. Finally, in red colour the legacy systems/services to be integrated in the scenarios are shown.

### 3.3.2 Experiment Requirements

#### 3.3.2.1 Business requirements

The Greenhouse Management and Control trial has as main objective to improve the business procedures and collaboration mechanisms between different legacy systems, business actors and stakeholders as far as the management of Greenhouses is concerned.

For each one of the scenarios defined, novel Apps, which will be available on FIspace marketplace, will provide the opportunity to Farmers, Farm Managers etc. to maximize the efficiency of their Greenhouse activities, improve the control over the existing systems and will enable the Business–to–Business collaboration between seemingly unrelated Businesses, regardless their location and former activities.

- Farm managers/Farmers will be able to manage their Greenhouses in a more efficient way, handle their tasks more efficiently retrieving information from multiple back-end systems, meteo services, advisory systems, all of which will collaborate in order to produce the best possible feedback to the stakeholder, which will potentially enable him to maximize his revenues
- End-Product Producers will be able to discover potential partners that interest them in a much more efficient way, retrieve updated information about products and be notified for any emergency situations concerning their products
- Legacy/Back-end systems' owners will deploy their systems in multiple collaboration chains, maximizing their products' usage and thus, revenues
- Developers will be able to upload their Apps to the Marketplaces, which will be used by the various business collaborations
- Various business actors who will be involved in the different scenarios like Consulting Firms, State Agencies etc. will also gain profit from participating in such collaborative chains
- Appropriate information that is related to farmers' profiles could be exchanged automatically with states' and information policies enabling to simplify daily routines. For example, a direct link between a farmer and the state agency would eliminate bureaucracy.

### 3.3.3 Match requirements with baseline Apps functionalities

The Baseline Apps functionalities, which have been identified according to the descriptions of the Baseline Apps so far, are presented below. For each one of the Baseline Apps, the scenarios, which will use them, are presented:

| Baseline App | Scenario |
|---|---|
| **Product Information Service (PInfS)** | Advice Request, Contracts, Managing Complaints, Product Recall, Task Planning |
| **Business Profile** | Contracts |
| **Marketplace Operations Apps** | Contracts |
| **Real-time Business SLA Management** | Contracts, Managing Complaints |

Figure 15 Baseline App requirements

### 3.3.4 Domain Apps specific requirements

The scenarios of the Greenhouse Management and Control Trial have been defined using archimate models on three levels/layers: Business, Technology and Component layers. In this section, and in order to demonstrate the functionality of the Domain Specific Apps, which are going to be used in the scenarios, the Technology (light blue) as well as the Component (green) layers of the scenarios are provided.

## *Advice Request*

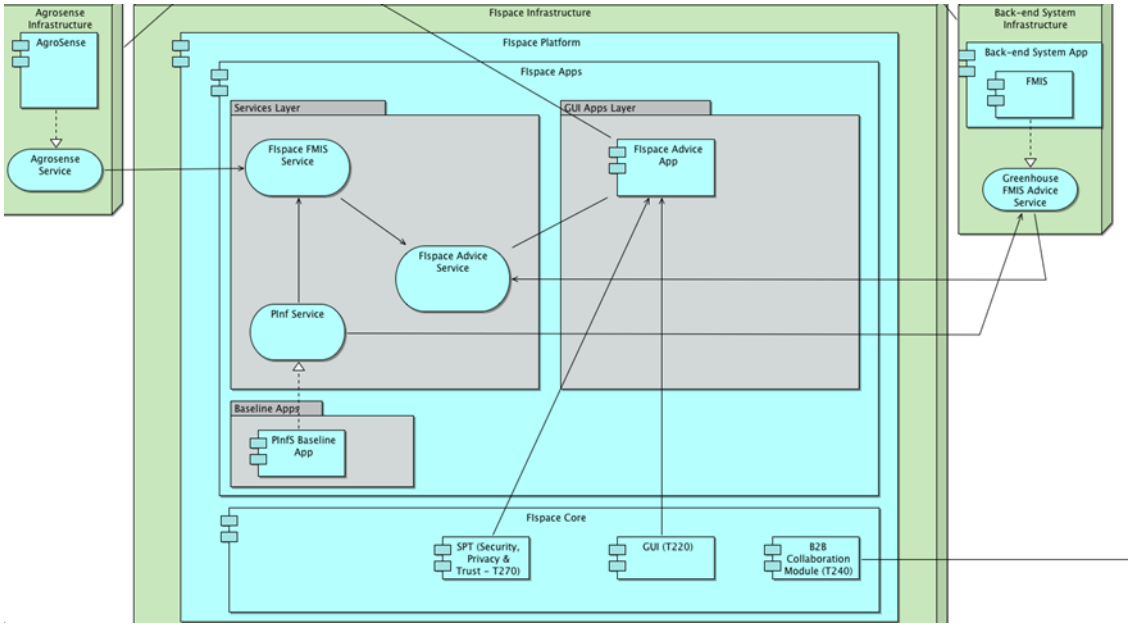



Figure 16. Technology layer for Advice Request Scenario

The App that will be developed for the particular scenario is depicted inside the GUI component of the above figure: FIspace Advice App. According to the description of the business layer of the scenario this Domain Specific App will take care of receiving the inputs from the Farmer and forward notifications to the relevant business players and back-end systems for receiving advice. The application will give the functionality –via the GUI- of uploading sensor data, as well as manually inputing data from the Farmer. Moreover, there will be the functionality of receiving notifications when the Advice is generated and a GUI to provide it to the Farmer.

Below the list of functional requirements of the Advice Request FIspace app is presented:

| ReqID | Title | Description |
|---|---|---|
| AdviceRequestApp_REQ01 | **Input sensor data** | The Farmer must have the capability to upload the data collected from the sensors of the Greenhouse, to be sent for the various back-end systems to process and give back the advice |
| AdviceRequestApp_REQ02 | **Input data manually** | Apart from the sensor data the farmer must be able to input some extra information concerning the product manually |
| AdviceRequestApp_REQ03 | **Submit advice request details** | When submitting an advice request, several parameters should also be defined by the farmer, like kind of request, date of request etc. |
| AdviceRequestApp_REQ04 | **Receive notifications** | By the time an advice report is available to the farmer, a notification should be present at the farmer's app GUI |
| AdviceRequestApp_REQ05 | **View the advice analysis** | After the notification, the received advice is presented via the GUI to the farmer |
| AdviceRequestApp_REQ06 | **System Integration (connection with T250)** | Connection between the FIspace app and the legacy/back-end systems |
| AdviceRequestApp_REQ07 | **Info Security (connection with T270)** | Define which stakeholders have access to each type of information |

Figure 17 Advice Request App functional requirements

## *Contract search*

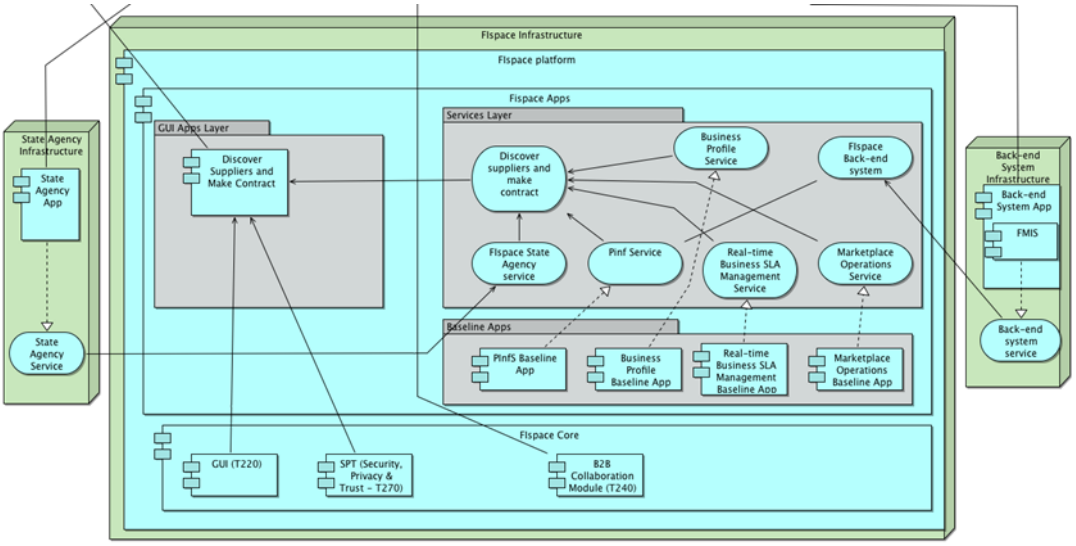



Figure 18. Technology layer for Contracts scenario

Similarly with the Advice Request FIspace app, the Contracts app is depicted inside the GUI Apps Layer on the left part of the model. The basic functionality of Contracts FIspace App is described as follows: the End-Product Producer via the app's GUI, inputs several parameters that will be used as search criteria for the potential partners and afterwards he/she receives the list of the suggested contracts to be made.

The list of functional requirements of Contracts FIspace App is:

| ReqID | Title | Description |
|---|---|---|
| ContractsApp_REQ01 | **Input search criteria** | Product, variety, location, cost, quantity, date availability, agricultural practices, pesticide etc. |
| ContractsApp_REQ02 | **Present list of results** | Via the GUI of the app, the list of the potential partners is presented with all details (location, product, date availability etc.) |
| ContractsApp_REQ03 | **"Suggest collaboration" button** | The End-Product Producer (App user) chooses the desired new partners and presses the "Suggest Collaboration" button which sends a notification (e.g. SMS/e-mail) according to the contact details of the person |
| ContractsApp_REQ04 | **System Integration (connection with T250)** | Connection between the FIspace app and the legacy/back-end systems |
| ContractsApp_REQ05 | **Info Security (connection with T270)** | Define which stakeholders have access to each type of information |

Figure 19 Contract App functional requirements

## *Managing Complaints*

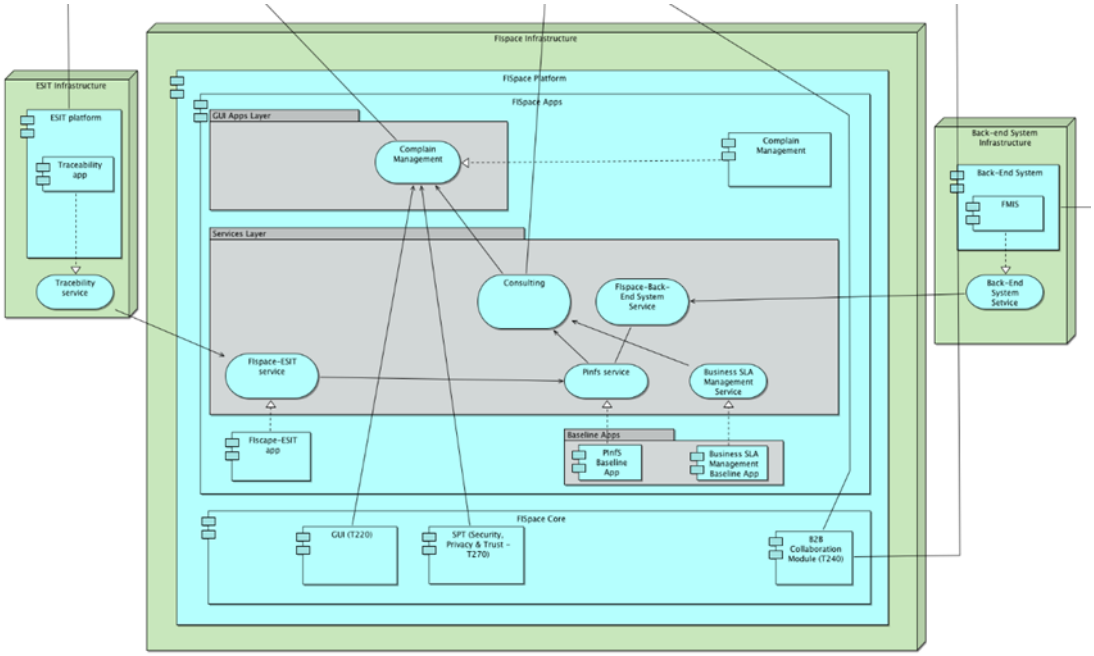



Figure 20. Technology layer for Managing Complaints scenario

The list of the requirements for the Managing Complaints follows:

| ReqID | Title | Description |
|---|---|---|
| ManagingComplaintsApp_REQ 01 | **Input consumer's complaint for analysis** | The app should be connected somehow to an existing method for consumers to input their complaints (external functionality of the app). The functionality of the app starts upon inputting the received complaint for analysis |
| ManagingComplaintsApp_REQ 02 | **Complaint details input** | Via the GUI of the app, the user shall be able to enter details of the particular complaint, product information, location from where the complaint was received etc. |
| ManagingComplaintsApp_REQ 03 | **System Integration (connection with T250)** | Connection between the FIspace app and the legacy/back-end systems |
| ManagingComplaintsApp_REQ 04 | **Receive complaint analysis** | After the complaint report has been analyzed by the connected systems, feedback shall be given to the user (end-product producer) via the GUI of the app in an appropriate way (steps) |
| ManagingComplaintsApp_REQ 05 | **Info Security (connection with T270)** | Define which stakeholders have access to the complaint analysis information |

Figure 21 Managing Complaints App functional requirements

### *Product Recall*

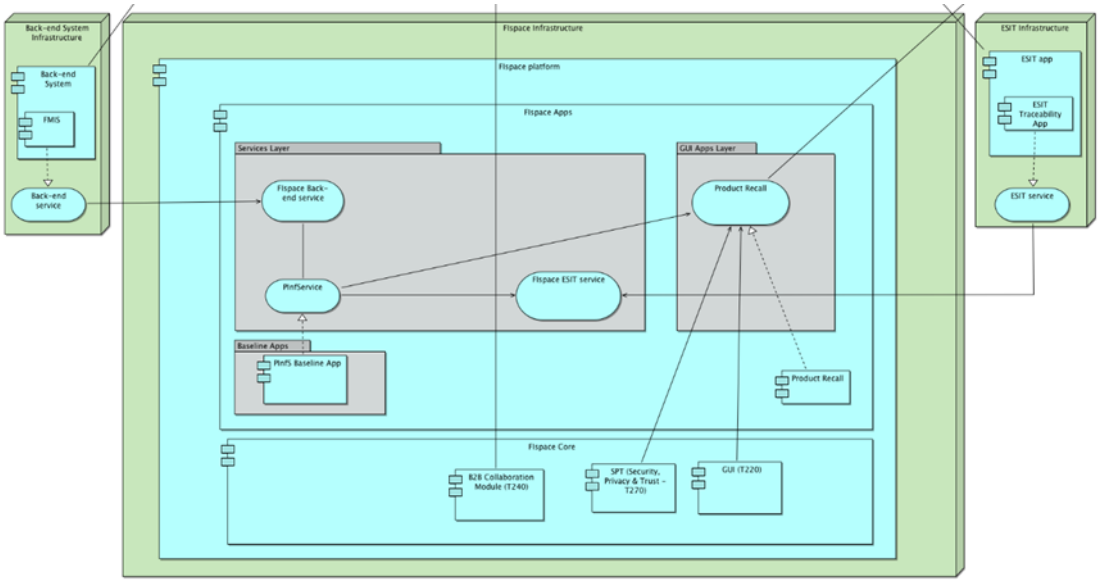



Figure 22. Technology layer for Product Recall scenario

Functional requirements table for FIspace Product Recall App:

| ReqID | Title | Description |
|---|---|---|
| ProductRecallApp_REQ01 | **Request for users** | After the health hazard is discovered, the user shall be able via the app to request to discover the users of the particular hazardous product |
| ProductRecallApp_REQ02 | **System Integration (connection with T250)** | Connection between the FIspace app and the legacy/back-end systems |
| ProductRecallApp_REQ03 | **Info Security (connection T270)** | Define which stakeholders have access to which kind of information |
| ProductRecallApp_REQ04 | **Receive feedback** | Receive information about the involved business actors involved |
| ProductRecallApp_REQ05 | **Send notifications** | Apart from receiving the results of the query and their presentation in the app's GUI, appropriate notification should be sent to the stakeholders |

Figure 23 Product Recall App functional requirements

### *Task Planning*

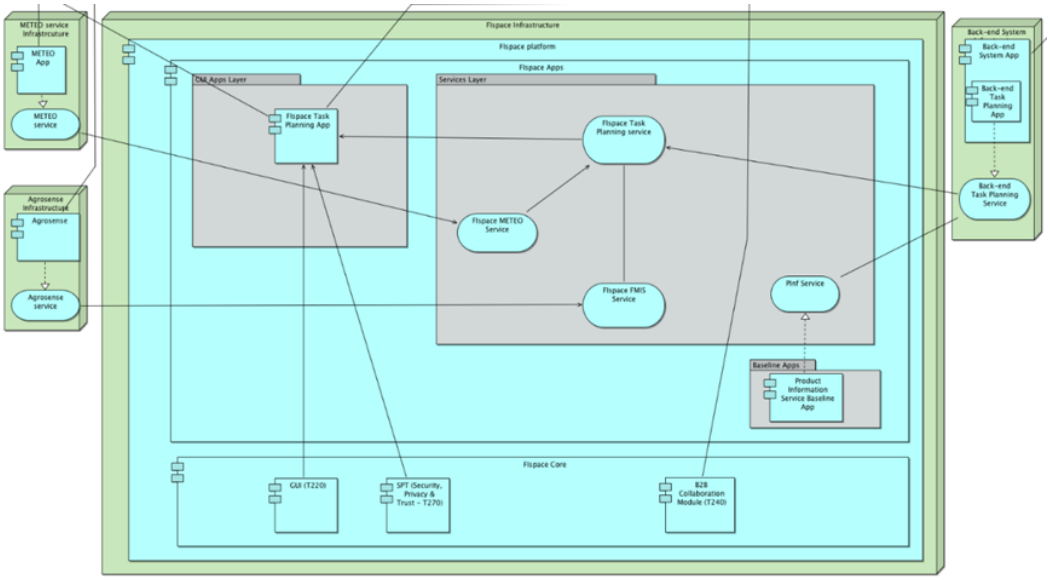



Figure 24. Technology layer for Task Planning scenario

Functional requirements table for FIspace Task Planning App:

| ReqID | Title | Description |
|---|---|---|
| TaskPlanningApp_REQ01 | **Request for Task Planning** | Create a request using the app's GUI for new task planning, updated from the tasks to be done list, the accomplished tasks etc. |
| TaskPlanningApp_REQ02 | **System Integration (connection with T250)** | Connection between the FIspace app and the legacy/back-end systems (Meteo service etc.) |
| TaskPlanningApp_REQ03 | **Info Security (connection T270)** | Define which stakeholders have access to which kind of information |
| TaskPlanningApp_REQ04 | **Receive Task Planning** | One app screen shall provide to the user the list of the tasks to be done, who will have to perform each action, when etc. |

Figure 25 Task Planning App functional requirements

## 3.3.5 FIspace and FIware services to be used

The first part of this section refers to the FIspace services and core components, which will be used by the Greenhouse trial, i.e. the Domain Specific application to be used per sceanrio.The second part refers to the GEs from FIware that are planned to be used.

### 3.3.5.1 FIspace services to be used

All the domain specific applications for the trial scenarios will take advantage of the Core Components of FIspace:

- **T220**: As already presented in the technology layer of the scenarios, all the domain specific apps will use an appropriate GUI for the interaction with the user
- **T230**: All the FIspace apps will be uploaded to the FIspace marketplace service
- **T240**: The FIspace Real-time B2B collaboration service will manage the collaborative processes among the stakeholders of the various scenarios
- **T250**: System and Data integration will be used also in all scenarios for connecting the legacy and back-end systems to the FIspace platform and each of the domain specific apps respectively
- **T260**: The Enterprise-Service Bus (ESB) will be used to connect all the different FIspace components with one each other, as well as to take care of transferring the data exchange between the apps and the core components

- **T270**: The Security, Privacy and Trust component will be used for controlling which users will have access to which type of information, authorization issues etc.
- **T280**: The SDK will provide all the essential tools in order to make use of the core components mentioned above.

The GEs that so far have been identified as, services with useful functionality for the Greenhouse Management abd Control trial scenarios are directly related to the GEs that will be used for the Core Components and the Baseline Apps of FIspace. The GEs planned to be used are:

- Mediator
- Publish Subscribe Context Broker
- Gateway Data Handling
- Data Handling PPL
- Complex Event Processing

### 3.3.6 Business Collaboration objects definition

In order to define the Business Processes of the various scenarios as well as the value of FIspace from a business perspective, the Business Layers of the five different scenarios of the Greenhouse Management and Control trial are presented, in which the different actors, as well as the flow of their interaction is demonstrated:

#### *Advice Request*

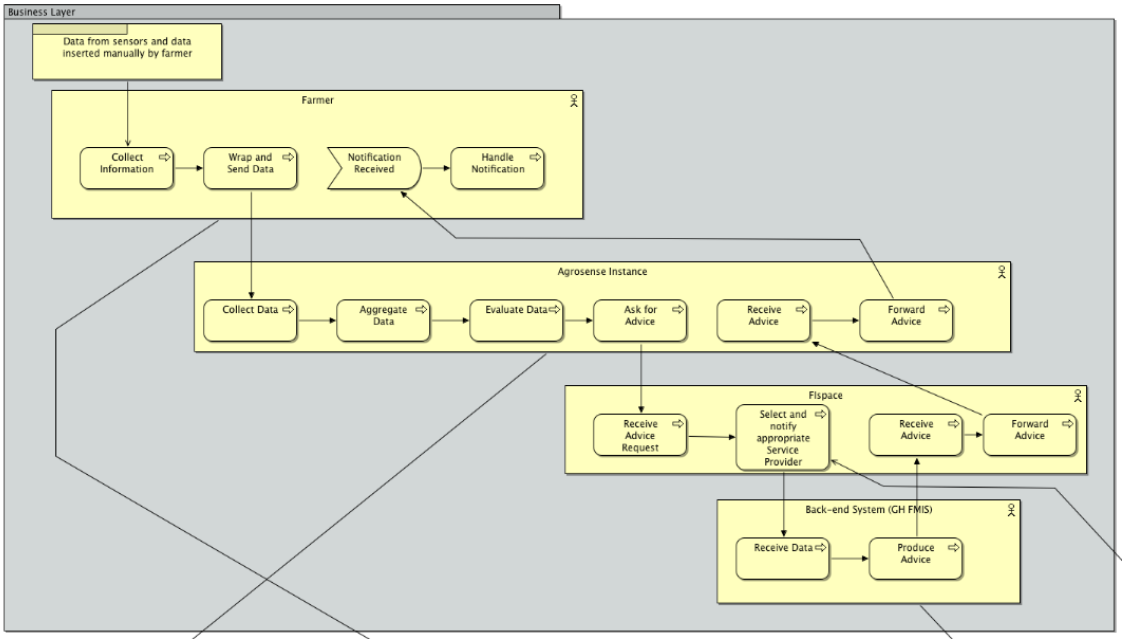



Figure 26. Business Layer for Advice Request scenario

#### *Contract search*

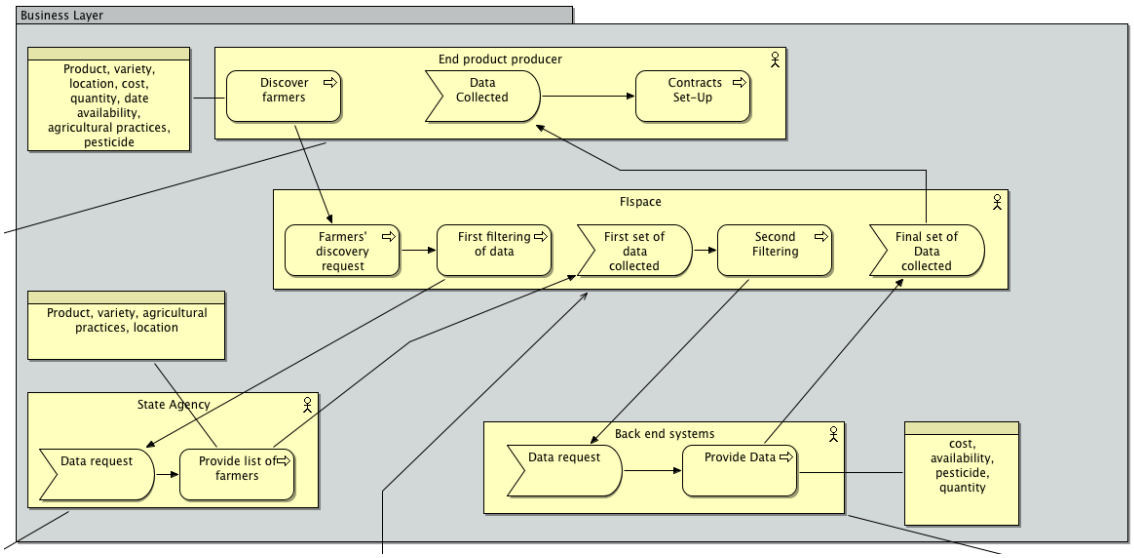



Figure 27. Business Layer for Contracts scenario

## *Managing Complaints*

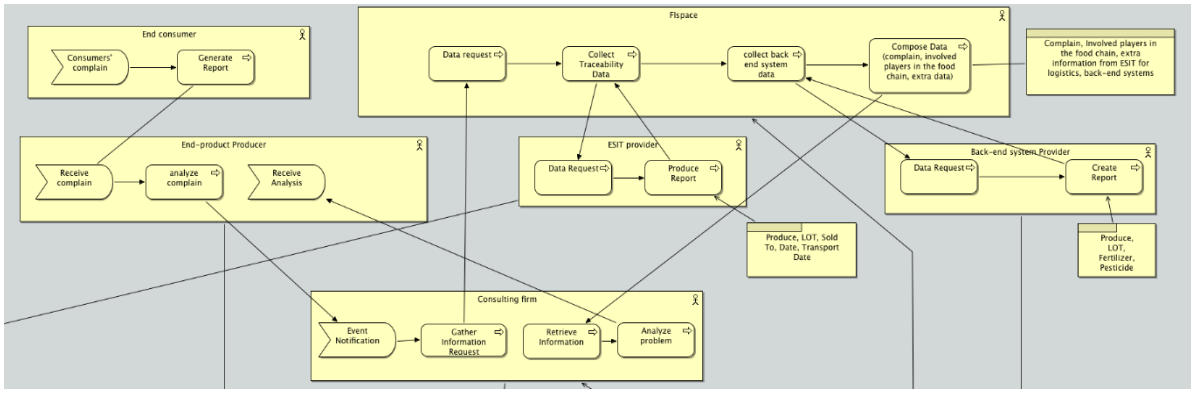



Figure 28. Business Layer for Managing Complaints scenario

## *Product Recall*

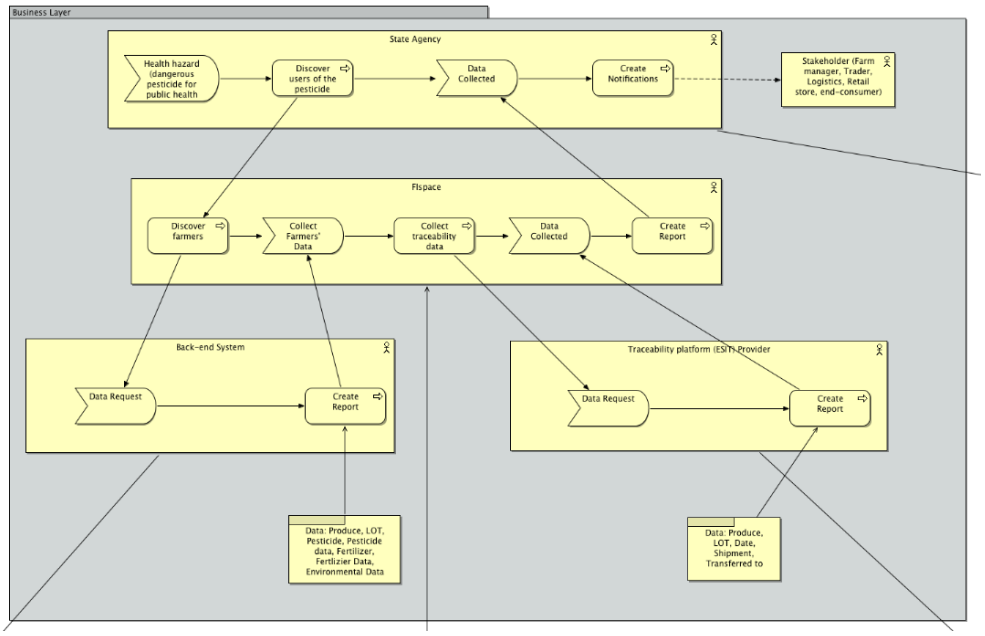



Figure 29. Business Layer for Product Recall scenario

## *Task Planning*

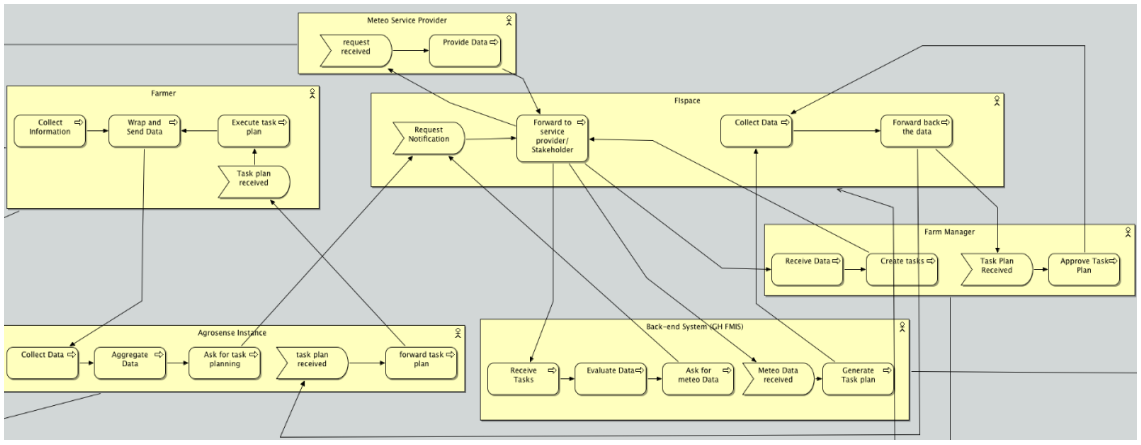



Figure 30. Business Layer for Task Planning scenario

### 3.3.7 Experimentation site

The following pictures were taken in some of the experimentation sites presented above in the tables, after NKUA and OPEKEPE representatives' visited some of them:

Figure 31 Experimentation site

(Left: *Mr Barbinis Vasilis – TU1 site, Megara - Attica, Greenhouse for growing cucumbers. The experimentation site will be almost 3 acres with cucumber production in soil. Right: Mr Gousteris – TU2, Megara - Attica, Greenhouse for growing tomatoes. The experimentation site will be almost 2.2 acres with tomato production (hydroponics in pumice).* ADSL and faster).

The greenhouse park is located in the experimental farm of the University of Thessaly (latitude 39°44´; longitude 22°79´; altitude 85 m) on the continental area of Eastern Greece.

Figure 32. (top-left) The Greenhouse park, Thessaly, Greece, (right) Inside one of the Greenhouses

The greenhouse park, almost 500m$^2$ it composed by three round arch with vertical side walls greenhouses, covered by a single polyethylene film (type PE-EVA-film TUV 3945, film thickness: 180 µm, Plastika Kritis S.A., Heraklion-Crete, Greece), NE/SW oriented (36° declination clockwise from North).

#### 3.3.7.1 Requirements

The only experimentation site requirement is that they are connected to the Internet via high-speed connection.

## 3.4 Trial 431 Fish Distribution and (Re-) Planning

### 3.4.1 Experiment definition

The experimentation is concerned with the feedering part of a fish export from Norway to Brazil. The feedering will cover the transport between Ålesund and Rotterdam.

The fish exporter will use the FIspace functionality to generate a description of the transport demand, to get in contact with potential service providers that can fulfil the demand, and to plan the transport. For both the client and provider, FIspace will also be used in the handling of bookings.

Due to a delay in getting the export licence, the fish can not be loaded on the vessel as planned. FIspace will be used to handle the replanning of the transport. The provider will also use the functionality of FIspace in order to be notified on transport demands that can be used as replacement for the cancelled cargo. This will also include the use of tools for anticipation of cancellations, in order to get a larger time window for finding replacement cargo.

The experimentation setup is detailed in the fish trial appendix to this document.

The business users represented in the test scenario are:

1. **NCL: the container ship operator** that provides feedering services from the Norwegian coast to Europe, including the voyage on focus in the scenario from Ålesund to Rotterdam (part of a regular route), served by the vessel Clarissa.
2. **APL: Overseas operator** that uses the FIspace platform for sending reservations to short sea carriers, confirm a specific booking to NCL for the Clarissa voyage (from Ålesund to Rotterdam), then cancel the shipment due to lack of export license.
3. **MSC: Overseas operator** that works on behalf of the fish exporter that registers a late need for transport, due to a recent deviation in own transport plan (requiring the cargo to leave Ålesund today instead of tomorrow).
4. **Tyrholm and Farstad (T&F): Forwarder** with minor roles in the trial, and works on behalf of the fish exporter to a book shipment. As the departure date approaches, FIspace detects a high probability of cancellation, based on information like cargo location and booking history. This detection of possible cancellation enables NCL to anticipate and open for more shipment bookings before it is too late.

### 3.4.2 Experiment requirements

The experiment will be performed on the experimentation environment described in FIspace WP300. The trial needs the following functionality from the Experimentation Environment to simulate the Softship booking system and to simulate LSC statistics.

### 3.4.1 Softship Simulation

For the fish trial, the following functionality related to Softship must be simulated:

1. Receive bookings from Logistics Planning app via System and Data Integration module (WP250), and send it to Softship on the IFTMIN format. The bookings can be confirmed, waiting list, or cancellations of already confirmed bookings, as shown in Figure 33.
2. Simulate events described in the Exception Detection app:
    a. Booking in Softship has changed from WaitingList to Confirmed
    b. Booking in Softship has changed from Confirmed to Cancelled. This notification is used by the Find Cargo Replacement domain app to search for replacement cargo.
3. Give feedback on available capacity on a certain Voyage for a certain vessel: What is the available capacity on a specified voyage.
4. Give feedback on available capacity based on a certain booking request. Send request back whether the booking can be confirmed or whether it has to be put on waiting list.

### 3.4.2 LSC Statistics Simulation

For the fish trial, the Experimentation Environment must simulate statistics on LSC reliability. This statistics may include for each shipper (LSC), for each type of cargo, the history of the shipper regarding cancellations. The history may also list other booking details, as from and to locations, and the time frame of the booking. Event information, as the position of the cargo, the status from the production, the status from earlier logistics operations in the transportation chain, and the existence of various required documents, may also be used here.

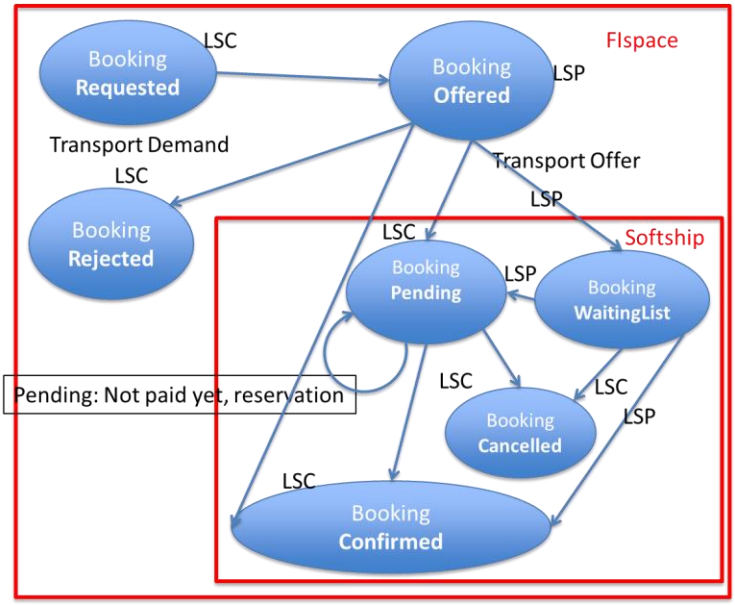



Figure 33 Booking Stages

### 3.4.3 Business requirements

The experiments conducted in the fish trial will show how to increase the capacity utilization for the carrier by improving the information flow from the fish exporter's side to the carrier's side by making more information available for use in the planning phase, and especially in the replanning phase. The problem that is solved is the handling of information related to late booking cancellations done by the fish exporter. There are two main reasons to the problems of late changes in plans and the need for replanning of shipping operations: "No shows" and "Booking Cancellation". Technically, only "dummy booking" is a problem of late booking cancellation, but "no-shows", which relates to delayed booking information flow has the same consequences, namely that the ship must sail with less cargo on board than originally planned, because the operator has no time to find replacement cargo. So both challenges can be related to a main challenge "late booking cancellation".

The first problem, "No Shows", is mainly about delayed booking Information flow due to late information, short planning window, and more explicitly due to manual transfer of information.

The second problem, "Dummy booking" or "Booking Cancellations", is caused by short planning window too. In addition, from the view of the exporter, problems related to production, license and other clarification documents-related problems are important causes of late cancellation of booking. Finally, an important problem which could be avoid thanks to better planning upstream in the supply chain is the reservation of capacity by customer for securing place onboard a ship for the desired voyage. Regardless of how this reservation of capacity is done, whether customers book several ships for a same shipment, or whether they book without knowing the exact amount of cargo that will in fact be available, the problem is still the one of bookings being unreliable and the feeder operator not being able to do anything to avoid it.

### 3.4.4 Trial requirements to baseline Apps functionalities

#### 3.4.4.1 Requirements for “Marketplace Operations” Baseline App

The fish trial makes heavily use of the marketplace functionality of the Business Service baseline app as described in the following:

1. Publish Transport Service Offers on Marketplace: The LSP (NCL) needs to publish a transport service using the Business Services app. The service description contains the following information, as in the NCL example:
    a. Description of the route with stop points and time schedules. The schedule should cover the Ålesund-Rotterdam leg.
    b. A description of the actual service (Short Sea Container transportation with freeze or non-freezing capacities )

2. Publish Demand on Marketplace: The LSC needs to publish its transport demand on the marketplace, and wait for LSPs to answer to this request. This can be done either directly in the Business Services App or by functionality in the Logistics Planning App.
3. Request Transport Service Offers from Marketplace: Do matchmaking: Fish Exporter/LSC needs to do matchmaking of their transport demand to try to get a set of offers matching their demand. This is done by interaction between the Logistics Planning App and the Business Services app: The logistics planning app sends a request containing a transport demand to the Business Services app, and a list of possible transport service descriptions are returned.
4. Request Transport Demand from Marketplace: The LSP (NCL) needs to enter a transport offer to the Marketplace, and to wait for the marketplace to do a matching, and to receive a list of matching transport demands. The purpose of the matchmaking can be either to find transport demands to fill up the vessel when a booking has been cancelled, or to each for transport demands to fill up the vessel more generally.
5. The "Booking Probability" app needs to get the transport schedules for a LSP (NCL), Based on the actual LSP (NCL) and a time interval, the Business Services app must return relevant transport schedules for the LSP. One purpose of this is to use the voyage information to search for bookings for this voyage that have not yet been confirmed, and to inform the LSP about this. Another purpose is to find bookings in this voyage and compute the probability that the booking will be cancelled, based on LSC statistics.

#### 3.4.4.2 Requirements for "Logistics Planning" Baseline App

The fish trial needs a lot of functionality from the "Logistics Planning" App as described in the following:

1. LSC User Interface:
    a. User interface to enter, update, view and delete transport demand.
    b. User interface to list transport services fulfilling a transport demand.
    c. User interface to start planning and replanning
2. LSP User Interface:
    a. User interface to handle transport offers
3. Transport Execution Plan permanent storage:
    a. Storage of transport demand, transport offers, bookings, and transport execution plans.
4. Logistics Planning App functionality:
    a. For LSC:
        i. Store and maintain transport demand
        ii. Search for services on Marketplace (Business Services App) to fulfil the transport demand
        iii. Fetch list of services that fulfil a certain transport demand
        iv. Start planning based on given transport demand
        v. Publish transport demand to Marketplace (Business Services App)
        vi. Convert a selected service to a booking request.
        vii. Select given services to start booking
    b. For LSP:
        i. Send the booking request to the LSP's backend system (NCL's Softship system).
        ii. Check backend booking systems (Softship) to determine whether needed capacity/service is available.
        iii. Send booking done by LSC to Softship.
        iv. The LSP should be able to resent bookings to the LSC that he wants the LSC to react on. For instance, NCL wants to resent an offer to a shipper saying that a booking has not yet been confirmed by the shipper, and that the cargo is soon to be picked up according to the plan.
    c. General requirements:
        i. Send booking/transport execution plan to execution (B2B Collaboration in WP240)
        ii. Receive Bookings from B2B Collaboration (WP240) saying that a booking in Softship has changed state from waiting list to OK.
        iii. Receive replanning trigger from B2B Collaboration (WP240).
        iv. Receive replanning trigger from LSC UI.
        v. Receive replanning trigger from LSP UI.

Note that sending booking/transport execution plan to Contract Manager App is not included in this trial, since the fish trial does not use the contracts module.

### 3.4.5 Domain Apps specific requirements

The trial envisions three domain apps to be developed to support the trial functionality:

1. The "Booking probability" app will be used to calculate the probabilities that a non-confirmed booking will be confirmed or cancelled and give an early warning about bookings that are likely to be cancelled.
2. The "Find cargo replacement" app is used to find transport demands that can be used to replace cancelled bookings.
3. The "Pricing proposal" app proposes transport prices based on e.g. booking situation and historical pricing data.

#### 3.4.5.1 Requirements for "Booking Probability" Domain App

The "Booking Probability" app is a domain specific app using LSC statistics to compute the probability of getting a confirmation for non-confirmed bookings. It can also compute the probability that an already confirmed booking will be cancelled based on tracing information of the cargo to be transported.

For the first computation (going from non-confirmed to confirmed bookings), voyage information is fetched from the Business Services app, and relevant bookings for this voyage are fetched from the Logistics Planning app. Then, actual rules that are set up for NCL must be checked, for instance, which voyages should be checked at a certain time (x hours before departure).

For the second computation (going from confirmed to cancelled bookings), the app requests cargo tracing information to find out where the cargo is placed compared to where it is supposed to be regarding the booking.

The Booking Probability app can also receive notifications on events related to bookings from the Exception Detection app (cargo, voyage, import license, loading list etc).

The actual bookings with associated probabilities are presented to NCL and used by them to achieve early warnings on missing confirmations and early warnings on possible cancellations. This makes them capable of handling changes at an earlier time, and to do replanning at an earlier time, when it is still time for it. The next step for NCL will be to request a confirmation from the LSC or to ask the Business Services app for replacement cargo to increase vessel utilization.

This app should be developed as part of the open call, with MRTK as the partner following up on this app.

#### 3.4.5.2 Requirements for "Find Cargo Replacement" Domain App

The "Find Cargo Replacement" domain app uses functionality from the Business Services app and input from backend booking systems to find replacement cargo. The app fetches actual transport demands from the Business Services app based on two different types of input:

One is that bookings from the backend booking system that have changed to Cancelled are fed into the app and matchmaking is done in the Business Services app. This will help the carrier to find replacement cargo for cancellations much easier than today. A percentage saying how well the new transport demand fits the cancellation should also be given.

The other is that the carrier wants to use this domain app to find possible cargo to fill up the capacity on a certain voyage. This is done by having this domain app fetching the available capacity from the booking system, and further by asking the Business Services app for possible transport demands that fits the voyage. The domain should also give a percentage describing the match in this case as well.

The "Find Cargo Replacement" app is very closely related to the Business Services app. Basically, what is needed is to set up two user interfaces, one to search for demands replacing cancelled bookings, similar to Figure 76, and one to find demands to fill up a vessel on a certain voyage, similar to Figure 77. In both cases, input capacities will be taken from Softship (simulated by WP300), and the request for demands will be sent to the Business Service App.

#### 3.4.5.3 Requirements for "Pricing Proposal" Domain App

An optional app that would be useful for the fish trial, is an application to be used by the LSP to propose a price on the transport offer based on statistical information regarding the booking situation, voyage details from Softship, and on historical information on prices. Since this app is not critical for the fish trial execu-

tion, it can be developed in the Open Call. However, knowledge from other pricing domain should be used here, for instance from food pricing or air freight pricing.

### 3.4.6 FIspace and FIware services to be used

#### 3.4.6.1 Requirements for B2B Collaboration (WP240)

The fish trial has the following requirements to the B2B Collaboration module of the platform:

1. The logistics planning app must notify the B2B Collaboration about new, updated, or cancelled transport plan/booking.
2. The B2B Collaboration module must be able to fetch the transport execution plan from the logistics planning app, and to follow up on the execution of the plan.
3. The B2B Collaboration module must send a replan trigger to the logistics planning app to notify the planner about a need for replanning of booking.
4. The B2B Collaboration module must pick up events related to bookings in Softship saying that the state has changed from waiting list to OK. This must be sent to the logistics planning app as a replanning trigger, since this must be handled by the LSC as a replanning action.

#### 3.4.6.2 Requirements for WP242 Event Processing

The fish trial has the following requirements regarding the set up and handling of events. These requirements can be handled by the event processing in WP242.

1. The LSP and LSC testing the fish trial need a possibility to set up the following rules:
    a. Notify NCL when an import licence for a cargo in a booking is missing 24 hours before loading starts.
    b. Notify NCL when the cargo has not been fetched at the shipper's place 12 hours before loading starts.
    c. Notify NCL when the cargo it delayed to terminal.
    d. Notify Logistics Planning app saying that a booking in Softship has moved from WaitingList to Confirmed due to the fact that NCL has updated their booking directly in Softship.
2. The domain app "Booking Probability Computation" needs input on events related to these rules, that is, the Experimentation Environment must create events conformant to these rules.

### 3.4.7 Requirements for System and Data Integration (WP250)

#### 3.4.7.1 Data Integration for SoftShip

The System and Data Integration module of the platform must handle data integration for the Softship booking system. This means that a mapping between booking formats must be done, between the booking formats of the logistics planning app and the Softship. Softship uses the IFTMIN format (EDIFACT), where the logistics planning app may use the TEP format (http://www.its.sintef9013.com/CF/v01/ ). The Softship functionality is simulated by the Experimentation Environment, and no actual system integration with Softship is needed. WP250 must be a mediator between the Logistics Planning app and the simulation of the Softship booking system done by the Experimentation Environment.

#### 3.4.7.2 System and Data Integration of Cargo Tracing Tool

As one component in computing the probability of a booking being cancelled, the Booking Probability app needs input from an AIS system that tracks vessels. Based on the vessel identification (MMSI) for a voyage, position data can be fetched from an AIS source in NMEA format. The request for position data for a vessel can be sent to ShipLog (http://www.appholic.cc/navigation/shiplog). The data can be received as an email containing an attachment with an XML file describing the AIS data. The System and Data Integration Module (WP250) must handle this interface.

As an optional part of the cargo tracing, the fish trial also can access position data for the actual fish cargo through the systems provided by Maritech (http://www.maritech.no/en/).

### 3.4.8 Use of Generic Enablers

The fish trial will not have any specific requirements to the use of Generic Enablers, and will not use any GEs directly. It is however assumed that some of the applications used in the trial may utilize GEs to meet the requirements from the trial.

### 3.4.9 Other technical requirements

### 3.4.10 Business Collaboration objects definition

The Fish trial needs the transport plan/booking to be defined as a Business Collaboration object. The state transitions should be as described in the above Figure 33. A booking is pending when it has not yet been paid for. A booking is confirmed when it is paid.

### 3.4.11 Experimentation site

The experimentation will be performed on the Experimentation Environment.

Softship, the booking system of NCL, should be simulated by the Experimentation Environment. NCL will provide real booking data that has been depersonalized.

AIS data can be fetched from directly from an AIS reception system, e.g. the ShipLog system. However, the data must be static to be sure that all cases are tested, for instance, both the case that the cargo is on track, and the opposite.

A description of a user acceptance test script to be used in the testing of the fish trial can be found in the appendx of Trial 422.

## 3.5 Trial 432 Fruit & Vegetables Quality Assurance

### 3.5.1 Experiment definition

The Use Cases that should be tested in the FFV Trial experiments are described in the following Table.

| Apps for experimentation | Scope | Actor | Priority | ID Experi-ment |
|---|---|---|---|---|
| Exchange of product and process information (forward) | The provision of information on products, processes, packaging, and production/trading sites linked to products and a physical transaction.<br>Information flow from supplier (Pfalzmarkt, Landgard) to customer (EDEKA) and RTI service provider | Trader, Retail | 1 | 1 |
| Exchange of product and distribution information (backward) | The provision of feedback information on products, packaging, and distributional issues (location, time, etc.) linked to products and a physical transaction. Information flow from customer (EDEKA) to supplier (Landgard, Pfalzmarkt) and RTI service provider | Retail, Trader | 1 | 2 |
| Management of RTI Boxes | The provision of status information on movements of RTIs | RTI Box Mgmt. | 2 | 3 |
| Certification Status Information | The provision of certification status information from a Certification Body regarding suppliers (e.g. GlobalG.A.P, Q&S) and products (Q&S). The Certification Status is linked to products originating from certified suppliers | Certification body, Retailer | 2 | 4 |

| Apps for experimentation | Scope | Actor | Priority | ID Experi-ment |
|---|---|---|---|---|
| | and a specific physical transaction by trader. | | | |
| Analytic Service Provider Integra-tion, early info provision<br>(Laboratory integration) | The provision of laboratory results is an im-portant requirement in food safety and quality guarantees. The integration of analytical ser-vice providers (laboratories) is therefore the integration of a primary source of information on the product quality status which is to be shared between actors (supplier, customer). Early arrival could be integrated into the product and process information App. (see also link to exception reporting) | Trader, Laboratory | 3 | 5 |
| Transport status Information | The transport status is an indicator for the quality of the transport process. The scope of this use case is the integration of transport service providers as primary information source for the provision of Transport Status Information to the involved actors (Supplier, Customer). *This App is dealt with through the 'Flower and Plants' trial (see also link to ex-ception reporting) but first experiments could deal with the analysis of principal fit.* | Transport service, Trader, Retailer | 3 | 6 |
| Deviation Man-agement and Exception Report-ing | The timely information on critical events or unsafe products is a pre-requisite for manag-ing food supply chains in a effective and re-sponsible way. Exception reporting in form of notifications that are send to all involved ac-tors in order to stop the distribution of unsafe products before they reach the consumer. | Trader, Retailer | 2 | 7 |
| Product and Information Marketplace | A online marketplace for products and prod-uct quality information for an improved spot-market, where products are traded together with the product-quality information. | Farmers,<br>Trader,<br>Retailer | 4 | 8 |

Table 4 Use Cases for experimentation in the FFV Trial

User Acceptance Testing is done in an twofold way; the experiments with the App should test the func-tional acceptance of the App as such and experiments with the FISpace Platform should test the ac-ceptance of the whole FISpace / FFV App concept as such.

### 3.5.2 Experiment Requirements

For experiments where the utilization of FIspace applications and their institutional and technological environment are simulated, the trial intends to provide a portable simulation environment which allows to running experiments at different locations such as meetings of stakeholder groups or at the site of participating companies in the chain including trader, transportation service, RTI service, and retail.

As described in the in the trial introduction, the information needs and interests of stakeholders circle around improvements in transparency, reductions of risks especially at retail's end, and improvements in the management of quality environmental, and societal issues regarding products and processes in production and distribution.

The trial will concentrate on the exchanges between stakeholders and the allocation and distribution of information with chain relevance along the chain. Transformation processes inside enterprises are not dealt with but are looked at as 'black boxes'.

Therefore, Experiments dealing with interfaces between legacy systems and FIspace applications are primarily of interest at stages of the food chain where information is collected and stored in legacy systems that needs to be communicated along the chain. This concerns the early stages of the chain and especially traders of fresh fruits and vegetables and to some extent providers of certification information. Participating trading companies build on Microsoft Dynamics (PFALZMARKT) and SAP (LANDGARD) legacy systems. Any one of them could provide the necessary experimental environment. GLOBAL G.A.P as one of the providers of certifications is located in the region and is prepared to open its legacy system for interface experiments.

Linkage with legacy systems at the end of the chain is only of relevance if the information pool created at the end of the chain should be channelled into the legacy system. This, however, is not a prerequisite for the applications to be used by retail.

A specific point concerns communication of trader and retail with the RTI provider. This asks for interface experiments between legacy system at trader, retail and RTI provider. Taking communication between PFALZMARKT (trader), EURO POOL SYSTEM (RTI Pool Mgmt.), and EDEKA (retail) as example, the experimental set-up would involve three companies at their respective locations. This experimental set-up is supported by the very close linkage of the developments with operational needs.

#### 3.5.2.1 Technical Requirements for Experimentation

The first experiments (paper-based) have no technical requirements. However, the functional and operation experiments require a mobile test environments including mobile PCs, Tablets or other Equipment (e.g. Scanners) which are fulfilling the basic requirements of FISpace and the FFV App. These hardware components need to be set-up in a way that allows the fast and easy presentation of the complete process of using FISpace and the FFV App. Any other material such as Pallets, RTI Boxes, Products, Labels etc. are provided by the project partners (e.g. EPS) and associated partners.

Additionally, resources are required to develop experimental interfaces:

- between the Global GAP system and the FFV Apps,
- between the Transport Service Provider and the FFV Apps,
- between the Traders and the FFV Apps,
- between the Retailer and the FFV Apps.

### 3.5.3 Business requirements

**1. Interest of retail, consumers, authorities: forward communication (FC)**

Communicating information from all stages of the chain but especially from farms for use by retail, consumers, and where relevant, for use by food safety authorities (forward communication). Information interests involve, first, information related to food origin, food safety, food quality, social concerns, and on environmental impacts (*static information*). Secondly, they include information on *deviations* in food safety, food quality or delivery status provided by early stages of the chain, by monitoring activities along the chain, or by authorities in case of food safety problems where a fast track is required to allow timely reaction by those concerned (*dynamic information*). Thirdly, and with lower priority, information interests concern the identification of potential supplies that meet certain requirements (marketplace information) in case of deviations in regular deliveries that require retail to identify matching supplies on short notice.

Serving information interests:

Traders (and the farms linked to them) could provide information on origin but also information on a specific product's quality and contaminations (e.g. from laboratories) as well as on the production process (spraying, etc.) of the individual sales product. Monitoring information could be provided by all stakeholders along the chain and especially transport services.

Certification providers such as GlobalG.A.P could provide information about farms, their production practices in general as well as information about social and environmental concerns which are part of their certification scheme. Certification providers such as Q&S could provide related information from various stages of the chain.

Trial experimentation relevance:

Serving information interests requires both, the *collection* and *provision* of information of relevance but also its *communication* between stakeholders which could build on applications that *push information* from collection sites to interested stakeholders or applications that allow to *pulling information* from where it originates. The collection of information involves as a specific complexity, an appropriate information allocation and aggregation from different sources such as farms, laboratories, traders, or certification providers. An additional trial complexity is due to the fact that the linkages between suppliers and customers may evolve from dynamically changing trade relationships in the sector's network of enterprises.

**2. Interest of traders, farms: backward communication (BC)**

Interests of traders and farms focus on transparency regarding the quality development and delivery characteristics of their products until they reach consumers. It supports their own production, quality and logistics management. As a first indication, their information interest from stakeholders along the chain and especially from retail includes information on the quality of their products at the point of sale, the time to market, storage times, monitoring results (temperature etc.), transportation deficiencies, and the location of the point of sale.

Serving information interests:

As all of this information is of relevance to retail and should reach it as part of the forward communication scheme, retail could serve information interests upon request. The same applies to any intermediary stakeholder who could provide earlier stages of the chain with information accumulated at this stage.

Trial experimentation relevance:

As a consequence, the provision of backward information does not require any collection activity that reaches beyond what retail or any intermediary stakeholder already knows but concentrates on the provision of applications that *push information* from collection sites towards the end of the chain to interested stakeholders at earlier stages of the chain or applications that allow early stages of the chain to *pulling information* from where it has being accumulated. A specific trial complexity is due to the fact that the linkages between suppliers and customers may evolve from dynamically changing trade relationships in the sector's network of enterprises.

**3. Interest of RTI service provider: Crate management (CM)**

The focus is on dispatch advises (DESADV) that inform the RTI service provider on traders' RTI deliveries with products to their customers such as retail. A confirmation on receipt of RTI deliveries with products by retail completes the 'handshake'. Organizing an electronic 'handshake' is of prime interest to all stakeholders concerned in improving efficiency. It could, in addition, provide stakeholders (as side product) with information on cleaning and on the movement of boxes with the products they carry.

Serving information interests:

An electronic handshake could provide all stakeholders with most actual information on the movement of RTIs. For the RTI service provider it's information on the whereabouts of RTIs, for traders and retailers better transparency on rental payment requirements. To this end, the RTI service provider could offer to stakeholders a stock management service. Furthermore, as dispatch advices and confirmations on receipt usually do not only include information on RTIs but also on the products carried by the RTIs, the approach allowed automated tracking of deliveries and transportation status throughout the chain and the provision of a tracking and tracing service.

Trial experimentation relevance:

The actual communication infrastructure builds on a pull situation (inquiries) by the RTI service provider. An electronic handshake scheme would change it to a push approach with traders and retail as the actors. It is being complemented by a new feedback information service (push) from RTI service provider to traders and retail on stock management and, depending on information received from traders and retail, on tracking and tracing transparency. A specific trial complexity is due to the fact that the linkages between suppliers and customers may evolve from dynamically changing trade relationships in the sector's network of enterprises.

#### 3.5.3.1 General Business Requirements

There are some basic requirements that, if not fulfilled, threaten the acceptance of any application development. They reach beyond individual applications and are outside the specific trial experiments. However, FISpace must provide functionalities that serve these requirements.

They involve amongst others:

**1. Data Ownership (Access Rights Management)**

The preservation of data ownership is a critical issue. Data are usually owned by those who collect them. FISpace must recognize data ownership by providing functionalities that allow data owners to *manage access rights*.

**2. Data localization**

Trust in data security is of major importance to industry. Traditionally own data are kept within the boundaries of an enterprise which allows enterprises to 'unplug' connection to the outside world. **The FISpace approach must recognize this need and provide a network configuration with functionalities that allow enterprises to keep business data within their boundaries**. Storing business data in the cloud might be an emerging trend and could be realized as an option but a solution solely built on data management through cloud services will at this time not find broad acceptance among users.

**3. Confidentiality (tracking and tracing)**

In realizing tracking and tracing solutions in chains that reach beyond a single supplier-customer relationship, one might want to develop a tracking and tracing tree. The development of such a tree for use outside life threatening situations will not be accepted by industry as it displays business relationships. An exception are closed network situation like e.g. to be found in certain sector domains such as in certain organic food production systems. An appropriate solution would build on a tracking and tracing tree that is created when needs arise and with the agreement of all partners involved (protection of confidentiality). FIspace should develop a functionality that *creates a tracking and tracing tree* by stepwise linking up with individual businesses ('one step up, one step down').

**4. Decentralization/Integration (bridge)**

Enterprises in a sector as a whole and across countries will not accept a central system management in the hands of an individual management group. FIspace must build on a network configuration with functionalities (***bridges***) that allow interconnectivity between different enterprise clusters with their own management or individual enterprises and be open for the accession of newly emerging groups from anywhere in the world.

**5. Privacy control (notification)**

Notifications and exception reports require agreements from potential recipients who might have different interests in being informed (apart from health threatening deviations). FIspace must provide functionalities that allow the *specification of notification needs* by potential recipients.

| App related features for Experimentation | Scope | Actor | Priority |
|---|---|---|---|
| Data Access rights | Functionalities that support protection of data ownership: | All stakeholders | 1 |
| Localization | Network functionalities that allow data to be kept locally | All stakeholders | 1 |

| | | | |
|---|---|---|---|
| Tracking and tracing tree (backward) | Functionalities that allow creation of a tracking and tracing tree (backward) if need arises (food safety) or upon agreement | All stakeholders | 1 |
| Bridges | Functionalities that allow linking up of enterprise clusters with FISpace (**bridges**) | All stakeholders | 2 |
| Notification | Functionalities that allow the *specification of notification needs* by potential recipients | All stakeholders | 2 |

Table 5 App related features that are a prerequisite for system acceptance

### 3.5.3.2 Functional requirements

The functional requirements are grouped in accordance to the main groups of tasks that need to be accomplished in the workflow. A simplified workflow in a FFV chain, not taking into account a network structure but a straight chain can be generally understood as presented in the following Figure 34. The actors in the chain are providing sequentially the products from one step to the next step in the chain. At the same time, they are providing access to information – feed-forward and feedback.

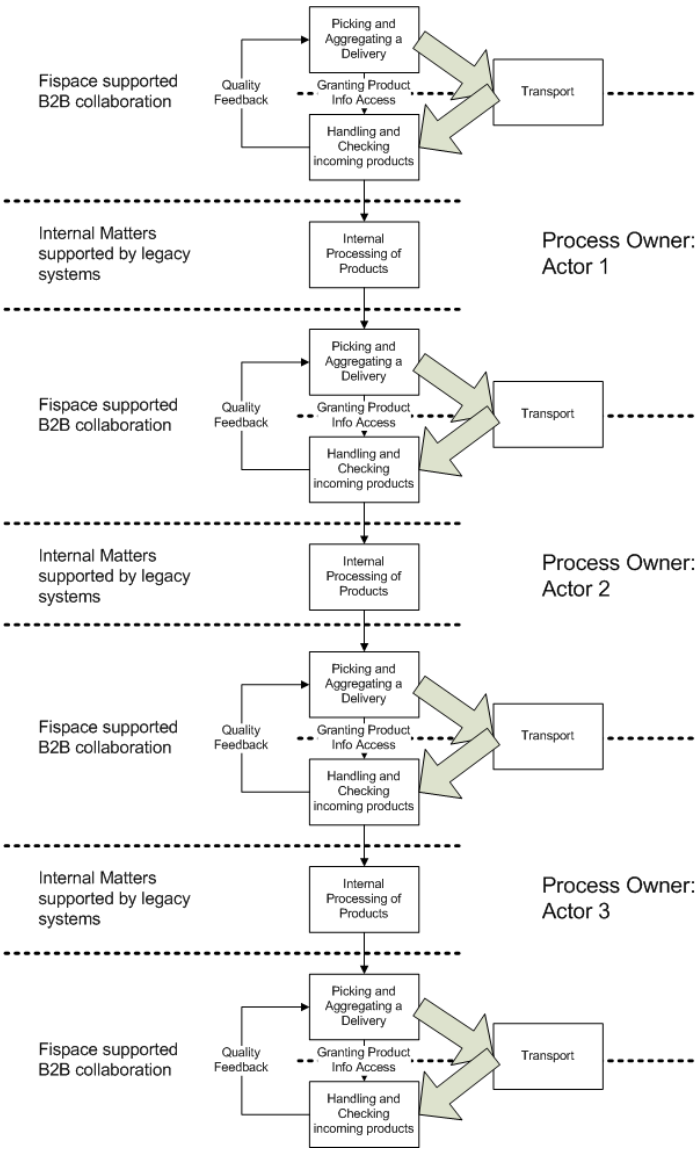



Figure 34: Simplified straight forward supply chain view.

Figure 354 identifies for each cooperation between a supplier and the subsequent customer an interaction that includes the physical handling of the product as well as the granting of access rights to product related information. This element in the overall workflow can be considered as a repetitive procedure that shall be supported by a FIspace App to facilitate on the one hand the direct business collaboration be-

tween those two process owners, while representing the prerequisite to enable the access via the FIspace app through the overall chain and finally even through an overall complex network. Such a "***FIspace supported B2B collaboration***" is further detailed in the following flowchart in figure 8. On top of that, it is defined as a loop that can continue as long as a product travels through the supply chain/supply network. One loop starts with forwarding of produce at e.g. Actor 1 and ends with the reception by Actor 2. If the loop continues, the start is carried out by Actor 2 and continues to Actor 3 and so on. As an add-on it also includes the RTI (returnable transport item) provider that remains the same and takes care for a clearing of boxes the different actors are currently having at their site.

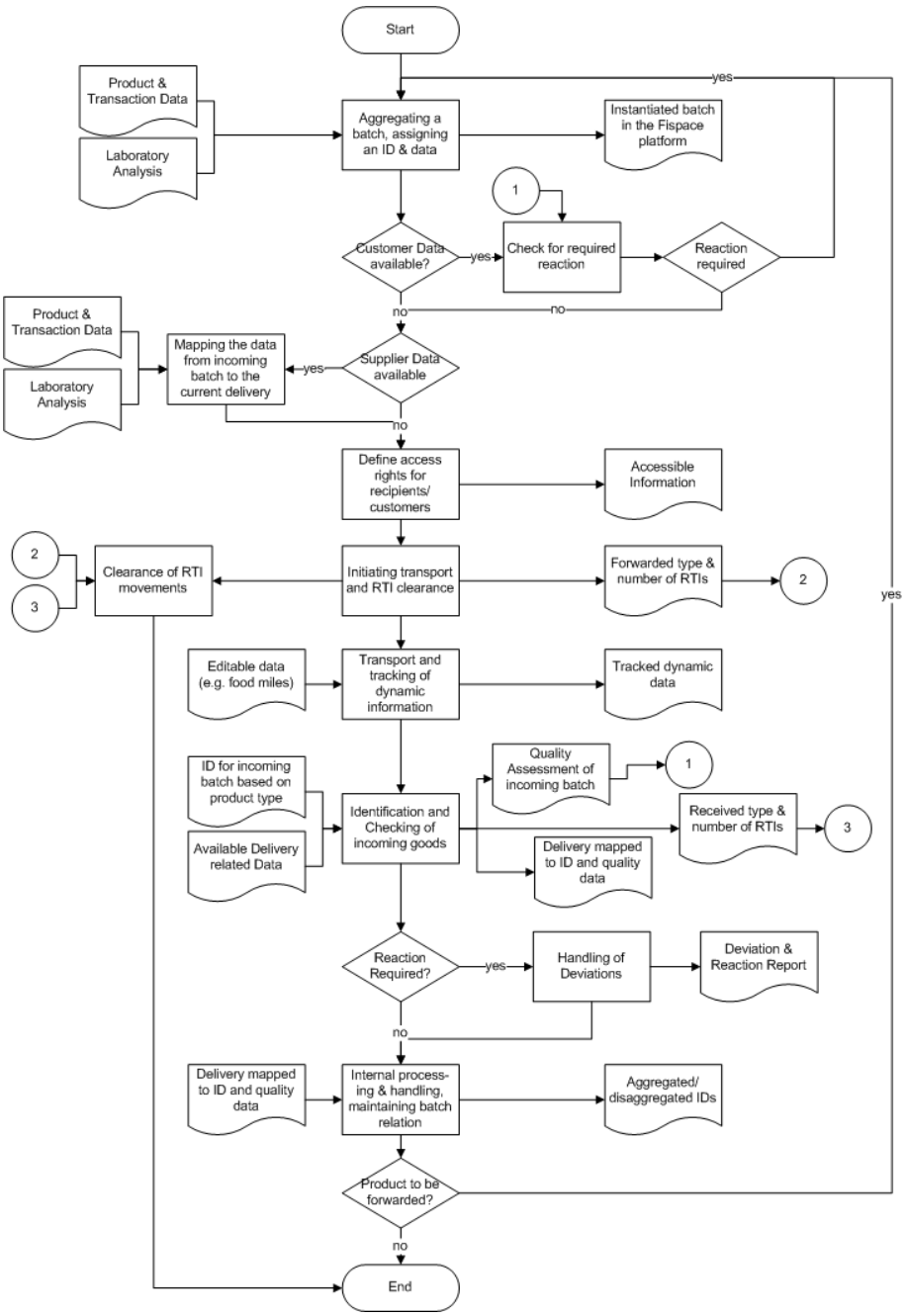



Figure 35: Detailed view on the "FISpace supported B2B collaboration", identifying main groups of tasks that shall be accomplished and supported in the FFV trial.

The different tasks that need to be accomplished in the workflow (see figure 8) were used to structure the description of the functional requirements. The following table further details the requirements.

| ID | Requirement | Description |
|---|---|---|

| | | |
|---|---|---|
| FFV-01-01 | Aggregating a batch, assigning an ID & data | The FIspace app shall support the virtualisation of the delivery, the unique identification of the delivery (or parts of it), and finally assigning product data as well as results from laboratory analysis that shall be published to customers. |
| FFV-02-01 | Check for required reaction | The feedback provided by customers is analysed according to specific rules. As soon as a situation arises that might have an impact on future deliveries, related reactions are initiated to avoid negative feedback/ issues with the same or other customers. |
| FFV-03-01 | Mapping data from incoming batch to the current delivery | It needs to be checked if there is information available from own suppliers and if it is of use to make it available to own customers. To enable this, the mapping of incoming and outgoing goods needs to be made |
| FFV-04-01 | Define access rights by recipients/ customers | The supplier of the produce shall be enabled to define the access rights for all the data that is provided to its customers |
| FFV-05-01 | Initiating transport and RTI movement declaration | The transport organisation is informed about the data that shall be tracked during transport or being provided to the supplier and/or customer. The start of transport is communicated and the amount of sent RTIs is forwarded. |
| FFV-06-01 | Processing of RTI movements | The movement of RTIs along the chain are monitored and the required payments with respect to the deposits are identified. |
| FFV-07-01 | Transport and tracking of dynamic information | The transport provider is enabled to track and publish relevant information to the supplier and customer. This is part of the backward information. |
| FFV-08-01 | Identification and Checking of incoming goods | The incoming delivery is uniquely registered and checked as prerequisite for the internal processing in the organisation. |
| FFV-09-01 | Handling of Deviations | Using the results of the incoming goods check and the data delivered by the supplier it is decided, if a deviation needs to be handled. |
| FFV-10-01 | Internal processing & handling, maintaining batch relation | The mapping of incoming deliveries, unique identification, supplier relation and related product information can be accessed at any time. |

Table 6 Functional Requirements for the FFV App

### 3.5.4 Match with baseline Apps functionalities

It is expected that the FIspace baseline apps will provide essential features for the FFV trial and its domain specific apps. Three baseline apps were identified that would be useful or even essential for covering requirements of the trial:

#### 1. Product Information Service:

The product information service will be used in almost all domain related apps in the FFV trial. The baseline app shall provide the underlying functionality to enable access to product information generated/ offered by the stakeholders in a supply chain and towards the final consumer, based on the B2B collaborative and system integration capacities offered by the FIspace platform.

System and data integration as well as security, privacy and trust will play a major role in this service to assure that the access to product information is highly secure as well as easy customisable.

**2. Logistics Planning Service:**

The planning service could be used for planning product transports and supply of RTIs (i.e. Returnable Trade Items). It shall enable stakeholders to communicate forecasted time of product arrival or to facilitate a re-planning in case of deviations. Furthermore, this service can ease the pool management of RTIs along the whole supply chain for clearance of RTI movements for reimbursing the deposits.

**3. Workflow/Event Processing Engine (i.e. baseline app or provided by Task 240):**

This baseline app shall provide the monitoring of goods and transport and enable actors to track and trace products to be aware of their status. The exception handling will be an important mechanism to communicate deviations and exceptions to all involved business partners. By notifying the related actors immediately concerning any urgent issue, they will be able to react accordingly.

Specifically the event processing and publish/subscribe mechanisms to detect deviations and inform actors are considered as main features.

### 3.5.5 Specific domain Apps required

The following Apps are required for achieving the previous stated improvement in the communication of product- and process-related information forwards and backwards in the fruit and vegetable chain. The different Apps represent different improvement issues that are linked to a uniquely identifiable transaction (e.g. a delivery of products). Based on the transaction identification, different information packages (Product Quality Information, Product Quality Feedback, Laboratory Results for products in the delivery, Transport Status Information) could be linked and additionally evaluated for deviations.

#### 3.5.5.1 Product Quality Information (forward communication)

The target group of this App are traders, which want to provide additional product-related information on their products linked to a specific delivery to their various customers (retailers). This product-related information is primary collected at the agricultural production stage and has to be forwarded through the chain to retail. Usually, a delivery of products between traders and retailers is an aggregation of different deliveries from different farmers. The idea of the App is that it virtualises and handles deliveries between single actors in the chain and enables the forwarding of product quality information linked to a specific physical transaction.

#### 3.5.5.2 Product Quality Feedback Information (backward)

The target group for this App is the customer side of the delivery and is the opposite of the previous App. The scope of this App is to enable the provision of product quality feedback information to suppliers in order to support supply chain integration and improvement activities at the supplier side of the transaction.

#### 3.5.5.3 Transport Status Information

The access to Transport Status Information is considered as a tremendous challenge for actors in all sectors because of the various transport service providers facilitated for physical transport of goods. Transport Service Providers operate highly sophisticated systems to monitor their transports and follow various regulations for the transport of different goods. The data is usually collected in legacy systems at the Transport Service Providers. This information is of relevance for all chain actors (Farmers, Trader, Retailer, RTI Pool Management). The purpose of this App is to link Transport Status Information (published e.g. as a Service from the Transport Service Providers) to the chain actor specific transactions in order to make it accessible for all involved parties.

#### 3.5.5.4 Pool Management of Returnable Packaging Items (RTI Boxes)

The efficient management of RTI Boxes is critical for the distribution of fresh fruits and vegetables. This holds true especially during the peaks in the seasons when RTI boxes are allocated to farmers all over Europe. The purpose of the App is the improvement of the management of RTI Boxes by improving the electronic communication between chain actors and the pool management organisation. The App's primary objective is to automate the declaration on movements of RTI Boxes or Pallets between chain actors and the pool management in order to optimize stock and distribution planning. This is especially important in clearing or time-based rental concepts, where the costs for an RTI are calculated in relation to

the time this item is staying in a specific company. The declaration of a RTI movement (from Actor A) and the confirmation that this RTI movement is completed (from Actor B) are therefore essential parts of the delivery process. This App is also linked to the physical transaction describes in the Product Quality Information provision, since the RTI Boxes are carriers of identification information and the product as such. Additional functionalities such as “Scan-to-Order” (Scan a code on an RTI Box for re-ordering) or “Notifications on RTI Box arrivals”, where Transport of RTI Boxes are delayed or cancelled.

#### 3.5.5.5 Certification Status Information

The evaluation of the Certification Status of suppliers is a crucial element of risk management of retailers. The certification of agri-food companies according to different sets of requirements from different certification bodies is a pre-requisite for the marketability, food safety and quality of fresh fruits and vegetables for most retail organizations. The App is based on the information on the origin of products provided in a specific delivery. This information on the suppliers and the origin of the product is checked against the certification database of a certification body. In the FFV Trial this role is represented by GlobalGAP, a certification body that certifies Good Agricultural Practice (GAP) which is managing the status of certified farmers.

#### 3.5.5.6 Analytic Service Provider (Laboratory) Integration

The integration of additional service providers or other involved actors is a challenge because of linking additional services to an existing transaction. The integration of an analytic service provider (Laboratory) is envisaged in order to import laboratory results concerning products handled in a physical transaction. Usually, these laboratory results are transferred via e-mail or traditional mail services to the contractor (Trader or Retailer). In order to speed up the process, this App should offer an integration option to the existing product quality information data sets. Traders and Retailers contract laboratory analysis services for quality control purposes. The laboratory creates a reference number and takes product samples from fields or warehouses for analysis. The samples are examined and results are created for this specific reference. This laboratory reference can be mapped to one or more deliveries from a supplier.

#### 3.5.5.7 Deviation Management and Exception Reporting

The deviation management and exception reporting is the most crucial point for our stakeholders. The role of the App is to provide functionality that compares the as-is product and process quality status, represented by all previous information packages, with actor specific expectations and requirements for products and the distribution process. Based on this evaluation, exception notifications (so called exception reporting) are send to all relevant actors involved in distribution process, which also includes possibly other chain actors that received products from the same source. These notifications have to be spread along identifiable transactions containing the same product from the source (often a uniquely identifiable farmer).

#### 3.5.5.8 Marketplace for fresh Fruits and Vegetables and Product Quality Information

The idea of an online marketplace for products is nothing new in the FFV sector. Many online marketplaces failed in the past, because the products offered were not tangible enough regarding product quality and therefore the concept failed. The same holds true for auctions, which are losing of importance in the past years for the same reason. The current rate of seasonal contracts, which allow way more influence on the supplier, compared to short-term contracts is approximately 70:30. However, the importance of these short-term contracts is still high, due to uncalculatable impacts on the availability of products. The aim of the Marketplace App described here should therefore enable the offering of products within a network of known suppliers and customers that know each other together with the product quality information available. The marketplace is therefore not only the management of the transaction itself, but also can include buying product information for the offered product as an additional item, or provide the product quality information right away together with the product offer. The App filters product offers according to specific product requirements (e.g. packaging in RTI boxes + pesticide level under 70% of the legal allowed borders) and provides matching product offers to the user.

### 3.5.6 Other Technical Functionalities

The basic requirements were highlighted in the sections before. There are some other technical requirements that are relevant especially with respect to the real world environments of the envisaged stake-

holders. They are shortly outlined in the following, while their importance is of limited relevance in the initial experimentation settings. In later stages of experimentation also aiming at a closer integration with operational systems, the following requirements need to be taken into account:

- Auto-ID infrastructures: At certain locations, there are auto-ID solutions installed that are identifying events and uniquely identifying objects in the workflow. Installations include scanners (i.e. mobile hand scanners, fixed scanners), printers, displays and back-end integration.
- Implemented standards: The actors in the FFV chain are generally using the UN/EDIFACT standard (i.e. especially DESADV for dispatch advice messages) as well as GS1 standards for unique identification and information exchange.
- Harsh environments: Device related technology that shall finally support the business processes need to comply to the requirements of harsh environments in terms of temperatures and humidity.
- Mobile autonomous devices need to be used within the process, while specifically dynamic business relationships and changing actors need to be supported. Specifically the apps itself shouldn't require long installation procedures (e.g. a truck driver can download an app, easily configure and directly enter in a interaction within the supply chain).
- Permanent Internet connectivity cannot be guaranteed, especially in warehouse and transport environments. Envisaged solutions need to allow user interactions also in offline situations.

### 3.5.7 FISpace and FI-Ware services

Different sources of services and applications will be discovered to provide required functionality to the open call application developers in this trial. This pool of functional components consists of

- 2nd release of Generic Enablers (GEs) provided by the FI WARE project,
- platform services provided by FISpace platform - WP200 and
- baseline applications provided by FISpace platform - WP400

Additionally IoT resources and external systems will be considered.

Table 7 shows specific applications considered within the scope of the FFV trial. Different types of components will be used for implementation. The GEs are software components partially used by the FIspace services and also integrated in the Baseline Apps. Based on the given functionalities provided by the Baseline Apps and enabled by the GE and FIspace services the app development will take place.

App developers will have access to functionality provided by the FISpace platform via a development toolkit created by WP200.

| **Use Cases (see Appendix)** | **Functional Requirements (see Section 3.5.3.2** Error! Reference source not found.**)** | **Collaboration Objects/ Information** | **Generic Enablers (F IWARE project)** | **FIspace Services (FIspace - WP200)** | **Baseline Apps (FIspace - WP400)** | **IOT (e.g. sensors, RFID)** | **External ICT (e.g. legacy systems)** |
|---|---|---|---|---|---|---|---|
| Product Quality Information<br>Product Quality Feedback Information | Aggregating batches, assigning IDs and data<br>Identification and Checking of incoming goods<br>Mapping product data to deliveries<br>Define access rights for recipients/ customers<br>Discovery of available data from suppliers | Batch Instantiation within FIspace platform<br>Quality analysis reports<br>Information accessible by value or link | Complex Event Processing GE<br>Mediator GE | Front-End, FIspace store<br>B2B Collaboration Core<br>System & Data Integration<br>Security, Privacy and Trust | Product Information Service | Products' Packaging<br>t.b.d. | Several Information systems along/within the supply chain/network<br>t.b.d. |
| Transport Status Information<br>Deviation Management and Exception Reporting | Discovery of available data from customers<br>Check for required reaction<br>(Initiating Transport and RTI clearance)<br>Transport and Tracking of dynamic information<br>Handling of De- | Tracked dynamic data accessible by value or link<br>Deviation and reaction reports | Complex Event Processing GE<br>Mediator GE<br>Publish/Subscribe Context Broker GE | Front-End<br>FIspace store<br>B2B Collaboration Core<br>System & Data Integration<br>Security, Privacy and Trust<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | Product Information Service<br>Planning Service<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | Transport units/ vehicles<br>t.b.d. | Several Information systems along/within the supply chain/network (Especially transport solution providers' information systems)<br>t.b.d. |

| **Use Cases (see Appendix)** | **Functional Requirements (see Section 3.5.3.2** Error! Reference source not found.**)** | **Collaboration Objects/ Information** | **Generic Enablers (F IWARE project)** | **FIspace Services (FIspace - WP200)** | **Baseline Apps (FIspace - WP400)** | **IOT (e.g. sensors, RFID)** | **External ICT (e.g. legacy systems)** |
|---|---|---|---|---|---|---|---|
| | viations and Exceptions | | | | | | |
| Pool Management of RTIs | Clearance of RTI movements<br>(Initiating Transport and RTI clearance)<br>Transport and Tracking of dynamic information | Received and forwarded RTIs | Complex Event Processing GE<br>Publish/Subscribe Context Broker GE | Front-End<br>FIspace store<br>System & Data Integration<br>Security, Privacy and Trust<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | Planning Service<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | RTIs<br>t.b.d. | Several Information systems along/within the supply chain/network (Especially RTI providers' information systems)<br>t.b.d. |
| Marketplace for Product Quality Information | Define access rights for recipients/ customers<br>Discovery of available data from suppliers<br>Handling of Deviations and Exceptions | Batch Instantiation within FIspace platform<br>Quality analysis reports<br>Information accessible by value or link<br>Tracked dynamic data accessible by value or link<br>Deviation and reaction reports | Marketplace GE<br>Mediator GE<br>Publish/Subscribe Context Broker GE | Front-End<br>FIspace store<br>B2B Collaboration Core<br>System & Data Integration<br>Security, Privacy and Trust<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | Product Information Service<br>(Real-Time Monitoring/ Track & Trace/ Exception Handling) | Products' Packaging<br>Transport units/ vehicles<br>t.b.d. | Several Information systems along/within the supply chain/network<br>t.b.d. |

Table 7 Identification of Components to be tested and used in the experimental Setup

### 3.5.8 Experimentation site

The trial has various experimental sites where experiments can be run with participation of stakeholders. We distinguish between different types of experiments:

1. Experiments where the utilization of Apps and their institutional and technological environment are simulated, and
2. Experiments where interfaces between existing legacy systems and FIspace applications are the focus of interest.

The associated partners (=testers) in the FFV trial are located within two small areas within the regions Cologne/Bonn (City of Bornheim) and Mannheim (City of Mutterstadt) which facilitates communication, prototype testing and prototype discussion. Within the project, both regions form a type of experimental 'living lab', where the experiment meetings and events will be carried out. The standardization partner GS1 who is running a 'Knowledge Centre' for Supply Chains and Standards forms an adjacent 'living lab', which offers potential to test the FFV App in an experimental supply chain environment. The location of the 'Bornheim cluster' including adjacent communication partners such as the University of Bonn with its experimental farms which deliver products to participating traders is outlined in Figure 36.

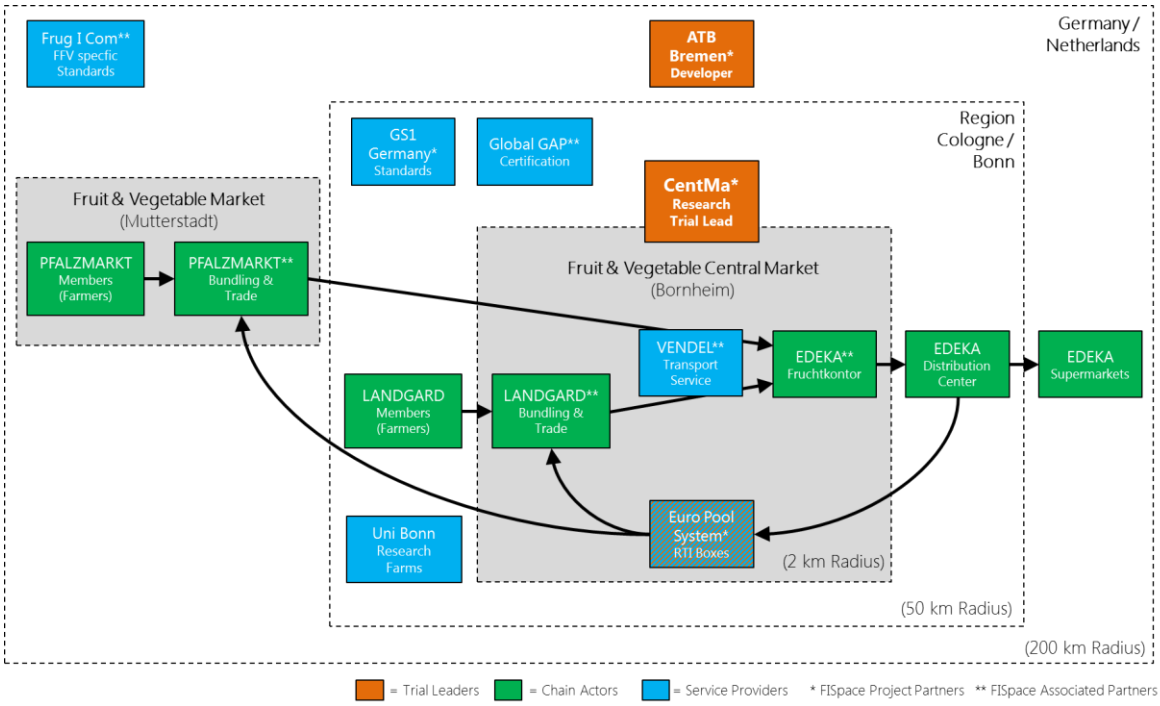



Figure 36: Localization of trial participants and experimental sites

## 3.6 Trial 433 Flowers & Plants Supply Chain Monitoring

### 3.6.1 Experiment definition

The scope of the trial is a plants supply chain from production to retail, including the following locations: Grower greenhouse (GLN), Grower outbound dock (GLN), truck on road to trader (GPS), Inbound dock trader (GLN), CC-trolley conversion area (cross-dock), Outbound dock trader (GLN), Truck on road to retail store (GPS) and Retail store (GLN).

The most important units for tracking and tracing logistics in the plant supply chain are potted plants (individual product level), plant tray (kind of box dedicated for pot plants), CC-trolley and conditioned container (see the Figure below).

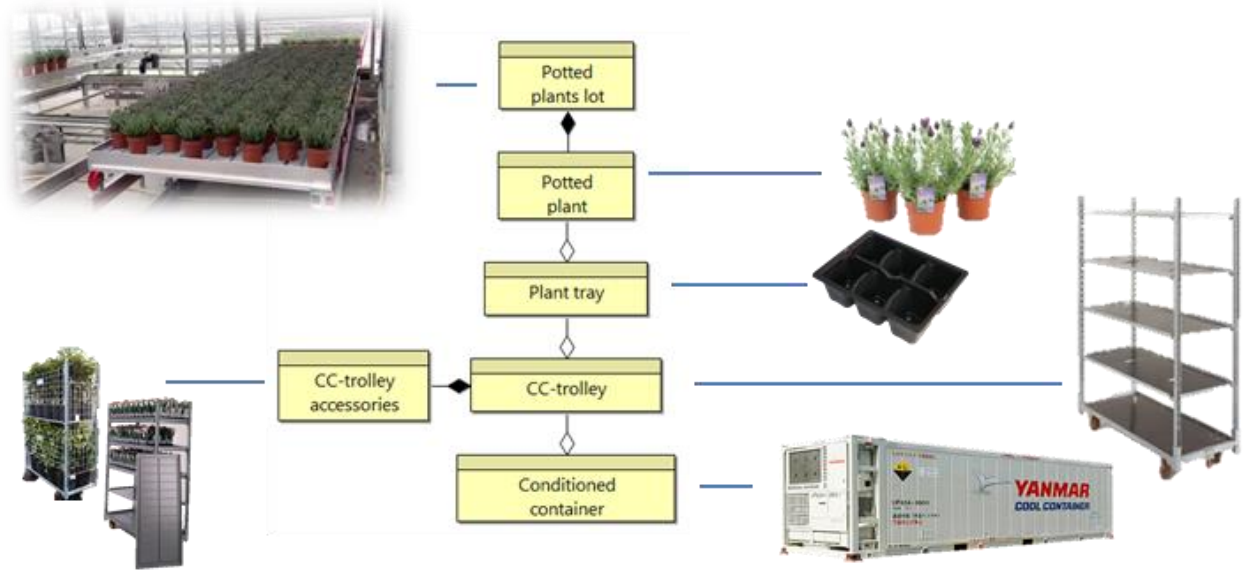



Figure 37 Main Relevant Traceability Units

To be able to track the items through the plant supply chain, the items have to be traceable. The items therefore are equiped with the following unique identifiers:

- Potted plant: Potted plant label with barcode (GTIN)
- Plant tray: Plant tray UHF RFID tag (GTIN)
- CC-trolley: CC-trolley UHF RFID tag (GRAI)
- Conditioned container: Container shipped by a truck with GPS ID
- Lot Batch of plants ordered by a specific customer (SSCC)

The planned experiments are within this trial are summarised in the figure below:

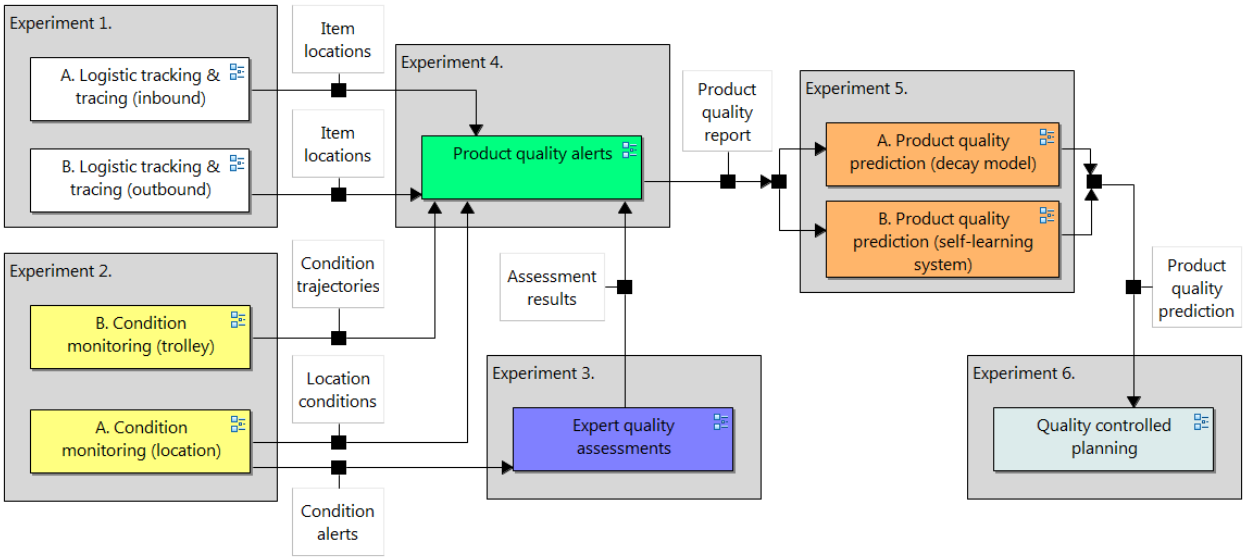



Figure 38 Summary of the Planned Experiments

**Business requirements**

:

| Experiment | Business Requirement | Business Benefits |
|---|---|---|
| Experiment 1.Logistic tracking and tracing (inbound and outbound) | It must be possible to track and trace flowers and plants from producer to retail stores on the level of items, batches/lots, trolleys and shipments. | More efficient logistic processes leading a reduction of lead times and a better logistics capacity utilization (including reduction of transport kilometres) |
| | It must be possible to check the trolley's authenticity logistics anywhere in the supply chain | Reduce the number of illegal trolleys |
| | It must be possible to monitor Returnable Trade Items (RTI's) | Transparent RTI management leading to reduction of RTI losses |
| Experiment 2.Condition Monitoring (locations and trolleys) | It must be possible to monitor the environmental conditions at a particular location (in particular warehouses and trucks) in the supply chain | Rapid correction of condition deviations resulting in less waste, better product quality |
| | It must be possible to monitor environmental conditions of flowers & plants during its journey through the supply chain | Rapid correction of condition deviations resulting in less waste, better product quality |
| Experiment 3.Expert Quality Assessments | It must be possible to access expert quality assessments of quality of products by quality experts in various positions of the supply chain. | Better insight in the product quality along the supply chain resulting in more sophisticated quality management. |
| Experiment 4. Product Quality Alerts | It must be possible to monitor the relevant condition parameters of flowers and plants from producers to retail stores | Rapid correction of condition deviations resulting in less waste, better product quality |
| Experiment 5 Product | It must be possible to predict quali- | Prevent waste in the future and in- |

| | | |
|---|---|---|
| Quality Prediction | ty decay of flowers & plants | crease product quality for the end consumer |
| Experiment 6 Quality Controlled Planning | It must be possible to reschedule logistics based on up-to-date quality information. | Prevent waste in the future and increase product quality for the end consumer |

Table 8 The overall business requirements of the planned experiments are as follows

More specifically the experiments will address the following issues:

#### 3.6.1.1 Item tracking and tracing

The first experiment of this trial aims at the realisation and testing of tracking and tracing of items. Items in that experiment include products, but also load bearers and the components from which the load bearer was built up. This experiment is first carried out for the handling of inbound logistics from the traders point of view and after that for the outbound logistics.

In the inbound part of the experiment trolleys are build up with potted plants at the grower and transported to the trader. The associated locations in which the items consecutively reside are the grower's greenhouse and docking, the conditioned container that brings the products from point A to B, and the trader's inbound docking. The experiment should support the following activities: pick plants from lot, put plants in tray, build up trolley with accessories, put trays on trolley, place trolley in docking, accept trolleys, place trolleys in conditioned container, transport container from grower to trader, deliver trolleys at trader, check authenticity of trolley, check accessories of trolley, check items on trolley and accept trolleys.

In the outbound part of the experiment 1b the plants that were delivered to the trader are redistributed over retailer trolleys which are transported to the retailer stores. The associated locations in which the items consecutively reside are the trader's inbound docking, conversion area, outbound docking, the conditioned container that brings the products from point A to B, and the retailer shop. The experiment should support the following activities: build up retailer trolley, redistribute plants from delivered trolleys over retail trolleys, place trolley in outbound docking, accept trolleys for transport, place trolleys in conditioned container, transport conditioned container to retailer shop, deliver trolleys at trader, check accessories of trolley, check items on trolley and accept trolleys.

#### 3.6.1.2 Condition Monitoring

The second experiment runs in parallel to the first and tries to establish measurements of conditions that influence quality of products. Norms for conditions will be established and if norms are violated quality experts and responsible work floor managers can be notified.

In the first part of the experiment the environmental conditions that influence product quality are measured at specific supply chain locations. There will be placed temperature and relative air humidity sensors at the warehouse location of the trader and in the trucks of the transporter. The experiment should support the following activities: measure and report location conditions.

In the second part of the experiment, condition sensors will be attached to the CC-trolley, thereby gathering data about the conditions through the entire supply chain locations including the trans-shipment points. The experiment should support the following activities: measure and report trolley conditions.

#### 3.6.1.3 Expert quality assessments

In this experiment data on the assessment of quality of products by quality experts are made available so it can be used in later experiments. The quality inspections take are done at the grower, trader and retail shop. Also consumers should be able to communicate their feedback about the quality of specific products. This experiment should support the following activities: register and report product quality, determine deviations and respond to negative quality report.

#### 3.6.1.4 Product quality alerts

In this experiment the realised data flows of the first three experiments are combined to generate product specific quality notifications and product specific quality overviews. This is done by all actors of the supply chain. The experiment starts with constructing the trajectory of quality conditions on trolley level based on

the Tracking and Tracing information and the condition information of the different locations in the supply chain. This constructed trajectory is then validated and completed by the condition information of sensors that are attached to the trolleys. The next step is integrating the validated trolley condition information with the quality assessment reports in an item quality report. This report includes all relevant quality information of specific quality items and is the basis to create alerts. The Figure below provides an overview of the experiment.

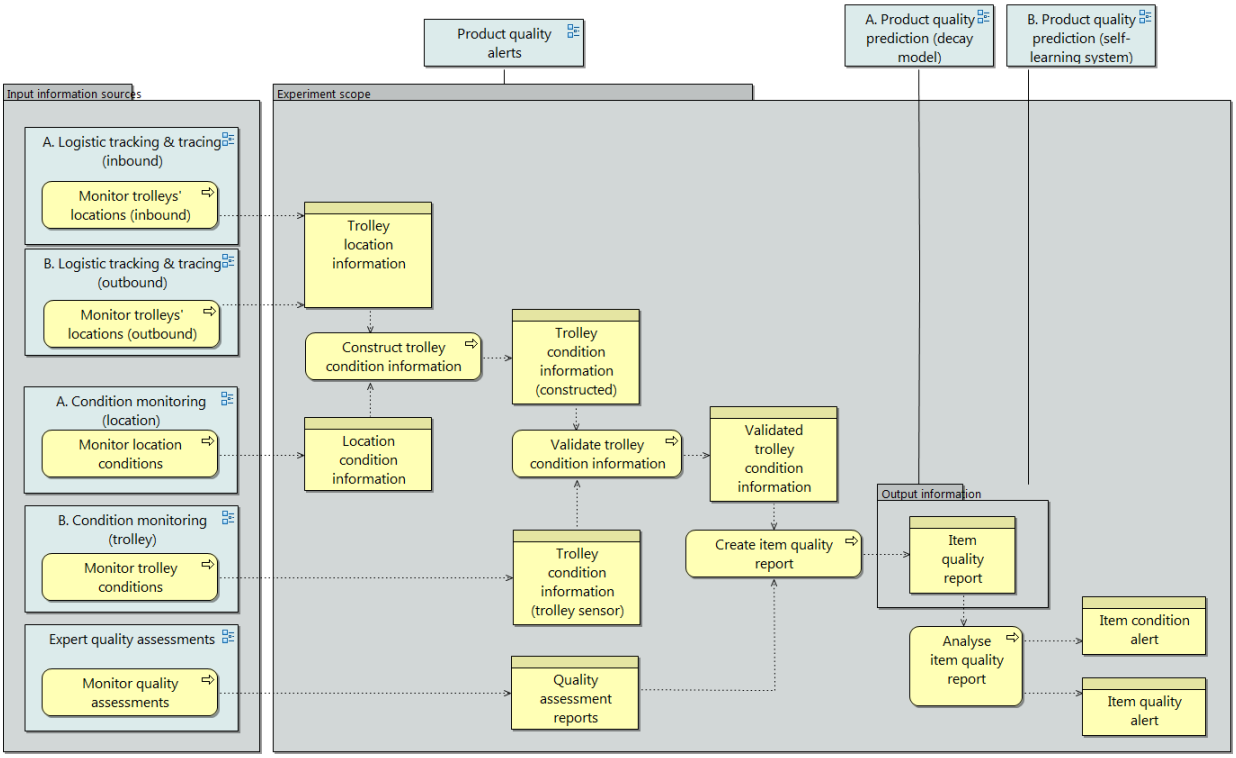



Figure 39 Overview of experiment 4 'Product Quality Alerts

### 3.6.1.5 Product quality prediction

The overviews of historic events and gathered data are used in the fifth experiment, with the help of quality decay algorithms and trend lines, to develop product specific quality predictions and alerts based on expected quality issues. This experiment starts with the Item quality report that was generated in the previous experiment as an input. Reports like these will be created for a selection of genus/species types. For the same selection cultivar variety specific quality decay algorithms will be formulated. By combining the information from the item quality report and the algorithms, quality decay forecasts can be determined. In the subsequent analysis the forecasts are analysed and alerts are created if norms are expected to be violated.

### 3.6.1.6 Quality controlled planning

In the sixth experiment the product quality alerts and quality predictions are used to update logistics planning . The relevant supply chain planning systems include cultivation plans (grower), demand planning (all), distribution requirements planning (trader), network planning (all), transportation plans (transporter) and replenishment plans (retailer). However, the experiment will focus on updatng transportation plans based on quality information and if feasible also distribution requirements planning.

## 3.6.2 Match with baseline Apps functionalities

The trial needs functionalities of the following baseline apps.

### 3.6.2.1 Product information service (PiS) baseline app

This baseline app is needed for the exchange of product related data that are not generated in logistics events. More specifically the required functionalities include:

- *Create, update or consume information*: stakeholders throughout the flowers and plants supply chain want to share logistic information, e.g.:
  - Growers want to share either lot-specific or product-representative photographs of the produce with all stakeholders in the chain;
  - Growers will record and share from which lot a specific product was picked, variety, product code and provide other basic product information;
  - The quality inspection company will gather expert quality assessments of samples of product at different locations in the chain (quality inspections).
- *Correct or modify information:* stakeholders want to automatically update the information regarding the quality characteristics of the products, as this information is continuously collected during the product's journey through the supply chain. One should think for example of sample product quality assessments by experts or environmental conditions trajectories.
- *Knowledge*: a stakeholder from the flowers and plants trial requires insight in the quality characteristics of a specific product via a quality summary with traffic light views on the compliance to norms. In the flowers and plants, chain information about the quality conditions of products should continuously be monitored and compared with norms for the optimal conditions (e.g. temperature, air humidity, light intensity) to keep plants. For example, the temperature norms for some varieties are given in the table below. Also, if norms are violated in the chain the responsible stakeholder has to be notified with an alert.

| | Temperature (°C) | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variety name** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Min | Max |
| Amaryllis | | | | | | | | | | | | | | | | | | | | | | 2 | 4 |
| Hippeastrum | | | | | | | | | | | | | | | | | | | | | | 2 | 4 |
| Calceolaria | | | | | | | | | | | | | | | | | | | | | | 2 | 5 |
| Crocus | | | | | | | | | | | | | | | | | | | | | | 2 | 5 |
| Cyclamen | | | | | | | | | | | | | | | | | | | | | | 2 | 5 |
| Dianthus | | | | | | | | | | | | | | | | | | | | | | 2 | 5 |

Figure 40 Example of temperature norms for plant optimal conditions

### 3.6.2.2 Logistics Planning Service Baseline App

Experiment 6 "Quality controlled planning" will be based on the Logistics Planning Service Baseline App. The required functionalities include:

- Traders need to be able to define a distribution planning which leads to requirements for transport demand. Relevant factors are the available supply of products at growers that are under contract (including quality characteristics), the demand of specific retail stores (including quality characteristics), the details of the contracts with growers and retailers, the current contract fulfillment status of the parties involved. Based on these factors the distribution planning is created
- It should be possible to formulate a set of logistic demand descriptions (LDDs) from the distribution planning and set priorities.
- It should be possible to publish the LDDs on a marketplace or something similar so that transporters can respond to the demands.
- Transporters should be able to setup a transportation plan for specific LDDs;
- *Re-planning and re-scheduling*: stakeholders from the flowers and plants chain want to be able to re-plan and reschedule a logistics transport plan so that events and changes reported on the execution are taken into account.
- *Quality controlled planning*: a flower trader want to receive notifications when the current quality of products in a certain shipment is below the norms that are set by the (high end) retailer involved.
  - He should be able to check the existing booking, and if the service cannot be completed within the new conditions a new (lower end) destination for the flowers is selected.
  - He should be able to check if the original booking can still be satisfied with a new shipment and if so plan the new shipment otherwise cancel the booking.
  - He should be able to do changes related to the cancelled booking (changes in loading list, changes in discharge list etc.)

### 3.6.2.3 Real-time Business SLA Management Baseline App

The required functionalities of this baseline app include:

- *Contract insight*: stakeholders from the flowers and plants supply chain require insight in the contracts they have with partners from the chain, including:
  - The online access to SLA of any stakeholder with any other stakeholder in the chain (note that this will require examination of privacy issues to implement)
  - The management of information in the SLA of a stakeholder so that this information can be shared downstream of his business operation
  - Real-time and online access to SLAs of agreed contracts
- *SLA analytics and business operation improvement*: Business partners from the flowers and plants supply chain want to receive analytics about their SLAs to use this information to improve their business operations.
  - Growers of flowers and plants want to receive reports that indicate violations of the quality norms of the product set by the retailer, which are created by quality assessment experts before the products are shipped to avoid the high costs of exception handling.
  - Growers of flowers and plants that have long term contracts with traders, including annual reservations and minimal purchase quantities, want insight in the contractual agreements and actual delivered numbers of products to the traders.
  - And finally business partners from the flowers and plants supply chain also to be able to find new partners to propose and initiate new contracts with.

### 3.6.3 Specific domain Apps required

In each experiment as defined in the "Experiment Roadmap" a domain-specific application will be developed that provides the functionalities that matches the earlier defined business requirements. Some of these applications will provide functionality that can be used stand alone, but the real business value will be achieved when the applications are implemented as parts of a whole. These application will mutually exchange data and experiment by experiment realize the underlying baseline for a quality controlled planning application as described in **Error! Reference source not found.**. In this chapter the general functionality of each application will be described.

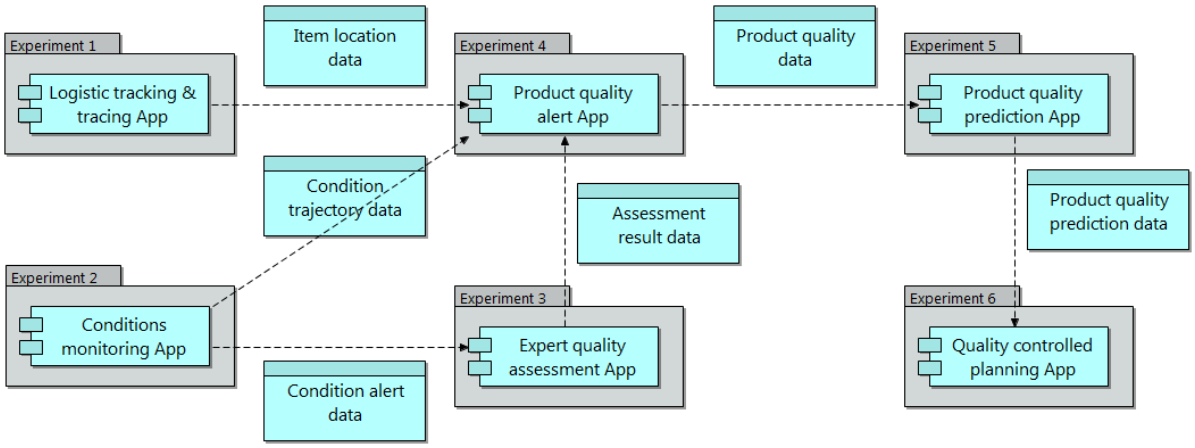



Figure 41 Overview of the main domain apps (excluding apps envisioned for the open call)

#### 3.6.3.1 Logistic tracking & tracing App

In the first experiment an application will be realized that will support the logistic monitoring and operational management of tracking and tracing items through flowers and plants supply chains. It will consist of three basic application functions:

- The tracking & tracing of products through plants and flowers supply chains
- The checking of the authenticity of trolleys based on its RFID tag
- The settlement of returnable trade items

The output of the first functionality is data about the historic whereabouts of the product. This will be used as an input for the conditions monitoring App and the product quality alert App.

#### 3.6.3.2 Conditions monitoring App

The second experiment will realize an application that supports the monitoring of conditions of locations in the supply chain. The application will be able to monitor the conditions at a specific location in the supply chain by getting access to the data of location based condition sensors and comparing the values with set norms. It will be able to combine the measured conditions of locations with the history of product's whereabouts to get product specific condition trajectories. Additionally the application will be able to gather product specific condition trajectories directly by receiving sensor data of sensors that are attached to a trolley. In summary the application will have the following two application functions:

- Location conditions monitoring
- Product conditions monitoring

The output of the first functionality is condition alert data that can be send to the expert quality assessment app as input. The output of the second functionality is condition trajectory data that can be used by the product quality alert App.

#### 3.6.3.3 Expert quality assessment App

The expert quality assessment App is an application from the third experiment that enables access to a currently used back-end system for the reporting of product quality. It is used by quality experts to report on their assessments of product quality. This app realized the access to the result data that is created by the experts. It also realises that these experts can receive alerts from the condition monitoring app. Its output is product quality assessment result data that may be accessed by the product quality alert App.

#### 3.6.3.4 Product quality alert App

The product quality alert App is an application that will be realized by the fourth experiment. It consolidates the data from the applications developed in the earlier experiments. By having access to all this data the product quality alert App will create and analyse product specific quality reports. From this analysis that includes comparisons to set norms alerts can be created if norms are violated. These alerts are sent to the appropriate responsible actors in the supply chain.

#### 3.6.3.5 Product quality prediction App

From the previous experiment, this experiment will use the product quality data as an input. The product quality prediction App will use this data to identify trends in the quality development of the product and use this to create reliable product quality predictions. Taking into account uncertainties in the calculations, minimum and maximum product quality projections are formulated. These may result in expected product quality alerts if the quality drops below the set norms within the set timeframe. The resulting product quality prediction data is used as an input by the quality controlled planning app.

#### 3.6.3.6 Quality controlled planning App

The final experiment realized the quality controlled planning application. This application is an implementation of the Logistics Planning Service Baseline App. It will use the quality prediction data as input for smarter distribution and logistics planning in which the expected shelf life of plants and flowers is taken into account.

These main domain apps are supported and complemented by domain apps that are envisioned in the open call:

- ***QR Product Information App***: enables users to scan the QR-code on the label of the product and directly get access to certain specific product information like botanic information of the cultivar, treatment instructions, representative pictures of the cultivar or even lot-specific photographs of the product. Also the app will contain an add-photograph feature which enables the user to take a photograph of the product and add it to the product information set. That way consumers, retailers or other stakeholders can send product quality feedback back into the chain.
- ***Plant Treatment Advice App***: gives the consumer treatment advice and alerts for their plant based on the current environmental conditions in his home. To enable this sensors in the home of the consumer will be used. This may be specific sensors with WIFI functionality that can send their data via a WIFI network over the internet to the advice module or it may be sensors that are

attached to the consumers smartphone (e.g. his camera to measure the light intensity or an add-on to measure temperature and air humidity) that send their data over the WIFI or GPRS network to an advice module. The advice module analyses the received data with expert norms and gives back treatment advice and alerts if for example the plant should be watered, fertilized or put in the shadow.

- ***Plant Quality Consumer Feedback App***: enables consumers to give feedback about the product he or she has bought. This feedback may be accessed by stakeholders from the supply chain so they can get a better idea about the end-quality of the product and the perception the consumers have of it. It may for example be used as input by breeders in their cultivar selection processes or by the retailer in their category management.
- ***Supplier Information App***: enables the user to access additional information about the supplier of the product he or she holds in his/her hands. One could think of the story behind the supplier explaining the origin of the product, including pictures and videos, certificates and the strategy of the company regarding carbon footprint reduction or biological pest control.
- ***Time Temperature Sum Planning App***: provides the transportation planner directly insight in the consequences of the selected planning features on the time-temperature-sum and (TTS) can optimise the plan to maximize the TTS. The TTS is a method used to calculate the remaining shelf life of products. This planning app doesn't take the first in first out principle as a basis, but actually looks at the current quality and expected expiry date of the product.

### 3.6.4 FISpace and FI-Ware services

All technical modules and systems, including specific FI-WARE enablers and FI-SPACE services will be further specified during *Design Software Architecture* phase. However, initial considerations include following components.

| Component | Experimentation | Description |
|---|---|---|
| IoT Broker | Condition Monitoring | Component for retrieving and aggregating data from sensors and data loggers within proper context. |
| IoT Gateway<br><br>Data Handling | Condition Monitoring | Required for stream analysing: filtering, merging, initial processing and events correlation of real-time IoT data. |
| Publish/Subscribe Context Broker | Condition Monitoring<br><br>Product Quality Alerts<br><br>Quality Controlled Planning | Component required for data distribution between multiple systems, actors and organizations. |
| Complex Event Processing | Logistic tracking & tracing<br><br>Condition Monitoring<br><br>Product Quality Alerts<br><br>Quality Controlled Planning | Analyses event data in real-time against complex set of rules and algorithms, generates immediate insight and response to changing conditions. |
| Location | Logistic tracking & tracing | Can be used to retrieve location data of 'in transit' plants within Item tracking and tracing experiment |
| Access Control | All | Will guarantee security and privacy of all real-time data generated during the experiments |

Table 9 Core Platform and FIspace requirements

### 3.6.5 Experimentation site

The focal company in the experiment is Baas Plantenservice, an innovative plants trader with the role of supply chain orchestrator. The pilot is leveraging the trader's logistic tracking system, which is based on the ultrahigh-frequency RFID tags that are attached to the complete pool of almost 4 million plant trolleys (CC). This trader was selected because it is one of the few companies in Europe who is actively taking advantage of this unique RFID infrastructure. Via this trader, also a grower and an inbound transporter are incorporated. The involved grower is Van der Salm, an important supplier of Baas Plantenservice, who produces lavender plants mainly in greenhouses. The involved transporter is Speksnijder, an important Logistic Service Provider of Baas Plantenservice, who is specialised in cooled logistics. The trader also plans to involve its main (German) retailer to include some retail stores in the experiments.

In addition to these direct supply chain actors, FloraHolland (the world's largest flower and plant auction; growers cooperative with about 6,000 members) and Union Fleurs (the International Flower Trade Association) are contributing to the trial with providing industry expertise.

Furthermore, it is planned to extend the experiments during this phase with an additional plants trader, some additional growers, an outbound transporter and with an experiment in the flower supply chain.

## 3.7 Trial 441 Meat Information Provenance

### 3.7.1 Experiment requirements

The MIP-trial experiments (simulation and realistic experiment) have the following requirements:

*Simulation experiment:*

1. Business process model for the meat supply chain in the context of EPCIS events;
2. EPCIS implementation (Fosstrak) with:
    a. EPCIS repository
    b. Data capture interface and app
    c. Data querying in EPCIS repository
3. EPCIS-events (data) that cover the whole meat supply chain from farm to retailer;
4. Workbench EPCIS implementation to run the experiment.

*Realistic experiment*:

1. Successful *simulation experiment*;
2. Involvement of the stakeholders of at least one meat supply chain.

### 3.7.2 Business reasons and expectations in the MIP trial

Meat supply chains are rather complicated and can have various *supply chain partners*. The MIP trial distinguishes typical roles of these partners. Sometimes a role is a company and sometimes one company has several roles. The following roles are typical for many meat supply chains: farmers (breeders and rearers), slaughter, processor, distributors, retailers, and, finally consumers. Next to these direct parties involved (from fork to farm) there are also other parties involved. There is GS1 with their barcodes and EPCIS standard, owners of quality assurance schemes or standards and certification bodies, cloud hosting providers, software solution providers, authorities and the overall society and interested members of the public.

The *whole supply chain* benefits from full transparency because it will chance its image in the eyes of meat consumers, but also in the society at large. Full transparency enables optimization of the business processes of all meat supply chain partners. It makes it easier to respond to consumer demands and also react adequately on needs of other partners in the meat supply chain. In the new meat supply chain information system tracking & tracing is strongly improved. It will be easier, more effective and instant. Tracing the source of contamination in the horsemeat scandal took about a month; with the proposed system it could be in the order of magnitude of minutes. If responses to meat alerts are necessary, they can be surgical, i.e. more precise, less recalled meat items and cutting out the affected parts only. The overall negative effect on meat consumption in general and business of the supply chain in question may be expected to be substantial lower. Finally, the new system will obviously comply with existing regulations, with EC 1169/2011 and it may be expected that new regulations will be easier adopted and integrated in the new system.

*Farmers* will get a more direct link with the consumers, which facilitates differentiating products from those of other farms, whether local, national or international. If farmers invest in for instance animal welfare or sustainable production, consumers should be aware of that and the new system enables to provide this kind of static farm related information. *Farmers, slaughterhouses* and meat processor can all benefit from the direct link with the consumers, as products can be better based on requirements of consumers and meat supply chain partners. In the end it will facilitate optimising every partner's business process and improve investment decisions.

*Retailers* are the final link in the meat supply chain before the consumer and therefor they have to provide information to their customers according regulations and legislation. This information should be true, which means certification by accredited organisations. It is not very exhaustively prescribed in the regulations what information should be provided, leaving room for extras, such as already is implemented in the present fTRACE system. In a similar way a new meat supply chain information system can provide all kinds of information, on top of what is required. This can include information of the farm, farming, health aspects of the product, sustainability throughout the supply chain, and many others.

*Consumers* can get access to the dynamic (meat item related) and static (supply chain partner related and general product information) information by using an app on their smartphone or using a website. In order not to overload consumers, such apps should allow its users to filter the meat related information to those features they are interested in. In this way, retailers can provide an enhanced consumer experience with a proven 'history' of the meat item and a 'brand like name' and approval stamp'.

There are also business cases for *ICT solution providers*, as they can include the reference architecture for meat supply chain information systems in their portfolio and implement it as tailored solution for their customers. *Cloud hosting provider* can enable implementation and *certification bodies* can guarantee correct working of the new system, if they are accredited by *accreditation bodies*.

*Authorities* are facilitated in their control and regulation enforcement. In case of meat alerts they work is strongly facilitated, which enables a fast, effective, surgical response, with less critique by the media and the general public, resulting in more confidence and trust in the responsible authorities. The *society* as a whole can benefit, the new system makes investing in sustainable production and animal welfare more lucrative. Moreover, no general alarms are required in case of meat alerts.

The MIP trial distinguishes two different business related outcomes. In the *simulation experiment* the MIP trial will be successful, if the following results are achieved:

1. Technical correct functioning (capturing EPCIS events and querying EPCIS In the *realistic experiment* the MIP trial will be successful if the following results are achieved:
2. The most important roles in the events and static data);
3. Queries that simulate a proper response in case of a meat alert should perform better than present systems were performing in the horsemeat scandal.
4. meat supply chain are represented in the experiment;
5. Meat supply chain partners and consumers are satisfied in:
    a. Ease of use;
    b. Promptness of information;
    c. Protection of their data for unauthorised access;
6. Meat consumers are satisfied in:
    a. Ease of use;
    b. Promptness of information;
7. Authorities and regulators should endorse the MIP reference architecture.

### 3.7.3 Match with baseline apps functionalities

.

| T441 MIP TRIAL | Baseline App User stories that apply to the trial | | | | Comments |
|---|---|---|---|---|---|
| | Epic | Feature | Story | Description | |
| 1. Product Info Baseline App | 1 | 1 | 1a | data created by events at farmers get available in the EPCIS; disaggregation of items are identified by serialized GTIN | the data storage should be locally where they were generated |
| 2. Logistics Planning Baseline App | 1 | 2 | 1 | all supply chain partners benefit from additional information | LSP are essential partners along the meat chain |

| | | | | | |
|---|---|---|---|---|---|
| 3. Real-time Business SLA Management App (former Contract Management App) | 1 | 1.1 | 1.1.1 | daily operations in ERP systems get supported by standardized mechanisms and processes more detailed, speed and accuracy are also important | reliable information, available at each step by automatic processes improve quality and open new challenges for business |
| | 1 | 1.2 | 1.2.1 | see above - not being standardized online-availability is necessary | see above |
| | 2 | 2.1 | 2.1.1 | integrated in ERPs; avoiding deviations and exception keeps costs low and fosters trust between partners - before starting to process | business partners should work together more collaboratively - sharing data generates better information for everyone - independently from the stage of processing |
| | 2 | 2.1 | 2.1.2 | … - during processing | see above |
| | 2 | 2.2 | 2.2.1 | … - after sales | see above |
| | 3 | 3.1 | 3.1.1 | finding partners and to be found itself widens the opportunity for business and competition; in the end the consumer should benefit too | it just a support for additional activities; maybe only a chance but perhaps of better probability in the future with FI |
| 4. Business Profile App (former Business Management App) | 1 | 4.1 | 4.1.1 | to be found - new partners can be useful but sharing essential data should be restricted only to registered entities on the platform | very comparable and similar to the opportunity above (3.1.1); perhaps it is more before a regular business relation based on contracts |
| | 1 | 4.1 | 4.1.2 | finding others - see above | see above |
| | | | | | |
| 5. Marketplace Operations App (former Business Management App) | | | | | |
| | | | | | |
| Traceability functionalities | | | | YES - for partners in the SC and consumers | even this is elementary for the MIP and all other Fispace Trails using EPCIS and unique identification - batchwise information along the supply chain |
| Notification functionalities | | | | YES - for partners in the SC and consumers | as an additional service beside meat sector specific acivities with EPCIS; in the MIP the intergrtion of governmental regulator or other authorities is part of the plan |

Table 10 Selected baseline apps, epics, features and stories, relevant for the MIP-trial.

### 3.7.4 MIP-trial requirements for apps

GS1's EPCIS is a standard for the capture and exchange of dynamic visibility data of objects identified with an EPC. Examples for objects relevant for the agri-food sector encompass products, animals, shipments, documents, locations, returnable transport items as well as assets, as in machine or vehicle management. It is important to comprehend that EPCIS is data carrier agnostic. EPCIS does not necessarily require RFID technology. It is meant to be complementary to EDI (Electronic Data Interchange, i.e. a standard for electronic exchange of business data from one computer system to another computer system). Each time an EPC identifier is read, an event is generated containing fine-granular visibility data encompassing four dimensions (Figure 42): what (uniquely identified objects), where (location and read point), when (time of event) and why (status and business process). The events are stored in decentralized databases (EPCIS repositories). An EPCIS repository has a capture interface for storing, as well as a query interface for retrieving event data. The transfer of data through the capturing interface is realized via HTTP, the query interface uses SOAP, XML over AS2 and XML over HTTP(S). All message protocols must be able to use authentication and authorization. Static product information will be send to the static data repository at the traceability provider (see Figure 11).

| What (SGTIN) | Where (GLN) | When | Why |
|---|---|---|---|
| urn:epc:id:sgtin:4000001.011629.2 | Dockdoor1, Vendor1 | 12-12-2013 09:00:00 | Goods receiving |

Figure 42: EPCIS data.

In order to perform both MIP trial experiments, an EPCIS repository should be implemented including a capturing interface and a tracking & tracing query interface. These interfaces should be implemented as apps for smartphones and PCs. Additionally, an administration app should be developed for authorisation of authorities and regulators (including certification bodies) to get access to the meat supply chain information system as a basis for response actions.

A full implementation can best and easiest be realised using the open source results of the Fosstrak EPCIS Project. It allows deploying an EPCIS Repository using this Fosstrak implementation of the EPCIS standard for repositories, querying an existing EPCIS Repository using Fosstrak's graphical user interface and filling an existing EPCIS Repository with EPC data using Fosstrak's graphical user interface (Figure 43).

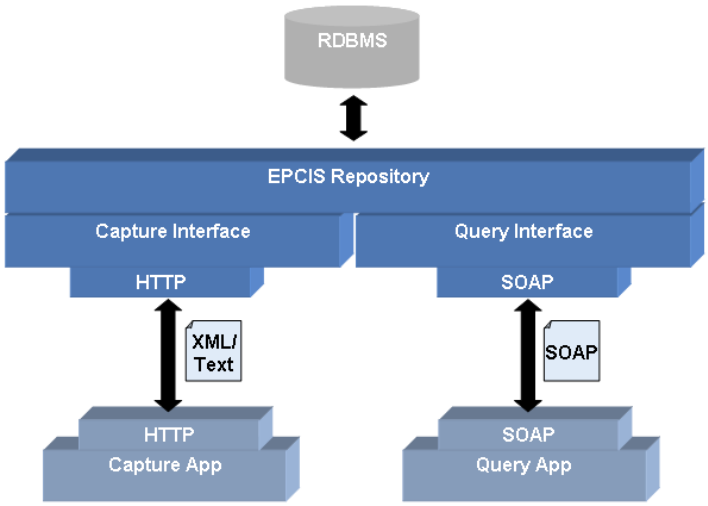



Figure 43. Overview of the Fosstrak EPCIS Implementation (from http://code.google.com/p/fosstrak/wiki/EpcisMain).

For the first, simulation experiment meat data have to be captured in the system and queried subsequently. The second realistic experiment the MIP trial relies on collaboration with stakeholders, including some of the associated partners and on the realisation of apps that enable capturing of data by handhelds and smartphones and for apps that enable querying the repositories by smartphones and PCs. The capturing app should run on devices that are often used in the meat industry, such as handhelds and on PCs and smartphones as well. Additional information on EPCIS can be found at http://www.gs1.org/gsmp/kc/epcglobal/epcis and more on the Fosstrak implementation https://code.google.com/p/fosstrak/wiki/EpcisMain.

### 3.7.5 FIspace and FIware Generic Enablers

As stated above, the basic and the core software needs of the meat transparency system should be provided by the Fosstrak EPCIS system. Fosstrak is an open source implementation of EPCIS that enables tracking and tracing but does not provide all that is required to provide extended transparency. Fosstrak makes use of infrastructures and systems (such as a MySQL database) that are not reliable or robust enough for large and computation intensive systems. Features such as access management are not part of the basic Fosstrak system.

With the FIspace meat transparency system the MIP trial aims to provide users with a system that allows them to share extended product information in a robust and secure system. The FI WARE generic enablers (GEs) can be used to augment the basic Fosstrak system to achieve these goals. The most relevant GEs that the MIP trial wishes to test are listed below (see also http://catalogue.fi-ware.eu/):

1. *DCRM/EPCIS repository*: Core to an EPCIS system – including Fosstrak – is the EPCIS repository where all events arising in the supply chain are captured and stored. Such a large and computation-intensive repository will benefit from IaaS DCRM GE.
2. *Event processing*: The transparency system is based on actively capturing various EPCIS events generated across meat supply chains in an EPCIS repository. Managing of events, and particularly analysing events to proactively prevent food alerts and scandals, requires complex processing to match interesting sequences of events such as preprogramed alarm signals.
3. *Publishing of/subscribe for events*: EPCIS Events can be captured only when events are published (by operators in the meat supply chains) and the transparency system subscribes to those events. The publish/subscribe GE provides a ready-made solution in this respect.
4. *Security and identity*: No software system that stretches over a number of organisations can operate without a reliable security and identity management feature. Both capturing of and querying for information will be restricted to either specific users or to specific situations, or both. The Identify Management GE, or a limited feature of this GE, will be valuable in the registration and management of the users of the transparency system.

### 3.7.6 Experimentation site

The *simulation experiment* (A3-a in **Error! Reference source not found.**) will be executed in a lab setting, whether at some solution provider in the meat sector, at GS1 G, or at WU and not at premises of any stakeholder.

The *realistic experiment* (A3-b in **Error! Reference source not found.**) requires a setting at the premises of one or more meat supply chain stakeholders, e.g. some associated partner in FIspace's MIP-trial. The MIP trial is planning to try for a Germany based supply chain and another one, probably in Spain in cooperation with FIspace partner Plusfresc, if possible in cooperation with a TIC trial experiment.

## 3.8 Trial 442 Import & Export of Consumer Goods

### 3.8.1 Experimentaton Definition

This trial is concerned with planning and execution of logistics activity in consumer goods sector ensuring effective planning of related activities resulting in improved coordination, loss minimization, efficient use of resources and high customer satisfaction level. Some information related to the business partners are fictitious for confidentiality purposes.

Korean Steel Company Ltd. is a company located at Ansan, Korea produces several different components continuously, sells them to consumer electronics manufacturing firms overseas. Arcelik purchases many items from Korean Steel to be used in production. Arcelik's logistics department is responsible from coordinating the transport activity of the purchased materials i.e. selection of the partners that will carry out the logistics operations, booking/contracting of transport services, customs declarations, follow up, and tracking and tracing of cargo. The story of the trial begins with the planning of transportation of components to be used in the manufacturing process of a washing machine model which will then be transformed into a finished good at the facility of Arcelik located in Cayirova, Istanbul and then will be transported to the warehouse of a subsidiary of Arcelik, namely Beko PLC, located in UK.

During the planning process of the inbound, it is expected that real-time information about the services of the logistics service providers are available therefore the (re)planning process can be based upon up-to-date information, benchmarking several different services available on the market. The envisioned solution provides the shipper and consignee with a collaboration environment during the transport demand description phase. Users can define monitoring requests according to their interests aiming proactive or real-time notifications of the deviations in the transport planning phase. Envisioned interactions between several users in the inbound planning is depicted below:

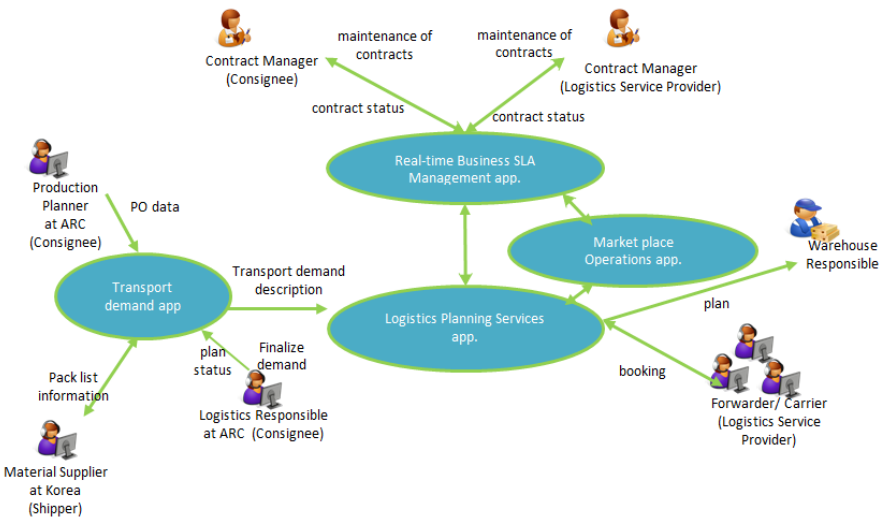



Figure 44: Envisioned interactions for e-planning (TO-BE)

Export scenario is built upon a shipment from Arcelik's washing machine plant to Beko PLC. Planning of the transportation is under Arcelik's responsibility due to agreed incoterms between Beko PLC and Arcelik A.S. Currently real-time information regarding the status of the shipments is distributed among several stakeholders and Arcelik contracts each party one by one to ensure on time delivery in full.

The scenario starts with a production delay, as a result, the logistics responsible re-plans the shipment by altering the pick-up date with the same logistics service providers in the original plan. The story is focused on the real-time information sharing about deviations through the platform to ensure that related parties can plan their internal operations accordingly without any delay. Although several events might lead to deviations from the plan in real-life, only four of them are included in the scenario: delay in the booking response, delay at pick-up from Arcelik's plant, delay in the transshipment port, postponed inland delivery to Beko PLC warehouse due to space unavailability.

The envisioned interactions between main actors are schematized as below:

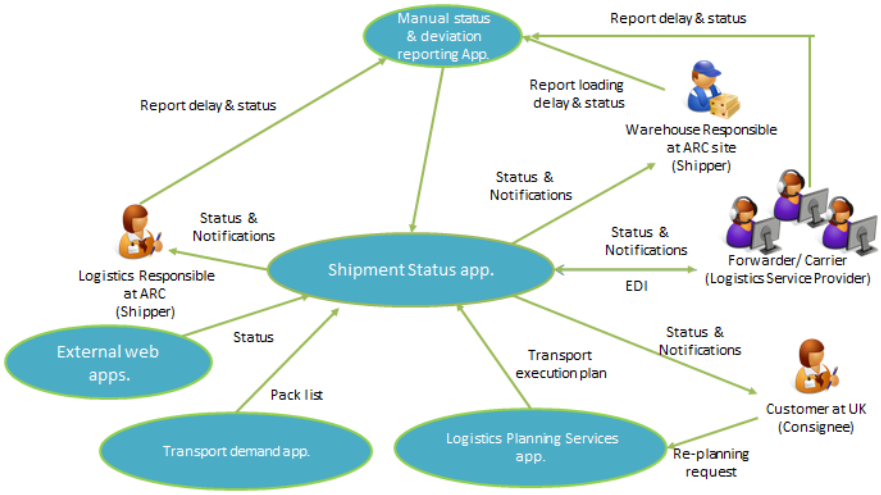



Figure 45: Envisioned interactions for shipment tracking (TO-BE)

### 3.8.2 Business Requirements:

Effective planning and timely monitoring of the transportation process is very crucial since unexpected delays might lead to many problems and losses in several stages starting from the production activity till the delivery of finished goods to the customers. Additionally it is very critical for shippers outsourcing the transport activity to have the ability to reach several different logistics service providers that can fulfil their request in a fast and efficient manner without losing time and effort with manual activities.

During FIspace project two main challenges deemed to be essential for effective management of the supply chains namely Shipment Tracking and Transport Order Management.

### 3.8.3 Shipment tracking challenge

Logistics service clients need to know whether the transport process of their cargo is going in line with their plans. They need to be informed immediately about possible deviations/disruptions to take action on short notice to prevent unfavorable consequences. Many logistics service providers have tracking services available such as tracking services on their websites. However it is time consuming for the client company to track its shipments one by one using such services. Instead companies prefer to build their own tracking tools which provide visibility to all of their shipments in one platform and store the relevant data and documents. Most of such tools rely on manual input from the logistics service providers; hence it is hard to assure that status data is always up-to-date. That's why shippers using such tools need to communicate with the logistics providers frequently to get real-time data or assure that the data is up-to-date which makes the process time consuming and sometimes complex.

Sharing real-time tracking data through one channel, where points of interest can be defined and real-time alerts for deviations can be created, is believed to bring significant benefits for all relevant parties. The identification of the challenge's root causes highlighted the need for automated input through integration or electronic data extraction in order to avoid human related problems. The envisioned solution to cope with this challenge is visualized as below:

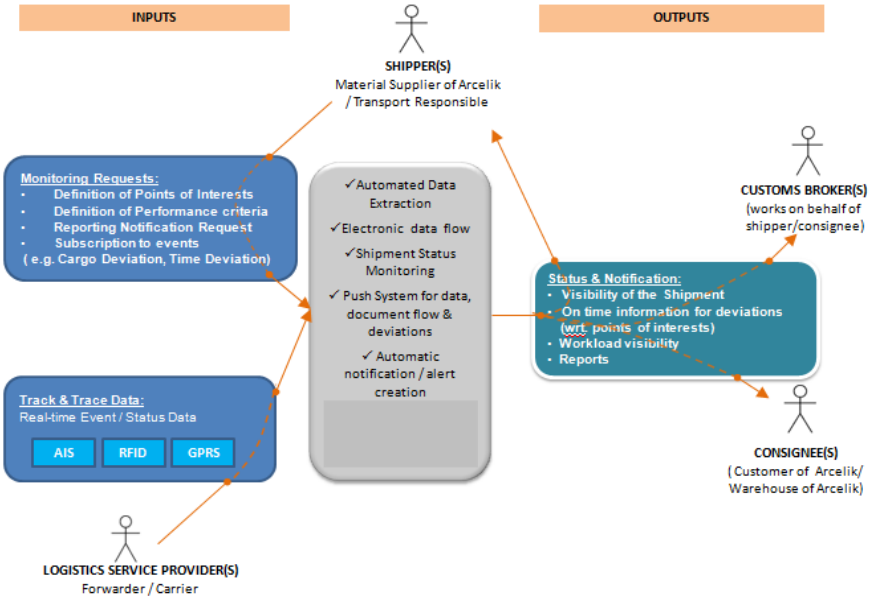



Figure 46 Shipment tracking service model

| AS-IS: | TO-BE: |
|---|---|
| • Manual input from LSPs about the status of the cargo<br>• Time delays in information input<br>• Lack of an automated alert system for deviations | • Automated input from tracking systems<br>• Information is visible to the parties that have authorization at the same time<br>• Timely notification different formats from multiple data sources. Creating an overview of deviations |

### 3.8.4 Transport order Management Challenge

Before creating a transport order, the person in charge should have an overview of all available alternatives to come up with the best decision that optimizes its processes. In companies (such as Arcelik) where no system is available that can automatically collect and merge real-time service information from the different sources, transport mode selection decision mainly relies on manual processing of information with of transport plan alternatives, especially for the overseas operations, is constrained by the knowledge and evaluation skills of the decision maker, data collection speed, data quality and available

time frame. Publishing the demand and services online to e-markets in fact may increase the reach of the process, meaning that several partners (globally) can be involved without heavy manual intervention. This provides SMEs with an environment where they can create awareness about their services more easily and increase their visibility in global business collaboration.

Additionally traditional supply chains have limited flexibility with respect to the partners involved in a specific supply chain. Collaborations are typically set up before the actual operation starts. With e-contracting capabilities of FIspace platform, partnership can be created just-in-time, during business operation at the time the functionality of the partner is actually needed.

The identification of the root causes of transport order management challenge highlights the need for an online "booking portal" through which communication and collaboration between actors is facilitated. The envisioned solution to cope with this challenge is visualized as below:

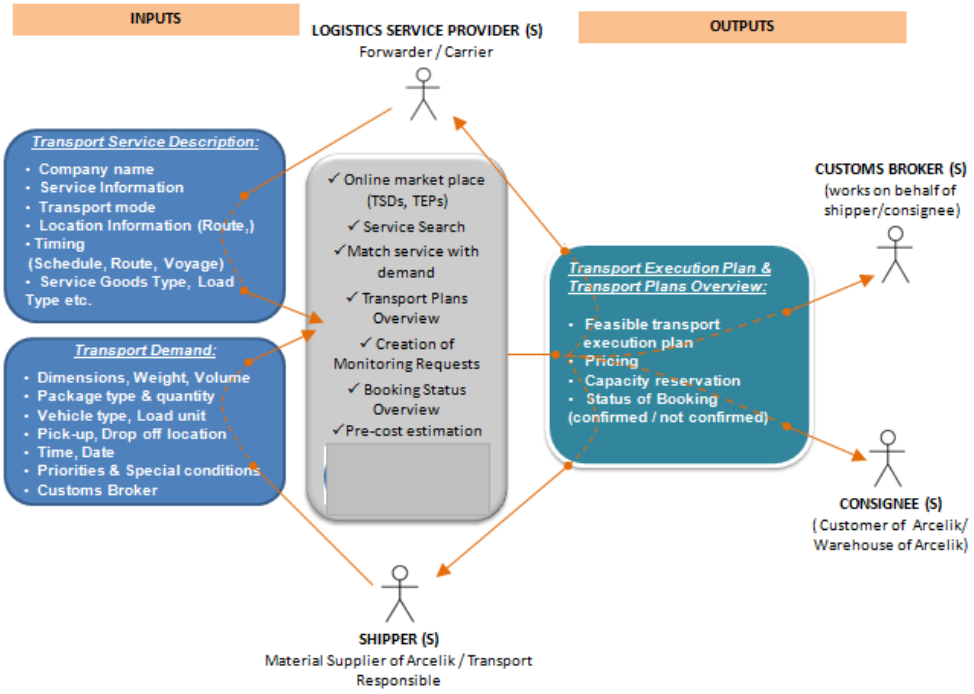



Figure 47 Booking service model

| AS-IS: | TO-BE: |
|---|---|
| • Manual process of data collection<br>• Data is collected from many different sources which have different formats<br>• Time delays in information input<br>• Hard to track updates<br>• Manual data processing for forming a cost overview | • Online service description connected to booking app.<br>• Automated data gathering<br>• Automatic pre-cost estimation<br>• Visibility of historical usage on the time of purchasing<br>• Effective contract management<br>• Collaboration among partners who work on the same transport chain plan |

### 3.8.5 Match Requirements with Baseline Apps Functionalities

Analysing the business requirements defined in the previous section, the services that should be provided to conduct the tests are summarized below:

1. Customized user interfaces based on points of interests ensuring secure information sharing through user access rights and privileges
2. Support description of transport demand and services
3. Support marketplace operations (e.g., publish offers and demands, search for services) enabling integration with external marketplaces

4. Support contract lifecycle management operations
5. Provide real-time feedback during the planning of the transport demand if the service offer is not in line with the SLA agreement in the contract
6. Automatic matching of transport demand with available services that can satisfy the requirements of the demand
7. Adding additional services and monitoring requests to transport execution plan
8. Selecting and building of transport chain plans based on the transport demand and online available services, using the latest available information for service descriptions and information from existing contracts
9. Settle a contract with a new partner
10. Booking request transfer and receiving confirmation/ rejection
11. Automatic retrieval of events from IoT or back-end tracking systems
12. Enabling definition of deviation rules and points of interest for monitoring purposes
13. Fast and seamless information exchange about the actual status of the shipment from one channel
14. Automated notifications of deviations from transport execution plan that occur or about to occur
15. Automated notifications of the events that the user is subscribed

Information Security functionality listed in requirement 1 is common to all baseline applications that will be developed within the scope of FIspace project exploiting the capabilities of the infrastructure for Security, Privacy and Trustworthiness.

The story of inbound process of raw materials to Arcelik's manufacturing facility is mainly about transport planning process and hence exploits Logistics planning service baseline app**.** to a great extent. Requirements 2, 3, 6, 7, 8, 10 and 14 are (should be) provided by this app whose aim is to provide logistics planning functionality both for the logistics service clients and providers. The app is based on the Transport Planning Module from the FIspace project.

Real-time Business SLA Management Baseline app. mainly focuses on the business service and contract management perspectives and takes advantage of the management of software services, part of the core architecture of FIspace. Therefore this app should support requirements 3, 4, 5 and 9 stated above.

In order to automate the shipment tracking process, we need a system that notifies the subscribed events and deviations to the users. Therefore notification and traceability functionalities as stated in requirements 11, 12, 13 and 15 should be provided by Real-time B2B Collaboration Core.

### 3.8.6 Domain Specific Apps Requierments

In the previous section, the matching between the business requirements and the functionalities that are planned to be provided by baseline applications are presented. There are some functionalities that are needed for the successful execution of the tests but currently not being planned to be provided by specific baseline app such as:

1. Support collaboration on transport demand description
2. Storage of information related with the products to be transported in a shipping unit
3. Manual status and deviation reporting where electronic data is not available
4. A user interface to subscribe events, define monitoring requests and notification rules
5. A user interface where the shipment status can be monitored starting from the initiation of the planning process till the end of its execution

Therefore it is envisioned that three domain specifics apps should be developed for the successful execution of "Import and Export of Consumer Goods" trial, whose requirements are determined as follows.

#### 3.8.6.1 Transport demand description app:

Transport demand app should allow different stakeholders to collaborate on the same transport demand description. According to predefined and agreed user rights, each user updates the demand description accordingly. The status of the process can be monitored using the app. The main idea is to store the details of the products to be transported (pack list information) attached to a specific demand description so that this information can be shared between different stakeholders. The requirements of this application are stated below:

| ReqID | Title | Description |
|---|---|---|
| 1 | User privileges | Define which stakeholders have right to do see which information and perform which action |
| 2 | Identification of status and events | Track the status of transport demand description to understand whose action is necessary to complete the transport demand on time. |
| 3 | Receive notification | User should be able to subscribe to receive information about certain events. Users should be able to monitor notifications that are created automatically according to the rules defined by the them by using the UI of this app. |
| 4 | Pull data from backend system | Production planner should have the capability to define filtering options to determine the content of input data that will be pulled from the back-end system. |
| 5 | Submit packing list request | After attaining purchase order items from the backend system, production planner should have the capability to select the items to be planned and submit a packing list request for the selected items. |
| 6 | Receive notifications | Material supplier should be informed about the packing list request |
| 7 | Submit packing list | Material supplier should be able to enter the packing list details manually (Or extract it from backend systems) |
| 8 | Receive notifications | Logistics responsible should receive a notification when the packing list information submitted |
| 9 | Update transport demand manually | Logistics responsible should have the right to update the transport demand |
| 10 | Store transport demand content | Pack-list information should be stored and be available to be used by other applications such as transport planning app. and shipment status app. |
| 11 | Submit transport demand to Logistics planning app. | Logistics responsible should have the ability to submit the transport demand to Logistics planning app. |

Table 11 Transport Demand App requirements

#### 3.8.6.2 Shipment status app:

Shipment status app. provides tracking functionality. The users subscribes to the events of their interest and creates additional rules for monitoring the shipment using this app. It is envisioned that this app. will be built upon the features provided by Real-time B2B Collaboration core. Every user defined in the export scenario should have a right to use this app. The requirements for this application are stated below:

| ReqID | Title | Description |
|---|---|---|
| 1 | Event configuration screen | UI to be used for subscribing predefined events |
| 2 | Define user specific notifications | Functionality to define user specific notifications using a predefined set of events |
| 3 | Pull transport execution plan | Transport execution plan should be extracted from logistics services planning app. (or backend systems) |
| 4 | Pull events, statuses from Real-time B2B Collaboration Core component | Should extract status data from B2B Collaboration Core |
| 5 | Pull real-time notifications created in case a deviation occurs or about to occurs | Should extract notification data from B2B Collaboration Core |
| 6 | Monitor the status of the shipment | Should have a UI that visualizes the shipment status together with the notifications |
| 7 | Pull pack-list information from transport demand app. | Match transport demand detail with shipment status |
| 8 | View product list included under a transport unit | It is assumed that Beko PLC (Customer) can monitor its stock in-transit using this app. |

Table 12 Shipment Status App requirements

#### 3.8.6.3 Manual event and deviation reporting app:

Not every transport company has the capability to supply status information electronically. Especially for SME's that have no technology for electronic status & event gathering, this app might help to improve their service level by providing their customers with a shipment status information that was entered manually and a functionality that notifies customers about deviations close to real-time. This application is envisioned to be used by the persons who are responsible from handling the actual execution of the shipment. They are facing the deviations real-time hence can report them real-time or close to real-time. Also this app. is envisioned to reduce the burden of information handling in companies without tracking services. The requirements for this application are stated below:

| ReqID | Title | Description |
|---|---|---|
| 1 | User login and assignment to a specific shipment | Once the user logs into the app, the app should know the shipment ids assigned to his user id. Alternatively he can enter a unique reference such as container number, truck plate to start reporting. |
| 2 | Report events during the execution of the transport | UI to that includes a list of predefined events and once the user select the event and use the button to report, the event information is created. |
| 3 | Send raw event data to B2B Collaboration module | It should have a connection to B2B Core to deliver manual events data. |
| 4 | Report deviations | The user selects the deviation type (early or late) , selects the deviation type from a predefined list of apps and reports how much time the transport execution will deviate from actual plan. |
| 5 | Smartphone / other systems | Should have the capability to be used on smartphones and other devices with internet access |

Table 13 Deviation Reporting App requirements

### 3.8.7 FIspace /FIWARE Services

Import and Export of Consumer goods trial will mainly use the functionalities that will be developed in task T220 Front-End, task T240 Real-Time B2B Collaboration, task T250 System & Data Integration, task T260 Operating Environment and task T270 Security, Privacy and Trust of the FIspace project. As for the usage of generic enablers, the trial will not use GEs directly, but indirectly through the Apps. and FIspace components.

The envisioned relations between the trial and FIspace /FIware services can be summarized as below:

- Front-End that will be developed in T220 allows the user to access the Apps hence this service will be needed to connect to all applications that will be available on FIspace. Hence generic enablers that the front-end exploits will be used indirectly to have an access functionalities provided by the applications.
- In B2B processes, confidential information is being exchanged between different stakeholders, hence "Information Security" is a key for the success of the FIspace platform that will provide an environment for B2B collaboration on the Cloud. The Security, Privacy and Trust system allows the actors in this trial to have access the information and to perform tasks only if they have right to do so. T270 should provide the necessary features for handling confidential business information in the Cloud, managing the access of individual users to the FIspace, secure access control to information kept in the FIspace and preventing unauthorized access and attacks. Hence IDM GE, Security Monitoring GE, Data Handling GE, Secure Storage GE will be used indirectly via services provided by SPT component.
- Real-time B2B collaboration core component with the usage of Complex Event Processing and Publish/Subscribe Context Broker GEs will analyse event data in real-time and detect situations enabling real-time events information sharing including notifications and supporting predictive monitoring of business processes with proactive notifications about future situations. Real-time information sharing and event management is crucial for the automated shipment tracking process to be tested in this trial; therefore shipment status app. will exploit the features of this component to a great extent. Real-time B2B collaboration component will mediate the information flow from back-end systems (or manual events) and Shipment status app. by extracting raw event data, turning raw events into notifications and statuses which will be monitored by the UI developed in Shipment status app.

- The System & Data Integration component enables the connection of existing systems with the FIspace in order to allow for the import and export of data and relevant information. During the planning of the import transport and the execution of the export transport, technical features provided by this component and relevant GEs such as Mediator GE will be needed to extract data from back-end systems.
- Operating Environment component will provide the necessary technical environment and infrastructure via which apps can technically interact and work together in harmony. Operation environment will support the tasks that rely on the interaction and collaboration of different apps and also supports to call backend features with actions by the user performs UI of an App. i.e import of purchase order data from legacy system via filtering features provided in the user interface of transport demand app.
- In addition to the GEs mentioned above, Repository GE, Market place GE (via Real-time Business SLA Management Baseline App), Object storage GE (via Logistics Services Planning app.) will also be used indirectly through baseline apps.

### 3.8.8 Experimentation Site:

Washing machines production plant, its warehouse and main building which Arcelik supply chain management directorate (import and export logistics) are all located in Arcelik Cayirova Campus, Tuzla, Istanbul (Turkey) hence Cayirova Campus is selected to be the place where the Import and Export of Consumer goods pilot will be deployed.

Figure 48: Arcelik Cayirova Campus

Arçelik Cayirova Washing Machine Plan stands as a modern manufacturing marvel, featuring a capacity of over 1.1 million washing appliances per year. The plant is also symbolic of Arcelik's rise as a regional manufacturing power.

Figure 49: Arcelik Produktion Site


Figure 50: Arcelik Cayirova Washing Machines Plant and Warehouse

The computers that will be used for conducting the tests will be placed in two separate rooms in the main building, namely Planning department meeting room located in the 2rd floor of the main building and Bati meeting room located in the 1st floor of the building.

Figure 51: Planning dep. meeting room

Figure 52: Bati meeting room (Logistics dep.)

## 3.9 Trial 443 Tailored Information for Consumers (TIC)

### 3.9.1 Experimentation Definition

This TIC trial is concerned with the planning and conduct use case trials focused on the use of the FIspace to improve the flow of goods to consumers and the experience that the consumer receives by being better informed about the goods that they are purchasing. The use case trial Tailored Information for Consumers (TIC) main challenge is provisioning of accurate information to consumers concerning products they are interested in purchasing and that they have purchased.

The experiment will cover the following scenarios:

**Scenario 1: Product tailored info/knowledge gathering**

The Tailored Information Provision Service is initiated by a customer who wishes to obtain information related to a product tailored to his/her personal preferences stored in the user profile (allergies, favourite food, etc.).

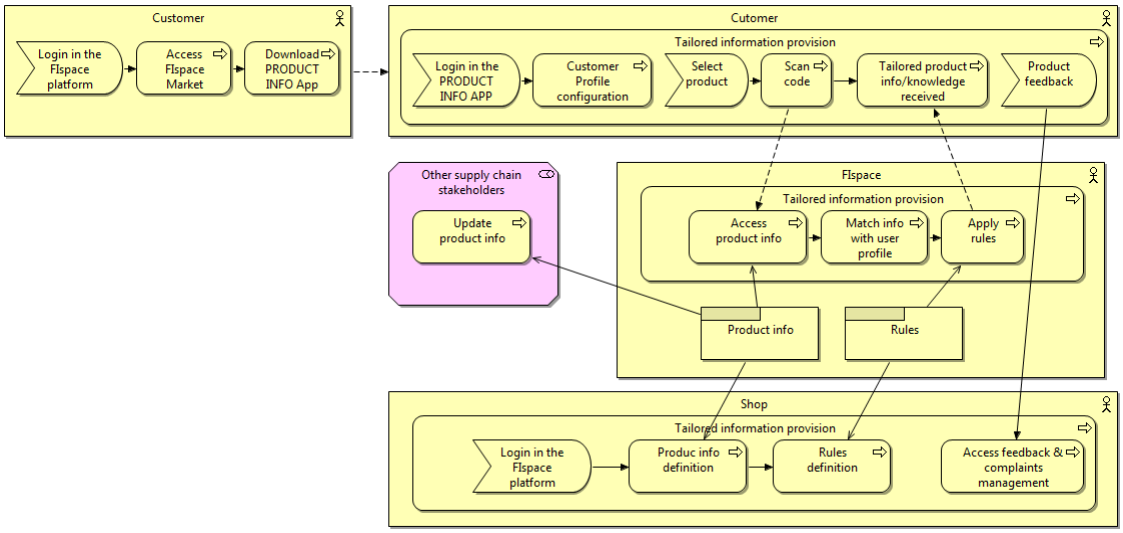



Figure 53 Tailored Information Service App model

### Scenario 2: Shopping list & recipes management

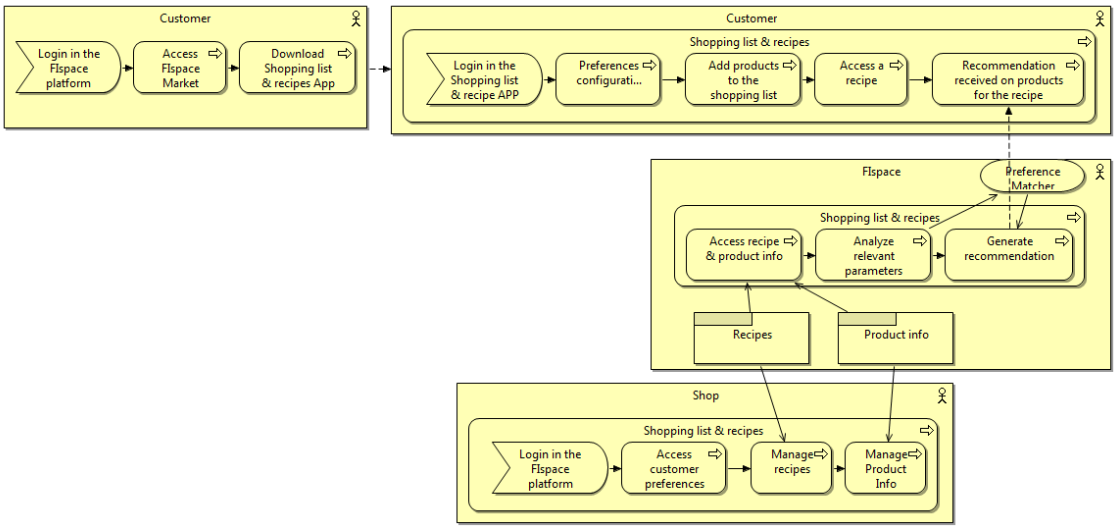



Figure 54 Shopping List and Recipes App model

### Scenario 3: Augmented reality & push information

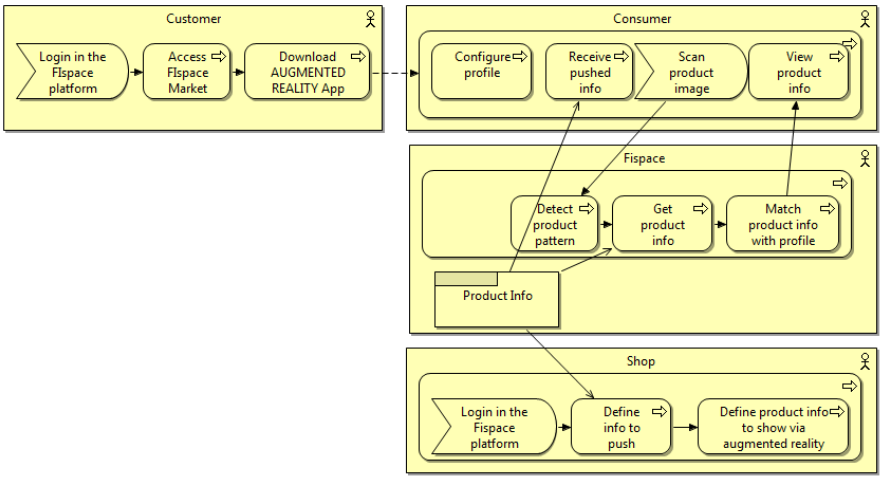



Figure 55 Augmented Reality App model

### Scenario 4: Alerts

The Alert Treatment service is related to the FFV scenario and the functionality provided by the FIspace platform (T240) of real time exception and event handling. This service is decomposed into two tasks, executed in the customer and in the shop. This service subscribes to food alerts and sends affected clients information related to these alerts.

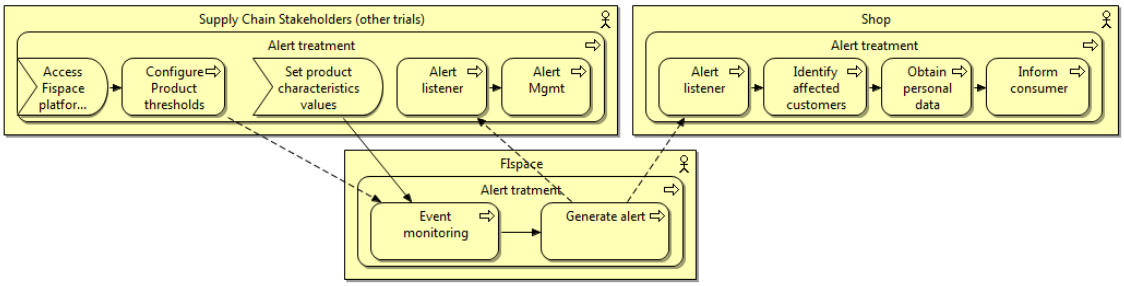



Figure 56 Alerts App model

### 3.9.2 Business requirements

The experiment Tailored Information for Consumers (TIC) is about the provisioning of accurate information to individual consumer's needs and feedback of this information. The trial will showcase novel Apps that help consumers (through using their personal, mobile device) to become more aware of the food they buy in the supermarket, and which they eat. The Apps will support both pre-shopping and post-shopping activities and will enable customization in the way the information is presented.

For the TIC experiment, PlusFresc participates by providing experimentation sites as a final agent of the chain, Plusfresc has a direct contact with the final consumer. Therefore, it is noteworthy to highlight Plusfresc as a retail store and distribution platform that can definitely help the project to provide real consumer needs identified in real environments. Consequently, Plusfresc shall be this vital platform where test applications can be implemented together with a direct analysis of the results and its impacts on customers. Finally, Plusfresc would emphasize its work to disseminate the project results

The TIC trial clearly fits with EU Agriculture policy which states that the main strengths of the European agrifood products are the high standards on health, quality and environment. Consumer awareness of these attributes is basic in order to value the attributes and, consequently, the products.

In this context, and taking into account the perspective of a retail company as PlusFresc organization, the business reasons of PlusFresc for running this experiment are based on the possibility to gain value through the improvement of the shopping experience of customers. This improvement will be fulfilled in the trial by gaining value for:

- Providing a differentiation service that allows satisfying customer expectations and needs for food information
- Gain new customers
- Cultivate loyalty of the current customers
- Increase of shopping volume
- Differentiation from competitors
- Assure quality of agrifood products to customers

The pilot is designed with the aim to provide value for the upstream and downstream next steps in the chain, being consumers downstream and the suppliers upstream, so:

- *Producers /Suppliers* with improvements in assuring that their products reach consumers which are informed of all product attributes. Communicating attributes of their products will add a clear value.

- *Consumers* with better information on origin, production method, quality, safety, nutrition, sustainability and other aspects of agrifood products. Here the pilot and corresponding conceptual prototypes are mainly focused on consumers with high information needs: consumers currently interested in knowing food attributes or product history and consumers with food intolerances.

To gain these values, it is also important for PlusFresc to have in mind its own needs (retail company) and the needs of the potential customers downstream (consumers) and upstream (suppliers):

- A ***consumer*** needs to know information of the products he/she buys, in a fast, easy, reliable and rigorous way. Consumers are becoming more and more interested in being informed of product attributes, so we need to be able to provide to consumers all product related information from farm to fork, according to the interests of each consumer.

- ***A retail company*** aims to satisfy customer needs on food awareness, hence gaining new customers, loyalty cultivation of the current customers and an increase of shopping volume.
- ***A supplier*** is willing to advertise himself through differentiating their products by providing more information of interest for consumers.

### 3.9.3 Match requirements with baseline Apps functionalities

The TIC trial requirements can be classified in to the following categories:

- Requirements describing the creation, publication, storage, management and execution of services. These requirements state that the TIC trial must include an infrastructure supporting different phases of the service lifecycle. These functionalities will be described later in this section.
- Requirements describing the communication infrastructure, the mobile nature of the provided services and the integration of legacy software and hardware systems. These requirements will be taken into account as some FIspace capabilities are designed to solve these problems.
- Requirements describing user notification of information, event generation, identification, processing, management and subsequent information visualization.

Related to the requirement of providing notifications to users in the form of food alerts we need a system that notifies the user for the exception event and keeps on monitoring the related information checking if the executed exception handling rule has solved the problem.

**This characteristic can be covered by the Exception Handling base line app** that will enable the supermarket to define constraints, observations and mitigations for their business process instances. The mentioned constraints as well as the execution of the business process overall, will be constantly checked by the Baseline App, using the Fispace core features. That should be done in real-time, detecting potential violations, and notifying the customers.

Requirements describing identification of products, access to product data, product information modification, access permission management, information filtering and transformation. This functional and non-functinoal requirements will be supported by the Product Information baseline application, whose goal is to provide a product information event-driven information exchange between the systems of the stakeholders of a supply chain and towards the final consumer, based on the B2B collaborative and system integration capacities offered by the FIspace platform. The PInfS will provide the following functionalities:

- Easy and secure exchange of product related information between supply chain partners, both from a technical and business perspective, by avoiding centralised storage of information
- Facilities for fine-grained access control over own product data by maintaining own data sources with adjusted access management;
- Provisioning of product information from trusted sources
- Federation of decentralised product data sources to increase data availability
- On-demand and real-time data access and update functionalities reducing duration and effort of data exchange
- Enabling bidirectional communication through the supply chain
- Provide relevant information for a stakeholder based on raw data.

**These requirements can be provided by the Product Information Service baseline app**, whose goal is to provide product information event-driven information exchange between the systems of the stakeholders of a supply chain and towards the final consumer, based on the B2B collaborative and system integration capacities offered by the FIspace platform.

Requirements describing user authentication, data privacy, product information confidentiality, stakeholder or customer reputation, and information transmission and storage securization are also included as functional requirements of the TIC solution. These requirements will be covered by the utilization of the Security, Privacy and Trust system, which ensures authentication, authorization and control for data access and modification. Section 3.4.1 will describe this system.

### 3.9.4 Domain Apps specific requirements

The App map for the TIC trial would be the following:

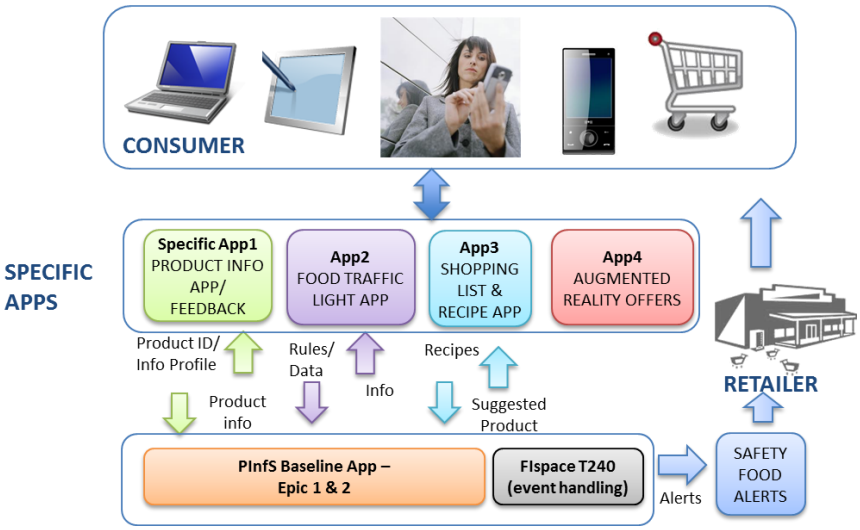



Figure 57 App map for TIC Trial

### 3.9.4.1 Product Info App:

This App allows end users to access tailored information through the mobile application where mode of use (anonymous, preferences) can be set and scan of different products located at supermarket premises can be achieved. It also allows the consumer to provide feedback on products.

| ReqID | Title | Description |
|---|---|---|
| APP1_REQ01 | **User registration** | User registration with the supermarket's local server:<br>• Anonymous; selection filters are created during the first session and are stored locally in the smartphone, modifiable from it.<br>• Fidelity card; the user uses his/her fidelity card as credentials. The information is stored remotely. |
| APP1_REQ02 | **Consumer profile definition** | So as to match the consumer's interests, it will be necessary to create a consumer profile in order to know what information the consumer is interested in<br>The consumer is the owner of his/her profile and the retailer can consult the profile only if the consumer gives access. So, profile information must be protected, authorizing the access to specific parts of the profile (depending on the user se-lection) and setting the information as anonymous if necessary, etc. |
| APP1_REQ03 | **Product info gather-ing** | Include social, health and environmental product information in the product. Supply chain stakeholders & retailer. |
| APP1_REQ04 | **QR & Bar code identi-fication** | Product's identification, based on code bar, QR code… |
| APP1_REQ05 | **Obtain user infor-mation** | Obtain user profile based on user id |
| APP1_REQ06 | **Match user's data with product's data** | The information provided to the consumer must be adapted to the consumer's profile |
| APP1_REQ07 | **Show the information** | The information must be shown to the user in his/her mobile device |
| APP1_REQ08 | **User feedback** | As an additional product attribute complaints/ranking related to the product will be storaged |
| APP1_REQ09 | **Security** | All information exchanges should be secured |
| APP1_REQ10 | **Multi-device** | The App should be able to be executed in different devices (smartphone, tablet…) |

Table 14 Product Information App requirements

### 3.9.4.2 Food Traffic Light App:

By means of this App, product data gathered from different actors can be transformed into knowledge based on a set of rules.

| ReqID | Title | Description |
|---|---|---|
| APP2_REQ01 | **Get product info** | Based on product id, this App must get the product info (fat, saturates, salt…) |
| APP2_REQ02 | **Define rules to turn product info into knowledge** | Retailer must monitor and manage the rules to transform product data into knowledge |
| APP2_REQ03 | **Turn product info into knowledge** | Based on defined rules and product info, info must be turned info into knowledge |
| APP2_REQ04 | **Show product knowledge** | Product info transformed into knowledge should be shown in a |
| APP2_REQ05 | **Security** | All information exchanges should be secured |
| APP2_REQ06 | **Multi-device** | The App should be able to be executed in different devices (smartphone, tablet…) |

Table 15 Food Traffic Light App requirements

### 3.9.4.3 Shopping List Recipe App:

This Specific App will allow the consumer to manage its shopping list, and based on product info and consumer preferences, suggest products to elaborate selected recipe.

| ReqID | Title | Description |
|---|---|---|
| APP3_REQ01 | **Shopping list management** | Add, remove and modify shopping list elements. Different ways to add elements at any place, at any time: scanning picture (product, label...), from a list, from former shoppings… |
| APP3_REQ02 | **Store the user's shopping list** | This list must be storage so that the user can access it at any time and make changes. |
| APP3_REQ03 | **Recipe storage** | Recipes include ingredients (by subcategories of products) and proportions |
| APP3_REQ04 | **Search a recipe** | Search ingredients (products) and proportions to make a recipe. Based on user preferences and product information, products will be suggested |
| APP3_REQ05 | **Security** | All information exchanges should be secured |
| APP3_REQ06 | **Multi-device** | The App should be able to be executed in different devices (smartphone, tablet…) |

Table 16 Shopping List Recipe App requirements

### 3.9.4.4 Augmented Reality Offers App:

This Specific App will allow the retailer to push specific information (offers, alerts, birthday greetings...) to the consumer, and the consumer to access tailored product information at the supermarket in its mobile device by means of augmented reality.

| ReqID | Title | Description |
|---|---|---|
| APP4_REQ01 | **Profile configuration** | Users must configure their profile to set the information type they would like to receive |
| APP4_REQ02 | **Define information to push to the clients** | The retailer must indicate which information they want to push to the consumers |
| APP4_REQ03 | **Push info** | Push information messages to the client |
| APP4_REQ04 | **Product pattern/ System training** | So as to recognize products, product pattern should be stored |
| APP4_REQ05 | **Connection with retailer ERP** | Information to be pushed to the client will be gathered from retailer ERP |
| APP4_REQ06 | **Product recognition** | Product should be recognized based on its shape |
| APP4_REQ07 | **Consumer criteria/profile** | The consumer will indicate the criteria (low fat, price, promotion…) of the information to be shown |
| APP4_REQ08 | **Show information (Augmented reality)** | Information tailored to user criteria should be shown in the mobile device screen superposed to the image of the products the user is scanning |
| APP4_REQ09 | **Security** | All information exchanges should be secured |
| APP4_REQ10 | **Multi-device** | The App should be able to be executed in different devices (smartphone, tablet…) |

Table 17 Augmented Reality App requirements

#### 3.9.4.5 Alerts

If any food alert arises, the FIspace platform should communicate it to the retailer that will contact affected customers (if they have used their fidelity card). The alert treatment the retailer must do is:

1. Check if there are users that have acquired the product.
2. Identify affected users and obtain affected users' data.
3. Notify the users and get confirmation back.

### 3.9.5 FIspace and FIware services to be used

This section is divided in two sub-sections describing FIspace services that will be used by the TIC trial and the generic enablers that will be employed.

#### 3.9.5.1 FIspace services

We identify relations of this trial with the FIspace components that will be developed in tasks task T240 FIspace Real-Time B2B Collaboration, task T250 System & Data Integration, task T260 FIspace Operating Environment and also with task T270 Security, Privacy and Trust.

The FIspace Real-time B2B collaboration service (from task T240) manages, executes and monitors collaborative processes among stakeholders. This service will be used by the TIC trial to identify the stakeholder that is the owner of product information, in order to request the information directly to it. This will permit to request information acccess to the owner of data, implemented data access and modification policies.

The System & Data Integration service (from task T250) enables the connection of existing systems with the FIspace in order to allow for the import and export of data and relevant information. The TIC trial will use this technical infrastructure to implement the communication channels between the FIspace and existing legacy systems in the supermarket (e.g. in-house logistics solution, ERP system),

The FIspace Operating Environment service (from task T260) consists of a technical infrastructure that allows all of the FIspace components to work together in harmony. This service will be needed to connect all FIspace modules, components and services through a cloud-based enterprise service bus (ESB) including P2P, Pub/Sub and Orchestration functionalities.

The Security, Privacy and Trust system (from task T270) allows TIC actors to provide and access product related data ensuring the utilization of an authentication and authorisation mechanism to control the access to data and decide about the trustworthiness of an information source from an ICT point of view.

**All of these services will be provided by the usage of the Product Information and the Exception Handling Baseline apps**, which directly access to the functionalities offered by the FIspace platform.

#### 3.9.5.2 Generic enablers

Generic enablers will be used in the trial by means of the Apps and the FIspace platform (WP200)The functionalities that we expect to be covered by generic enablers are:

- Data handling provision in product storage
- Rule provision for transforming raw data into knowledge.
- User notification of information (offers or food alerts)

Regarding the first one we identify the following generic enablers that could be used:

The Data Handling – PPL GE provides the framework and the necessary tool to give the control to the data owner by imposing obligations on the data and restrictions. This generic enabler will permit that customers consume information related to products and the supermarket or other stakeholder can create or update it.

The Object Storage generic enabler provides an object database in a distributed way and some access permissions depending on users or groups of users. Also, object storage consumers can register to context producer applications, update context information or send updates of temperature, being notified when changes on context information take place

Regarding the second functionality, in order to extract some useful knowledge for specific stakeholders, rules could be defined to filter this information. The Complex Event Processing and Gateway Data Handling GE – Esper4FastData can be used for this task:

The Complex Event Processing (CEP) GE analyses event data in real-time, generates immediate insight and enables instant response to changing conditions. While standard reactive applications are based on reactions to single events, the CEP GE reacts to situations rather than to single events.

The Gateway Data Handling GE – Esper4FastData, transforms data into events using smart rules. Applications collect in real-time large amount of data, but only relevant data avoiding boring and asynchronous data analysis. Client can manage raw data as well as define some local rules to add value on raw data and send only relevant events when a typical situation happens. He will also be able to add and change the rules

Regarding the last functionality the Publish/Subscribe Context Broker GE – Context Awareness Platform can be used. Using these GE clients can register to context producer applications, update context information and being notified when changes on context information take place.

The Data-Handling, Object Storage, Complex Event Processing and Gateway Data Handling Generic Enablers will be presumably used by the Product Information baseline app, whereas the Publish/Subscribe Context broker GE will be used through the exception handling baseline app.

### 3.9.6 Experimentation Site

The TIC pilot is deployed in PlusFresc facilities located in Lleida (Spain).

The facilities of the supermarket consist of two floors: The ground floor is the supermarket itself and the first floor with the consumers' space room.

The supermarket that is located there is a medium size store (Figure 4) composed by a dry products section, a bakery and a big fresh food area with fresh fruit and vegetables (Figure 5), a butcher and fish/seafood services (Figure 6). The main client profile of this shop is middle-aged middle-high class consumers, according to the neighbourhood profile.

At the entry of Sunka supermarket there is an area for exhibition of works by amateur artists, private collections of objects and photographs.

Above the supermarket, is the Consumer's Space named Sunka Room. It is a place where part of PlusFresc communication and marketing department is situated, and is used for consumer-retailer interaction in order to have feedback from its regular consumers (the ones with PlusFresc fidelity card) about different subjects such as new products offered by the supermarket, cooking classes, master classes of nutrition, etc. It is a room with capacity for maximum 40 people with all the facilities for carrying out workshops, talks, cooking classes, and so on. The room is also used for book launches, conferences and children activities. The figures below represent top and ground floor facilities.


Figure 58: Top Floor Ground Floor

Facilities in Calle Bisbe Ruano have been chosen as the best site for pilot deployment because of the following reasons (Figure 59):

- The medium size of the supermarkets represents the best conditions for a prototype test.
- The location of the Sunka supermarket and the consumers' space Sunka Room is in a young and dynamic neighbourhood, so is the profile of its clients. Young and dynamic consumers are more likely to be used and interested in new technologies. Therefore, the panel of consumers consisting of clients of the supermarket will be easy to create and be involved in the project.
- Sunka supermarket has always been at state-of-the-art of innovation and activities for consumers.
- The deployment of all equipment needed for TIC pilot can be set up in the Consumers' space, which provides enough room for it.
- The Consumers' space represents a perfect place for developing TIC pilot tests in a closed and controlled environment, using pilot products from the supermarket and totally equipped for the development of the workshops with consumers.

Figure 59: Entry of Sunka supermarket

Figure 60: Fresh fruits and vegetables area

Figure 61: Fresh fish area

The computer equipment is installed in a room located in the Sunka Room, next to the room where workshops with consumers will be carried out.

Figure 62: Sunka Consumer area Cooking area

### 3.9.6.1 Requirements

The Wi-Fi network is necessary to conduct the TIC pilot as consumers need to access to it in order to use their Smartphone at both sites, the supermarket and the Sunka Room. In the same way, the server should be connected to the Wi-Fi signal in PlusFresc.

# 4 Harmonization and Collaboration

## 4.1 WP400 Collaboration and Organization

The work load, spread over the eight trials and consolidated in WP400, is mainly aligned in bi-weekly management calls. All trial leads update each other and the work package leads inform about news and changes or progress to the overall project community. In addition, these calls are used to align the teams and discuss any issues while collectively arriving at agreement on direction and solutions.

Within WP400 the achieved results are delivered in consolidated deliverables, as expected by the DoW. This approach facilitates cross trial and task activities as work package wide templates and approaches are developed. The standardization helps to support the other work packages even with the aggressive timelines for the project.

## 4.2 WP400 Workplan

The coordination of the tasks and milestones of WP400 and its trial is managed thru a work plan that incorporates the specific work plans of each trial. This consolidated work plan is included in the embedded Excel file.

FIspace workplan
WP400 incl trial plans

The WP400 work plan is kept as a living document and will be updated and enhanced whenever it is necessary. The detailed work and expermention plans for each specific trial can be found in Annex 7.1 to this document.

# 5 Summary

The task of D400.1 is to define the experimentation approaches and plans of the several trials from the domain perspective. Apart from describing the experiments and the experimentations site it was also requested to demonstrate the relevance of the trials with respect to the utilization of FIspace and FIware services. Each trial has elaborated which base line apps will be used, which domain specific apps shall be developed in order to achieve the expected results and which FIspace and FIware services are planned to be used.

## 5.1 Requested Base line Apps

The FIspace concept is based on the technology platform (FIware) operating certain core business applications called base line apps. These base line apps are providing the basic functionalities for managing a certain business with FIspace. Within D400.1 the trials identified requirements for the following base line apps:

- Real-time Business SLA management
- Business Profile App
- Marketplace Operations App
- Business services
- Logistics planning
- Product Information Services
- Business Profile / Marketplace Operation Apps
- Workflow/Event Processing Engine (i.e. baseline app or provided by Task 240

This list of baseline apps will require alignment with WP200 to ensure that there is no overlap with what is being considered as base functionality within the FIspace service itself. Alignment is an ongoing process as WP200 develops the detailed specifications for the FIspace service itself.

## 5.2 Domain Specific Apps

Each of the trials has defined several domain specific applications (domain apps) that will cover a certain specific functionality. These apps have to be developed via the open call either from project partners or by outside developers.

## 5.3 FIspace Platform Services

The Experimentation set up of each trial is based on FIspace platform services FIspace and FIware GEs. The aim is to test the trial concepts utilizing the platform capabilities as well Core Platform GEs. Within D400.1 each trial has evaluated which services from FIspace and FIware will be utilized or is necessary to perform the experimentation scenarios.

# 6 Annex

## 6.1 Workplans

### 6.1.1 Task 421 Crop Protection Information Sharing Trial

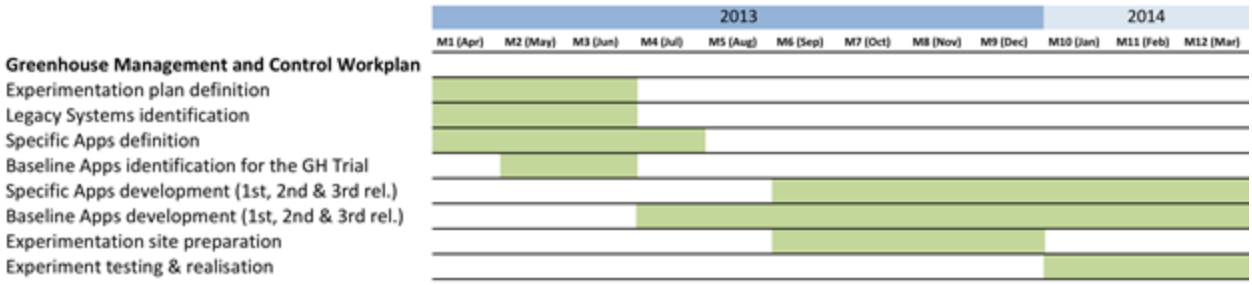
| Del. month | Sprint data | Trial part in official deliverable | Milestone | C | G | D | N | S | T |
|---|---|---|---|---|---|---|---|---|---|
| | April 29 | | - Actualize Work plan<br>- 1e draft essential use cases<br>- BPM&UseCases “Combine Weather” (1.1)<br>- Required data “Combine Weather” (1.1)<br>- Indication of required generic enablers | | | | | X | |
| | May 13 | | - Actualize plan<br>- Essential use cases described<br>- 1e draft data model<br>- 1e draft experiments<br>- Indication of useful base apps | | | | | X | X |
| | May 22 | Draft version of the Planning and Elaboration plan, inclusive test plan. | - Finalize plan. plan<br>- First draft behavioural model<br>- BPM&UseCases “Whole Field Phytophthora Advise” (1.2)<br>- Required data “Whole Field Phytophthora Advise” (1.2)<br>- | | | | | | |
| | June 10 | Version of the Planning and Elaboration plan, inclusive test plan, to be reviewed by Rod | - Finalize plan<br>- Specification of base apps | | | X | | | |
| M3 | June 24 | - Formulation of the experiments<br>- Final version of Planning and elaboration Phase | - Finalized experiment plan<br>- Updated work plan<br>- Specification of base apps<br>- BPM&UseCases “Assemble Field data” (2.1) | | | | | | |

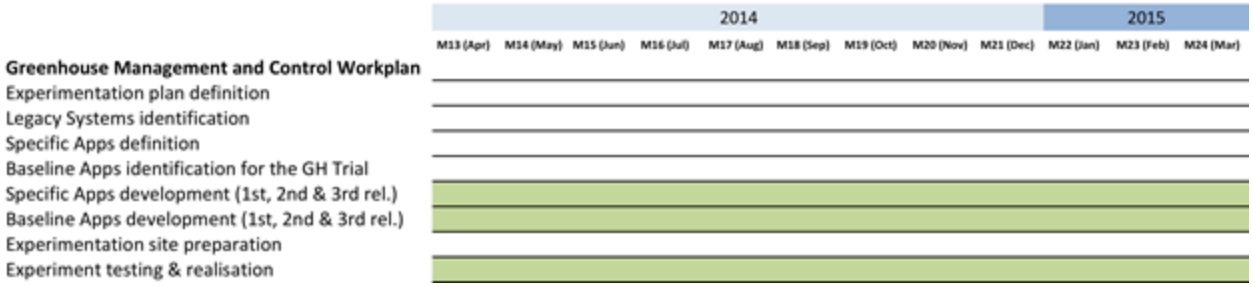
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | - Inventory of Apps which have communality over more trials, with requirement specification of those Apps | - Data requirements “Assemble Field data” (2.1)<br>- Data model “Assemble Field data” (2.1)<br>- System behaviour “Assemble Field data” (2.1)<br>- Test “Measure Crop Reflectance” (3.2) | | | | | | |
| | July 8 | | - Indication of Apps to be developed by third parties<br>-BPM & Use Cases “Recipe Formulation (2.2)<br>- Data requirements “Recipe Formulation (2.2)<br>- Data model “Recipe Formulation (2.2)<br>- Global description of “Spraying”(4.1) | | | | x | | |
| M4 | July 22 | Specification of apps we think third parties should develop as intensification or extension of apps we develop ourselves | - Requirements for open call<br>- System behaviour “Combine Weather” (1.1)<br>- Behaviour model “Recipe Formulation (2.2)<br>- BPM & Use Cases “Task Formulation” (2.3)<br>- Data requirements “Task Formulation” (2.3)<br>- Data model “Task Formulation” (2.3) | | | | x | | |
| | August 5 | | - Interface definition “Combine Weather” (1.1)<br>- Test of “Combine Weather” (1.1)<br>- System behaviour “Whole Field Phytophthora Advise” (1.2)<br>- Interface definition “Recipe Formulation (2.2)<br>- Behaviour model “Task Formulation” (2.3)<br>- BPM & Use Cases “Measuring Weather and soil moisture variables” (3.1)<br>- Required data “Measuring Weather and soil moisture variables” (3.1) | X | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | - Behaviour model “Measuring Weather and soil moisture variables” (3.1) | | | | | | |
| | August 19 | | - Interface definition “Whole Field Phytophthora Advise” (1.2)<br>- Interface definition “Assemble Field data” (2.1)<br>- Interface definition “Task Formulation” (2.3)<br>- Interface definition “Measuring Weather and soil moisture variables” (3.1) | X | X | | | | |
| | September 2 | | - Test “Whole Field Phytophthora Advise” (1.2)<br>- Test “Assemble Field data” (2.1)<br>- Test “Recipe Formulation (2.2)<br>- Test “Task Formulation” (2.3)<br>- Test “Measuring Weather and soil moisture variables” (3.1)<br>- Test “Spraying” (4.1) | | X | | | | |
| M6 | September 16 | - Results from our first experiments with cycle 1 apps on our own platforms.<br>- Description of our cycle 1 App(s)<br>- Business collaboration object for 1e cycle business process | - Re-test all failed test results.<br>- Formulate business collaboration object, based on behaviour models.<br>- | | | | | | |
| | September 30 | | | | | x | | | |
| | | | | | | | | | |

### 6.1.2 Trial 422 Greenhouse Management

The workplan for the Greenhouse Management & Control Trial, including definition of Baseline and Domain-Specific Applications' functionalities & development, experimentation site preparation and experimentation testing & realisation is presented in the table below:




### 6.1.3 Trial 431 Fish Distribution and (Re-)Planning

#### 6.1.3.1 Task 431 Summary

This section summaries the work to be conducted in WP431 "Fish Distribution and (Re)-Planning" and how each task is related to other cSpace deliverables.

The purpose of the WP is to conduct trial experiments that leverage the cSpace service, domain specific applications and the FI WARE infrastructure, and also to prepare for large scale trial (phase 3) by making sure that what we test can survive in a business environment.

**Summary of activities:**

**April-June 2013: Detailed Experiment Definition:**

1. Identification of appropriate experiments based on use case requirements identified in Phase 1
2. Development of detailed experimental protocols to ensure that the experimental site and FI system are exercised in a manner that provides useful feedback to business partners, cSpace developers, domain application developers and FI WARE developers
3. Identification of experimentation sites capable of performing the defined experiments
4. Identification of requirements for domain specific applications to conduct the experiments
5. Identification of cSpace and FI WARE services required for the experiments
6. The set-up of protocols (in particular the logging framework and ex ante definition of stakeholder interactions) will be done in coordination with T520 so that metrics and other information relevant for the assessment of business models within the trials can be fed into the Business Model analysis in cSpace.

**May-Dec 2013: Experiment and App requirement Elicitation:**

This task is concerned with identifying the detailed business and technical requirements (as necessary) for each application and domain-specific test application, obtain internal or open call resources to develop the applications and provision the applications so that defined experiments can be conducted. This task includes:

1. Evaluation of Phase 1 domain application designs
2. Identification of additional domain application requirements based on detailed experiment designs
3. Identification of appropriate resources to develop applications

**Oct 2013-Mar 2015: Large Scale Rollout Preparation:**

This task includes the identification of potential large scale trials, identification of potential trial sites and development of a large scale trial rollout plan. This includes:

1. Selection of specific trials that have business value for large scale rollout tests
2. Development rollout test plans for the rollout
3. Identification and documentation of rollout site requirements
4. Identification of potential rollout sites
5. Documentation of the above in a plan for the conduct of large scale trials

This task will interact with T570 where the overall large scale rollout of cSpace is developed.

**Jan 2014-Mar 2015: Experiment Realization and Test:**

This task is concerned with the actual conduct of the defined experiments using the identified experimentation environments, domain specific applications, cSpace services and FI WARE infrastructure. Experimental outcomes, based on clearly defined protocols, will be documented and compared to expected outcomes. Results will be documented and feedback made based on achievement of business value, performance of cSpace and FI WARE services and domain applications. This includes:

1. Conduction of defined experiment following the experimental protocol
2. Documentation of experimental outcomes
3. Feedback of experimental outcomes to interested domain partners, cSpace developers, domain application developers and FI WARE developers
4. Accommodation for T520 to perform specific trial-based business modelling activities.

T520 will feed iterative questionnaires to the experiment lead, for distribution and completion among the localised business ecosystem performing the trial, and by organising interactive business model workshops with the trial stakeholders for a preselected set of trials. These activities will be facilitated by Task 413 and contribute to the overall exploitation analysis in WP500.

Figure 1 shows the task timeline for WP431.

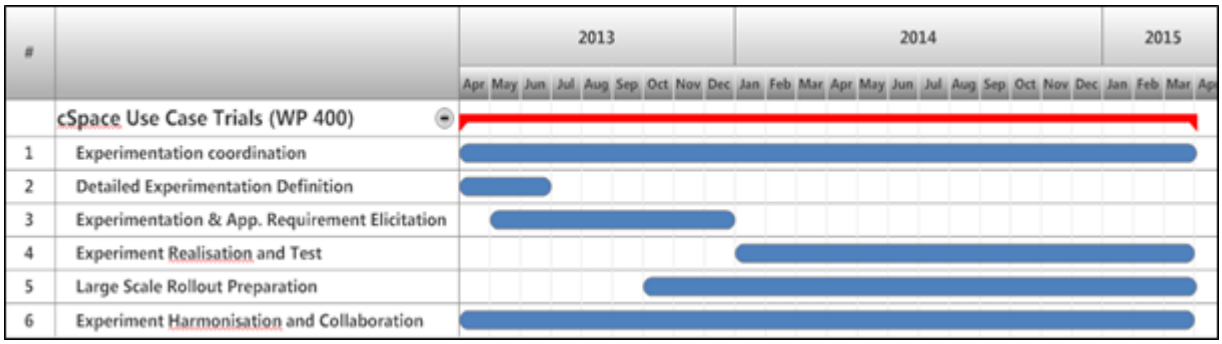



Figure 63 Task timeline for WP431

### 6.1.3.2 Work Approach

During the two year duration of the fish trial, we will follow an iterative development strategy.

After the Planning and Elaboration Phase of the whole Fish trial, different use cases within the trial will be developed in iterative cycles. In the first cycle we will develop the core functionality of Fish distribution and re-planning, and expanded this in successive development cycles. Each development cycle will be divided in Sprints which at least include refinement of the plan, analysis, design, development and test.

The development cycles will be limited to a three month period, synchronised with deliverables that the fish trial has to give input to.

Each sprint will have duration of two weeks which will start with reporting results of the previous period and formulation of a delivery plan for the next sprint.

### 6.1.3.3 M1-M3 Plans

Plans for the first three months:

| Week | Task | Responsible |
|---|---|---|
| **15** | Kickoff | |
| **16** | | |
| **17** | 22.04: MRTK-NCL meeting: scope, tasks, responsibilities<br>• Select details on process steps in the trial to continue with<br>• Identify third party systems to interface to<br>• Identify stakeholders | MRTK, NCL |
| | 24.04: Deadline for input to WP200 on first iteration of technical requirements | |
| **18** | | MRTK, NCL |
| **End** | 30.04: Deadline: on Set up of stakeholder identification | |

| Week | Task | Responsible |
|---|---|---|
| **April** | | |
| **19** | Telecon with NCL to discuss more details on: Business Requirements:<br>• Detailed process description<br>• Expected results<br>• Test data<br>• Identification of experimentation sites | MRTK |
| | Fix/check meeting with Maritech as Fish producer Tracking/tracing? | |
| | Fix/check Norwegian meeting on Open calls for fish trial: To get response/ideas | |
| **20** | First version of technical requirements:<br>• Baseline app capabilities<br>• Domain specific app capabilities<br>• cSpace platform (direct)<br>• GE usage (direct) | MRTK |
| **21** | Telecon with NCL to discuss Business Requirements, and effect descriptions, capabilities, and Expected goals/KPIs. | MRTK, NCL |
| **22**<br>**End May** | | |
| **23** | 10.06: Input to deliverable 400.1 finished:<br>• Detailed experimentation plans<br>• Initial workplan<br>• Functionality for baseline apps, domain apps, and GEs | MRTK |
| **24** | 17.06: Input to deliverable D400.10 finished: Technical definition for open call: Specification of possible third party apps development | MRTK |
| **25** | | |
| **26**<br>**End June** | 30th June: Deadline for D400.1 Detailed Experimentation Plans and Initial Work Plans, Including App Development (M3) | |

#### 6.1.3.4 M4-M6 Planning

| Week | Task | Responsible |
|---|---|---|
| 27 | | |
| 28 | | |
| 29 | | |
| 30 | | |
| 31<br>End July | 31st July: Deadline for Deliverable D400.14: Technical definition of the Open Call (M5) | |
| 32 | | |
| 33 | | |
| 34 | | |
| 35<br>End au-gust | First version of the following:<br>1) Evaluation of Phase 1 domain application designs<br>2) Identification of additional domain application requirements based on detailed experiment designs<br>3) Identification of appropriate resources for application devel-opement | |
| 36 | | |
| 37 | 10th-12th Sept: cSpace plenary meeting | |
| 38 | | |
| 39 | | |
| 40<br>End sep-tember | Mon 30th Sept: Deadline for Deliverable D400.2: Progress report on trial experimentation and App development and initial plan for Phase 3 rollout. (M6) | |

### 6.1.4 Trial 432 Fruit and Vegetables Quality Assurance

#### 6.1.4.1 Work plan (including development)

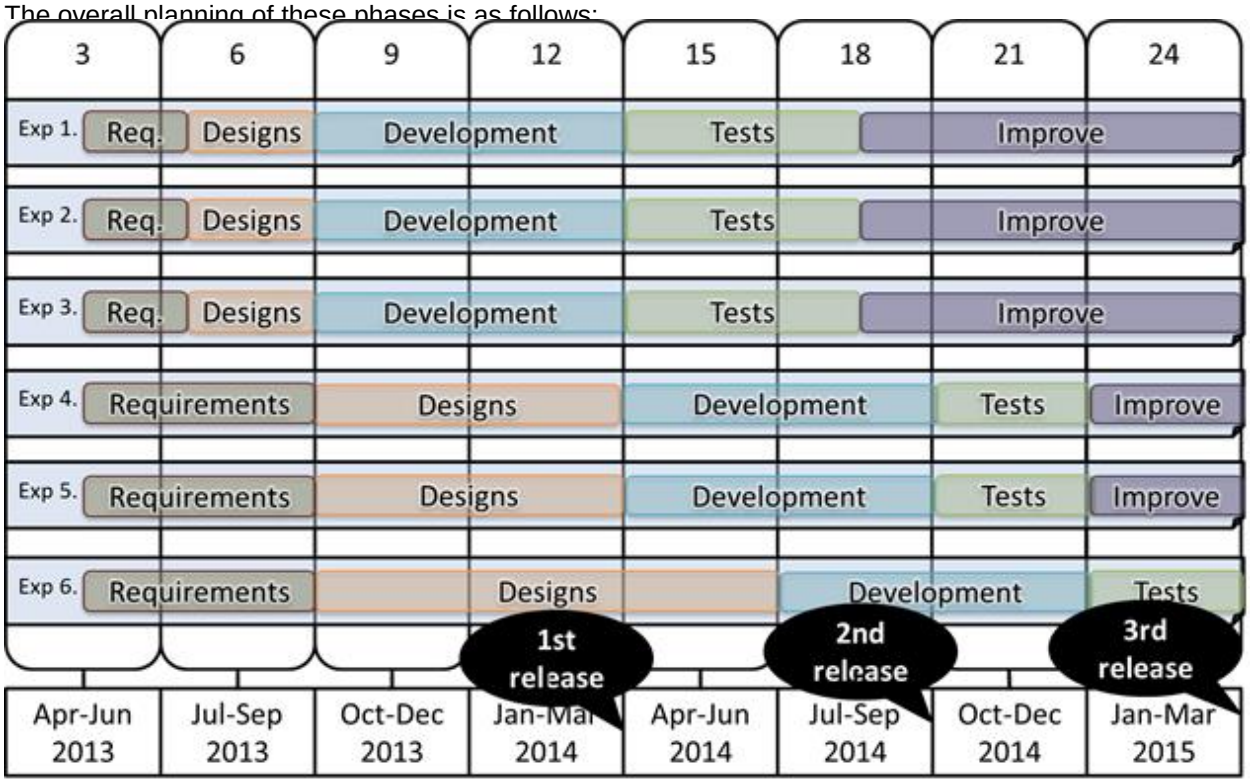
| | Q1 (3) | Q2 (6) | Q3 (9) | Q4 (12) | Q5 (15) | Q6 (18) | Q7 (21) | Q8 (24) |
|---|---|---|---|---|---|---|---|---|
| **Experiment 1 (forward communication)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 2 (backward communication)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 3 (Management of RTI boxes)** | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 4 (Certification status information)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 5 (Laboratory information integration)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 6 (transport status information)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 7 (Exception reporting, product/process information)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 8 ((Deviation reporting transport)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |
| **Experiment 9 (market place)** | | | | | | | | |
| Require | | | | | | | | |
| Design | | | | | | | | |
| Develop | | | | | | | | |
| Test | | | | | | | | |
| Improve | | | | | | | | |

### 6.1.5 Trial 433 Flowers and Plants Distribution

A. *Experimentation Planning*: this task will elaborate the specific experiments that will be conducted, the expected out-comes of the experiments, the business relevance of the experiments, the experimental site requirements, cSpace services required, domain specific application requirements and FI WARE services to be used for each of the experiments;
B. *Experiment and App Requirement Elicitation (*Use Case Analysis): this task is concerned with identifying the detailed business and technical requirements (as necessary) for each application and domain-specific test application, obtain internal or open call resources to develop the applications and provision the applications so that defined experiments can be conducted;
C. *Design Software Architecture:* this task will provide the technical specification and develop the trial-specific application, including the identification of technical requirements, the definition of the conceptual and technical specifications, the identification of cSpace functionalities and potential GE to build upon,
D. *Software Development:* the development of specific domain test applications, the integration of baseline apps, testing and technical documentation;
E. *Experiment Realisation and Test*: this task is concerned with the actual conduct of the defined experiments using the identified experimentation environments, domain specific applications, cSpace services and FI WARE infrastructure;
F. *Large Scale Rollout Preparation and Dissemination*: this task includes the identification of potential large scale trials, identification of potential trial sites and development of a large scale trial rollout plan;
G. *Experimentation harmonization & collaboration*: this task is concerned with the definition, control, and regular update/refinement of the work plan for the trial experiment.

The overall planning of these phases is as follows:




For more details about the planning of the next steps we refer to the detailed milestone plan of the first 6 months of the project.

### 6.1.6 Trial 441 Meat Information Provenance

In the Gantt-chart resources are not yet indicated, as this is not possible at such a detailed level and, moreover, it does not help execution of the workplan.

The work in the MIP trial (T441) is decomposed in actions and sub-actions. The following actions are distinguished: (A0) trial management, (A1) stakeholder involvement, (A2) system development, (A3) experimenting, (A4) Business process modelling, (A5) open call, (A6) dissemination and exploitation and (A7) roll-out in FI-PPP phase 3. See the summary in

Summary of main actions in MIP trial T441.

| Main actions in T441 | | |
|---|---|---|
| A0 | Trial management | Managing MIP trial (T441) |
| A1 | Stakeholder involvement | Interacting with stakeholders to involve and persuade them to participate. |
| A2 | System development | Realisation of a new EPCIS-based meat supply chain information system. |
| A3 | Experimenting | This is the core task in the MIP trial (T441), where the real (or simulated) practical tests are done. |
| A4 | Business process modelling | Business process modelling is used to model the business processes of the meat supply chain in a way that facilitates translating its processes into EPCIS events. |
| A5 | Open call | What the trial team has to do in relation to Fispace's open call. |

| | | |
|---|---|---|
| A6 | Dissemination and Exploitation | Dissemination of results and exploitation of the reference architecture for new meat supply chain information system. |
| A7 | Roll-out in FI-PPP phase 3 | The tested reference architecture of a new meat supply chain information system should be used in other meat supply chains; the actions consist of supporting FI-PPP phase 3 project proposal that aim to do that. |

| | | | 2013 | | | | | | | | | 2014 | | | | | | | | | | | | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T441 | | Actions and sub-actions in MIP trial (M1-M24) | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| **A0** | | **Trial management** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A01 | Trial experiment plan | | | | | | | | | | | | | | | | | | | | | | | | |
| | A02 | Internal communication | | | | | | | | | | | | | | | | | | | | | | | | |
| | A03 | External communication | | | | | | | | | | | | | | | | | | | | | | | | |
| | A04 | Trial meetings | | | | | | | | | | | | | | | | | | | | | | | | |
| | A05 | Trial reporting | | | | | | | | | | | | | | | | | | | | | | | | |
| **A1** | | **Stakeholder involvement** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-1 | Planning stakeholder involvement | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-2 | Stakeholder analysis (who) with matrix | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-3 | Business cases for various stakeholders | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-4 | Stakeholder persuasion document | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-5 | Stakeholder persuasion powerpoint | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-6 | Data collection | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-7 | Questionaire | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-8 | Interviews | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-9 | Analysing interviews/questionaire | | | | | | | | | | | | | | | | | | | | | | | | |
| | A1-10 | Stakeholder meeting | | | | | | | | | | | | | | | | | | | | | | | | |
| **A2** | | **System development** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A2-1 | Requirements to EPCIS to WP200 and T450 | | | | | | | | | | | | | | | | | | | | | | | | |
| | A2-2 | Requirements to basic apps | | | | | | | | | | | | | | | | | | | | | | | | |
| | A2-3 | Requirements to other apps | | | | | | | | | | | | | | | | | | | | | | | | |
| | A2-4 | Architecture | | | | | | | | | | | | | | | | | | | | | | | | |
| | A2-5 | select GE's that are interesting to be used | | | | | | | | | | | | | | | | | | | | | | | | |
| | A | Software | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2-6 | implementation | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 2-7 | Technical test | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 2-8 | Software improvement | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 2-9 | Software improvement test | | | | | | | | | | | | | | | | | | | | | | | | |
| **A 3** | | **Experimenting** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-1 | Define KPI | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-2 | Planning simulation | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-3 | Doing simulation | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-4 | Analyse simulation results | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-5 | Prepare realistic experiment | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 3-6 | Do realistic exper-iment in 1 supply chain | | | | | | | | | | | | | | | | | | | | | | | | |
| **A 4** | | **Business process modelling** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 4-1 | Describing typical beef supply chain process | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 4-2 | Translate to EP-CIS event types | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 4-3 | First draft of BPM (ArchiMate) | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 4-4 | Validate model with stakeholders | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | 2013 | | | | | | | | | 2014 | | | | | | | | | | | | 2014 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T441 | | Actions and sub-actions in MIP trial (M1-M24) | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| **A 5** | | **Open call** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 5-1 | Describe technical and functional requirements | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 5-2 | Identify interest of solution providers | | | | | | | | | | | | | | | | | | | | | | | | |
| | A 5-3 | IPR issues | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A5-4 | Help preparing proposal | | | | | | | | | | | | | | | | | | | | | | | | |
| | A5-5 | Record progress | | | | | | | | | | | | | | | | | | | | | | | | |
| | A5-6 | Test resulting software | | | | | | | | | | | | | | | | | | | | | | | | |
| **A6** | | **Dissemination and Exploitation** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A6-1 | Dissemination plan | | | | | | | | | | | | | | | | | | | | | | | | |
| | A6-2 | National discussion panel | | | | | | | | | | | | | | | | | | | | | | | | |
| | A6-3 | Platform (part of FI-space) | | | | | | | | | | | | | | | | | | | | | | | | |
| | A6-4 | Reflection | | | | | | | | | | | | | | | | | | | | | | | | |
| | A6-6 | Exploitation plan | | | | | | | | | | | | | | | | | | | | | | | | |
| **A7** | | **Roll-out in FI-PPP phase 3** | | | | | | | | | | | | | | | | | | | | | | | | |
| | A7-1 | Identify interested stakeholders | | | | | | | | | | | | | | | | | | | | | | | | |
| | A7-2 | Help preparing proposal phase 3 | | | | | | | | | | | | | | | | | | | | | | | | |

### 6.1.7 Trial 442 Im- and Export of Consumer Goods

In this section the detailed workplan for the trial experiment should be documented. Primary tasks, resource requirements, and expected task durations should all be documented. All inputs from external work packages or third parties should be clearly documented as to timing so that these can be tracked and closely monitored. Critical path elements and milestones should be noted so that they can be tracked.

| Participants | Task | Details | Date | Week |
|---|---|---|---|---|
| ARC - Internal | Kick-off | Allign about project requirements | 12.04.2013 | 15 |
| | | | | 16 |

| | | | | |
|---|---|---|---|---|
| ARC | Define scope, tasks, responsibilities | Select details on process steps in the trial to continue with<br>Refine experimental test data<br>Identify stakeholders & roles & privileges | 22.04.2013 | 17 |
| | | | | 18 |
| ARC | Refine taks & responsibilities | Process description and revision of privileges<br>Initial refinement of test scenarios<br>Initial mapping with techinal requirements | 10.05.2013 | 19 |
| ARC & KN | Telecon with KN & KOC | Revision of process description & tasks & test scenarios | 17.05.2013 | 20 |
| ARC & KOC | First version of technical requirements:<br>• Baseline app capabilities<br>• Domain specific app capabilities<br>• FIspace (direct)<br>• GE usage (direct) | List of FIspace services<br>List of relevant GE's<br>Initial mapping with business requirements to technical requirements<br>Draft technical relations process flow | 13-17.05.2013 | 20 |
| ARC & KN & KOC | Telecon with KN & KOC | Revision of process description & tasks & test scenarios<br>Refinement of technical process flow<br>Refinement of initial techical mapping | 21.05.2013 (?) | 21 |
| ARC | Finalization of the draft deliverable | First draft deliverable 400.1 | 31.05.2013 | 21-22 |
| ARC&KN&KOC | Telco on draft deliverable | Refinement on business requirements<br>Refinement of initial technical infrastructure | 03-07.06.2013 | 23 |
| ARC&KN&KOC | Input to deliverable 400.1 finished | Detailed experimentation plans<br>Initial workplan<br>Functionality for baseline apps, domain apps, and GEs | 14.06.2013 | 24 |
| ARC &KN&KOC | Input to deliverable 400.1 finished | 17.06: Input to deliverable D400.10 finished: Technical definition for open call: Specification of possible third party apps development | 17.06.2013 | 25 |
| | | | | 26 |
| ARC & KN | 30th June: Deadline for D400.1 Detailed Experimentation Plans and Initial Work Plans, Including App Development (M3) | | 30.06.2013 | 27 |

| | | | | |
|---|---|---|---|---|
| | | | | 28 |
| | | | | 29 |
| | | | | 30 |
| ARC & KN | 31st July: Deadline for Deliverable D400.14: Technical definition of the Open Call (M5) | | | 31 |
| | | | | 32 |
| | | | | 33 |
| | | | | 34 |
| ARC & KN | | First version of the following:<br>1) Evaluation of Phase 1 domain application designs<br>2) Identification of additional domain application requirements based on detailed experiment designs<br>3) Identification of appropriate resources for application developement | | 35 |
| | | | | 36 |
| | Istanbul pleanery meeting | | | 37 |
| | | | | 38 |
| | | | | 39 |
| ARC & KN | Mon 30th Sept: Deadline for Deliverable D400.2: Progress report on trial experimentation and App development and initial plan for Phase 3 rollout. (M6) | | | 40 |

### 6.1.8 Trial 443 Tailored Information for Consumers

| Sprint Tasks<br>(short & understandable description) | Due date | Responsible<br>(person(s) responsible for sprint task) |
|---|---|---|
| **Sprint 1-18.04** | | |
| Kick off | 29.04.2013 | All |
| Revision of use case requirements identified in Phase 1 and possible experiments for Phase 2 | 29.04.2013 | All |
| Identify possible legacy systems to integrate to | 29.04.2013 | Plus Fresc |
| **Sprint 2-06.05** | | |

| Sprint Tasks (short & understandable description) | Due date | Responsible (person(s) responsible for sprint task) |
|---|---|---|
| Business requirements definition and priorization | 10.05.2013 | Plus Fresc |
| Business requirements analysis from a technical point of view:<br>- Baseline App<br>-Specific App | 17.05.2013 | Atos/UPM |
| Review Baseline app functionalities defined in T451 | 21.05.2013 | ATOS/UPM |
| **Sprint 3-21.05** | | |
| Detailed experiment/process description:<br>• Detailed process description<br>• Expected results<br>• Stakeholders | 24.05.2013 | Plus Fresc / Atos |
| Experimentation site definition | 03.06.2013 | Plus Fresc |
| Technical requirements definition. Identify FIspace an FIware services required for the experiment and interaction with WP200 | 03.06.2013 | Atos/UPM |
| **Sprint 4-03.06** | | |
| Identify interactions between trials and information to exchange (high level) | 07.06.2013 | All |
| Input to deliverable **D400.1 (M3)** finished:<br>• Detailed experimentation plans<br>• Initial workplan<br>• Functionality for baseline apps, domain apps, and Ges | 14.06.2013 | All |
| **Sprint 5-17.06** | | |
| Evaluate technical requirements, distribute development responssibilities and decide on requirements to be taken out to the open call | 17.06.2013 | All |
| Input to deliverable **D400.14 (M4)** finished: Technical definition for open call: Specification of possible third party apps development | 21.06.2013 | All |
| **Sprint 6-01.07** | | |
| Preparing trial experimantation progress report<br>Define app functionalites intial roll out plan proposal | 15.07.2013 | |
| Business collaboration objects definition | 15.07.2013 | |
| **Sprint 7-15.07** | | |
| Input to deliverable **D400.2 (M6):** Trial experimentation progress report | 31.07.2013 | |
| Input to deliverable **D400.10 (M6):** Definition of the business collaboration objects | 31.07.2013 | |
| **Sprint 8-29.07** | | |
| Input to deliverable **D400.2 (M6)** finished: Trial experimantation progress report | 31.07.2013 | |
| Input to deliverable **D400.10 (M6):** Definition of the business collaboration objects | 31.07.2013 | |

| Sprint Tasks (short & understandable description) | Due date | Responsible (person(s) responsible for sprint task) |
|---|---|---|
| **Sprint 9-12.08** | | |
| | | |
| **Sprint 10-06.09** | | |

Plan trial experimentation

## 6.2 Additional Trial specific Documents

### 6.2.1 421 Crop Protection Information Sharing Development and test of system functions.

Table 18.**High level use cases and realised functions.**

| **High level Use case** | **Realised functions ( some functions will be added in later development cycles)** | **Cycle** [1)] | remarks |
|---|---|---|---|
| Advise Crop Protection | 2.1 Assemble Field data<br>1.1 Combine weather data<br>1.2 Whole Field Phytophthora Advise<br>1.4 Variety and canopy dependent dose | 1<br>1-2<br>1-2<br>2 | |
| Plan Spraying | 2.1 Assemble Field data<br>2.2 Recipe Formulation<br>2.3 Task Formulation<br>2.4 Scheduling | 1<br>1<br>1<br>2-3 | In cycle 2 specified by farm manager |
| Execute spraying | 3.2 Measure Crop reflection<br>4.2 Real time dose adjustment<br>4.1 Spraying<br>4.3 Logging | 1<br>3<br>1<br>2 - 3 | In cycle 2 On line logging, in 3 wireless |
| Collect local climate and soil moisture data | 3.1 Measure weather and soil variables | 1-2 | |
| Remote Control | 4.3 Logging<br><br>2.5 Real time monitoring | 2<br><br>2 | Real time logging and communicate |

1) When more cycles are indicated, this means that the functionality is elaborated (made more sophisticated) in the successive cycles.

The release cycles in which they system functions will be developed and released for testing are indicated in

Table 18, and those to be tested in the first release cycle are worked out in more detail in the paragraphs 6.2.1.1.1 to 6.2.1.13.

- **Release cycle 1** is characterised by that it gives an advise (version 1a) on a whole field (CropField) basis. (System functions 1.1a and 1.2a) A presumption is that only one variety is grown on that field. The output is restricted to whether to spray yes or no and with which type of product. Recipe formulation (2.2) and Task formulation (2.3) are quit straight forward as no site specific doses are required. Logging is restricted to recording relevant process variables on actual applied dosages in a Taskfile.

- **Release cycle 2** will extend the whole field advise (version 1b) with adjustment of spraying to cultivar ( System function 1.2b). This whole field crop advise will also have a version (version 2) which takes the DWIP part of the model into account (1.2c). This requires additional weather data provided by version 2 of combine weather data. (1.1b) The advice will also be extended with the spatial version (version 3) in which variation of the crop canopy is included and variety characteristics are taken into account (biomass map based on UAS or satellite image) (this is system function 1.4). This requires extension the functionality of Task Formulation (system function 2.3b) as site specific doses must be specified in the Taskfile.
- **In Release cycle 3** Real-time dose adjustment based on real time measured sensor signals will be included (4.2) and Monitoring will be extended to sending information wirelessly in real time and implementation of a data store for this data (2.5).

Table 19. Timing of release cycles and test periods.

| month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plan & Elaborate phase | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| Release cycle 1 | | | X | X | X | X | | | | | | | | | | | | | | | | | | |
| Test Cycle 1 | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | |
| Release cycle 2 | | | | | | | X | X | X | X | X | X | | | | | | | | | | | | |
| Test Cycle 2 | | | | | | | | | | | | | X | X | X | X | X | X | | | | | | |
| Release cycle 3 | | | | | | | | | | | | | X | X | X | X | X | X | | | | | | |
| Test Cycle 3 | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X |

Each release cycle includes the following activities.

1. Define business process models, distinguish the functions and use cases and describe them.
2. Inventory of required data (from use case description) and model it in the reference data model and define eventual coding tables.
3. Define system behaviour by means of sequence diagrams and eventual State Transition Diagrams. Define the Events from the description in the use cases.
4. Define the messages/interfaces.
5. Test the data interfaces between the different use cases when they are implemented in separate Apps.
6. Test the functional behaviour of the employed apps.
7. Test the employability on the FIspace platform (When that is available)
8. Test the user acceptance
9. Test in an operational environment
10. Scale up to a real world situation.

Steps 7-10 will only start in during release cycle 2, when the FIspace platform will become available.

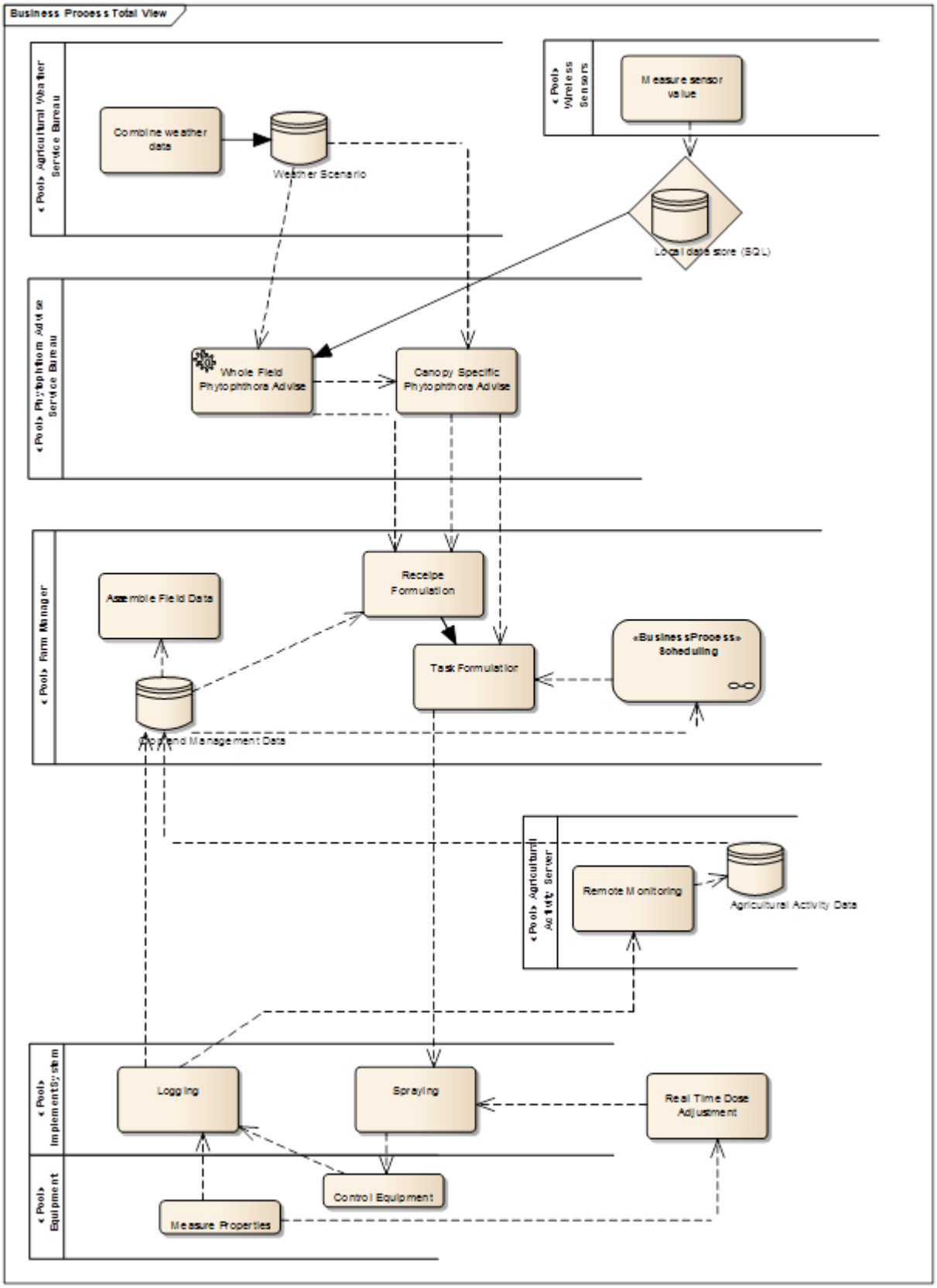



Figure 64. Overview of main system functions in the Crop Protection Information Sharing trial.

### 6.2.1.1 Business Processes to be tested

#### 6.2.1.1.1 Combine weather data. (Id = 1.1)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesCombineWeatherV20130425.docx .

| ***Task Id*** | ***Task*** | ***Release Cycle*** | ***Actor*** | ***Partner*** | ***Task Description*** | ***Input data*** | ***Output data*** | ***Pre-condition*** |
|---|---|---|---|---|---|---|---|---|
| *1.1.1* | *Get GFS weather prediction* | *1* | *Weather prediction service burau* | *internal* | *The weather predictions for the relevant grids will be collected* | *GFS prediction*<br><br>*Relevant grids for the region* | *GFS prediction for selected grids.* | *GFSdata must be available* |
| *1.1.2.a* | *Make regional weather forecast.* | *1* | *Weather prediction service bureau* | *Agricultural weather Service bureau* | *Make a weather forecast in a narrow grid and small timesteps.* | *GFS prediction for selected grids.* | *Prediction (T, RH and rain) for a narrow grid and high temporal resolution* | *?* |
| *1.1.2.b* | *Make regional weather forecast with more variables* | *2* | *Weather prediction service bureau* | *Agricultural weather Service bureau* | *Make a weather forecast in a narrow grid and small timesteps with more weather variables* | *GFS prediction for selected grids.* | *Prediction (T, RH and rain) for a narrow grid and high temporal resolution+P,Q, GR, H0, zi and u1.* | |
| *1.1.3.a* | *Make Agricultural weather scenario (for two locations and Dacom data)* | *1* | *Agricultural weather Service bureau* | *Phytophthora Advise Bureau* | *Combine historical and predicted weather.* | *T, RH and Rain for each hour for nearest grid point and for nearest weather station* | *T, RH and Rain for each hour for the gidpoint nearest to the field location* | *?* |
| *1.1.3.b* | *Make Agricultural weather scenario (for two locations and Dacom data)* | *2* | *Agricultural weather Service bureau* | *Phytophthora Advise Bureau* | *Combine historical and predicted weather.* | *T, RH and Rain +P,Q, GR, H0, zi and u1. for each hour for nearest grid point and for nearest weather station* | *T, RH, Rai, P,Q, GR, H0, zi and u1 for each hour for the gidpoint nearest to the field location* | |
| *1.1.3.**c*** | *Make Agricultural weather scenario **(for requested locations** and Dacom data)* | *2* | *Agricultural weather Service bureau* | *Phytophthora Advise Bureau* | *Combine historical and predicted weather.* | *T, RH and Rain +P,Q, GR, H0, zi and u1. for each hour for nearest grid point and for nearest weather station* | *T, RH, Rai, P,Q, GR, H0, zi and u1 for each hour for the gidpoint nearest to the field location* | |
| *1.1.3.**d*** | *Make Agricultural weather scenario (for requested locations and **other meteo*** | *2-3* | *Agricultural weather Service bureau* | *Phytophthora Advise Bureau* | *Combine historical and predicted weather.* | *T, RH and Rain for each hour for nearest grid point and for nearest weather station* | *T, RH, Rai, P,Q, GR, H0, zi and u1 for each hour for the gidpoint nearest to the field location* | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ***data)*** | | | | | | | |
| *1.1.4* | *Check whether requester signed up.* | *2-3* | *Agricultural weather Service bureau* | *Phytophthora Advise Bureau & or Farm Manager* | | | | |
| *1.1.5* | *Sign up* | *2-3* | *Phytophthora Advise Bureau & or Farm Manager* | *Agricultural weather Service bureau* | | | | |

### 6.2.1.1.2 Whole Field Phytophthora Advice (1.2)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesWholeFieldPhytophthoraAdvise_SH.docx .

| ***TaskId*** | ***Task (is Use Case)*** | ***Release Cycle*** | ***Actor*** | ***Partner*** | ***Task Detail*** | ***Input data*** | ***Output data*** | ***Pre-condition*** | ***Documents and Id*** |
|---|---|---|---|---|---|---|---|---|---|
| *1.2.1* | *Request Phytophthora advice* | *1* | *Farm manager* | *Phytophthora Advise Bureau* | *The farmer requests a Phytophthora advice for a particular field* | *Field, location, variety and past spraying operations* | *-* | | |
| *1.2.2* | *Process Request for advice* | *1* | *Phytophthora Advise Bureau* | *internal* | *Determine for which location an advice is requested, eventually request weather scenario* | *Field location* | *-* | | |
| *1.2.3* | *Collect weather scenario* | *1* | *Phytophthora Advise Bureau* | *Agricultural weather Service bureau* | *Request weather scenario for the grid location which is nearest to the location of the field.* | *Location* | *Past and predicted weather variables* | | |
| *1.2.4.a* | *Formulate whole field Phytophthora advice (without DWIP) (is version 1a)* | *1* | *Phytophthora Advise Bureau* | *Farm manager* | *Based on past spraying operations and the weather scenario a date and a type of product is advised* | *Past and predicted weather variables & Field, location, variety and past spraying operations* | *Date with product type for spraying* | | |
| *1.2.4.b* | *Formulate whole field Phytophthora advice for different varieties (without DWIP)(= version 1b)* | *1* | *Phytophthora Advise Bureau* | *Farm manager* | *Based on past spraying operations and the weather scenario a date and a type of product is advised* | *Past and predicted weather variables & Field, location, variety and past spraying* | *Date with product type for spraying* | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *opera-tions* | | | |
| *1.2.4.* ***b*** | *Formulate whole field Phytophtho-ra advice (**with DWIP**) (= version 2)* | *2* | *Phytophthora Advise Bureau* | *Farm manager* | | | | | |
| *1.2.5* | *Check whether requester signed up.* | *2-3* | *Phytophthora Advise Bureau* | *Farm manager* | | | | | |
| *1.2.6* | *Sign up* | *2-3* | *Farm manager* | *Phytophthora Advise Bureau* | | | | | |

### 6.2.1.2 Bad Weather Alert (1.3)

This is not formulated yet. The need for this process is questioned.

### 6.2.1.3 Variety and canopy dependent dose advise (1.4)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCaseVarietyAndCanopySpecificPhytophthoraAdvise.docx .

| ***TaskId*** | ***Task (is Use Case)*** | ***Release Cycle*** | ***Actor*** | ***Partner*** | ***Task Detail*** | ***Input data*** | ***Output data*** | ***Pre-condition*** | ***Documents and Id*** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| *1.4.1* | *Request site specific Phy-tophthora advice* | *2* | *Farm manager* | | | | | | |
| *1.2.2* | *Process Request for site specific advice* | *2* | *Phytophthora Advise Bureau* | | | | | | |
| *1.4.3* | *Collect space/airborne remote sensing data* | *2* | *Phytophthora Advise Bureau* | | | | | | |
| *1.4.4* | *Collect local remote sensing data* | *2* | *Phytophthora Advise Bureau* | | | | | | |
| *1.4.5* | *Estimate actual WDVI* | *2* | *Phytophthora Advise Bureau ???* | | | | | | |
| *1.4.6* | *Determine variable rate.* | *2* | *Phytophthora Advise Bureau* | | | | | | |
| *1.2.7* | *Check whether requester signed up.* | *2-3* | *Phytophthora Advise Bureau* | | | | | | |
| *1.2.8* | *Sign up* | *2-3* | *Farm Manager* | | | | | | |

### 6.2.1.4 Assemble Field Data (2.1)

Not specified in detail yet.

| ***TaskId*** | ***Task (is Use Case)*** | ***Release Cycle*** | ***Actor*** | ***Partner*** | ***Task Detail*** | ***Input data*** | ***Output data*** | ***Pre-condition*** |
|---|---|---|---|---|---|---|---|---|
| *2.1.1.a* | *Specify Field (not site specific)* | *1* | *Farm manager* | *-* | *The name of the field, variety and position must be specified* | *Variety list* | *CropField with relevant attributes and related objects placed in data store* | *-* |
| *2.1.1.**b*** | *Specify Field (**site specific**)* | *2* | *Farm manager* | *-* | *The name of the field, variety and position **of the border points** must be specified* | *Variety list and position of the field border.* | *CropField with relavant attributes and related objects placed in data store* | *The position of the field border is measured.* |
| *2.1.2* | *Manual entry of past Phytophthora spraying operation* | *1* | *Farm manager* | *Phytophthora Advise Bureau* | *Past spraying operations are inputted in a simple entry form* | *Work records* | *Date of spraying and product used* | |
| *`2.1.3* | *Visual inspection and manual entry of healthiness* | *1* | *Farm manager* | | *Look in the field whether there is Phytophthora present and input result in a simple form* | *observation* | *Field and healthiness* | |
| *2.1.4.a* | *Process executed spraying operation (only the task/Operation)* | *1?* | *Farm manager* | | *Read ISO11783 TaskFile and process.* | *TaskFile* | *Executed operations and tasks in (local) data store* | |
| *2.1.4.**b*** | *Process executed spraying operation (**including as applied data**)* | *2* | *Farm manager* | | | | | |
| *2.1.5.a* | *Report past spraying operation based on TaskFile* | *1?* | *Farm manager* | *Phytophthora Advise Bureau* | *The operations as coming from an ISO11783 Taskfile are reported in the dmCrop format.* | *Executed operations in (local) data store* | *Executed operations in specified interface.* | |
| *2.1.5.**b*** | *Report past spraying operation (**Including as applied data**)* | *2* | *Farm manager* | | | | | |
| *2.1.6* | *Process implement bound sensor data* | *2* | *Farm manager* | | | | | |
| *2.1.7* | *Report implement bound sensor data.* | *2* | *Farm manager* | | | | | |
| *2.1.8* | *Set up a data store in the FIspace platform* | *?* | *Farm manager* | *Platform Provider* | *Take care that (a copy of) data can be stored on the FIspace platform* | | | |
| *2.1.9* | *Authorise data users* | *?* | *Farm manager* | *Base App provider.* | *Authorise users for specific data in the data store.* | | | |

### 6.2.1.5 Recipe formulation (Plan Operation) (2.2)

Recipe formulation is not described in detail yet.

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition |
|---|---|---|---|---|---|---|---|---|
| 2.2.1 | Compile/Update list of products | 1 | Farm manager | | The products the farmer will use for Phytophthora protection will be placed in his table | List of Allowed products (on web page or paper) | Table in (local) data store. | |
| 2.2.2 | Select Product and determine dose | 1 | Farm manager | | Based on the advised type of product, the farmer chooses one. | Table in (local) data store. | Type and amount of product to be applied in defined interface. | |

### 6.2.1.6 Task Formulation (2.3)

Task Formulation is not described in detail yet.

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition |
|---|---|---|---|---|---|---|---|---|
| 2.3.4 | Compile/update list of relevant Operation Techniques | ? | Farm manager | | | | | |
| 2.3.5 | Compile/update list of equipment | ? | Farm manager | | | | | |
| 2.3.6 | Assign equipment to OperationTechniques | ? | Farm manager | | | | | |
| 2.3.7 | Compile/update list of Task Types | ? | Farm manager | | | | | |
| 2.3.8 | Assign TaskTypes to Operation Techniques. | ? | Farm manager | | | | | |
| 2.3.1 | Determine operations to be carried out | 1 | Farm manager | | Look for the advised or planned operations in the planning period | List of advised or planned spraying operations for the planning period in (local) data store | Selected list of operations | |
| 2.3.2 | Formulate Tasks | 1 | Farm manager | | | Selected list of operations, with their specification | ISO11783 TaskFile. | |
| 2.3.3 | Specify ISO11783 treatment zones. | 2 | Farm manager | | | | | |

### 6.2.1.7 Scheduling (2.4)

A start for a business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/cSpace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesScheduling.docx .

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition | Documents and Id |
|---|---|---|---|---|---|---|---|---|---|
| 2.4.1 | Specify Working period of workers | 2 | Farm manager | | | | | | |
| 2.4.2 | Determine weather related workable periods | 2 | Farm manager | | | | | | |
| 2.4.3 | Calculate required times for Jobs | 2 | Farm manager | | | | | | |
| 2.4.4 | Distribute spraying jobs over workable periods | 2 | Farm manager | | | | | | |
| 2.4.5 | Formulate/Update | 2 | Farm | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *workability criteria for Operation Techniques.* | | *manager* | | | | | | |

### 6.2.1.8 Real Time Monitoring (2.5)

Real Time monitoring is not described in detail yet.

| ***TaskId*** | ***Task (is Use Case)*** | ***Release Cycle*** | ***Actor*** | ***Partner*** | ***Task Detail*** | ***Input data*** | ***Output data*** | ***Pre-condition*** | ***Documents and Id*** |
|---|---|---|---|---|---|---|---|---|---|
| *2.5.1* | *Specify required Process variables. (See also 4.4.3)* | *3* | *Farm manager* | *Agricultural Activity Server Provider* | | | | | |
| *2.5.2* | *Store Process variables* | *2* | *Agricultural Activity Server* | | | | | | |
| *2.5.3* | *Provide process variables to authorised users.* | *3* | *Agricultural Activity Server* | | | | | | |
| *2.5.4* | *Visualize relevant process variables.* | *3* | *Farm manager* | | | | | | |
| *2.5.5* | *Authorise data users* | *?* | *Farm manager* | *Base App provider.* | *Authorise users for specific data in the datastore.* | | | | |
| *2.5.6* | *Control Authentity of data- user* | | *Base App provider* | *user* | *Check whether the user is who he claims to be.* | | | | |

### 6.2.1.9 Measuring weather and soil variables (3.1)

A start for a business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/cSpace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesMeasureWeattherAndSoilvariables.docx.

| **TaskId** | **Task (is Use Case)** | **Release Cycle** | **Actor** | **Partner** | **Task Detail** | **Input data** | **Output data** | **Pre-condition** |
|---|---|---|---|---|---|---|---|---|
| 3.1.1 | Specify location of sensors | 2 | Farm manager | | | | | |
| 3.1.2 | Collect sensor variables in gate-way | 1 | gateway | | Implement wireless sensor network | Sensor values | Process variables in local data store. | Wirless sensor network must be delivered |
| 3.1.3 | Store sensor variables in sen-sor data server in the cloud. | 1-2 | Sensor data server | | Transfer local stored data to central dat server | Process variables in local data store. | Process variables in data server. | |
| 3.1.4 | Provide sensor data | 2 | Sensor data Server | | | | | |
| 3.1.5 | View sensor data | 2 | Farm manager | | | | | |
| 3.1.6 | Calibrate sensors | 3 | Farm manager | | | | | |
| 3.1.7 | Authorise data users | ? | Farm manager | Base App provider. | Authorise users for specific data in the datastore. | | | |
| 3.1.8 | Control Authentity of data- user | | Base App provider | user | Check whether the user is who he claims to be. | | | |
| | | | | | | | | |

### 6.2.1.10 Measure Crop Reflectance (3.2)

Measure Crop Reflectance is not described in detail yet.

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition |
|---|---|---|---|---|---|---|---|---|
| 3.2.1 | Collect reflectance data | 1 | Driver | | Make sensor observations during spraying | - | Refelctance data in proprietary format | |

### 6.2.1.11 Spraying (4.1)

Spraying is not described in detail yet. As spraying is a complex, but independent system only interaction with other processes will be described.

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition |
|---|---|---|---|---|---|---|---|---|
| 4.1.1 | Read task data | 1 | Driver | | Read Taskfile | ISO11783 Taskfile | Task in local data store | |
| 4.1.2 | Spraying | 1 | Driver | | Spraying activity with logging relevant events | Task in local data store | Updated task in local data store | |
| 4.1.3 | Update Task data | 1 | Driver | | Write TaskFile | Updated task in local data store | Updated Iso 11783 TaskFile | |

### 6.2.1.12 Real Time Dose adjustment (4.2)

It is questioned whether Real time dose adjustment is a realistic business process to implement. The same effect will be realised by Variety and Canopy specific Phytophthora Advise as described in 6.2.1.3

### 6.2.1.13 Data Logging (4.3)

Data Logging is not described in detail yet.

| TaskId | Task (is Use Case) | Release Cycle | Actor | Partner | Task Detail | Input data | Output data | Pre-condition | Documents and Id |
|---|---|---|---|---|---|---|---|---|---|
| 4.3.1 | Formulate process variables to be logged on line. | 2 | Farm Manager | | | | | | |
| 4.3.2 | Log Process variables on line | 2 | Task Controller | | | | | | |
| 4.3.3 | Formulate process variables to be logged and reported wirelessly | 3 | Farm manager | | | | | | |
| 4.3.4 | Log process variables and send wirelessly. | 3 | Data Logger | | | | | | |
| 4.3.5 | Check authentity of dat requester. | | | | Check whether the requester for wireless data is who he claims to be. | | | | |

### 6.2.1.14 Required Generic Enablers, FIspace services and other functionalities.

Table 20. Generic Enablers, FIspace services, Baseline Apps and other services used for the Crop Protection Information Sharing trial.

| ***System Function*** | ***GE to be utilized*** | ***FIspace service to be used*** | ***Baseline Apps used*** | ***Specific Apps manadatory*** | ***Additional Apps*** | ***IoT sensor etc*** | ***External IOCT*** |
|---|---|---|---|---|---|---|---|
| *1.1 Combine Weather data* | *GE required for specified services + (Object Storage ? + Publish&Subscribe* | *DaaS + Those mentioned under numbers: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11* | | *Tasks specified in* ***Error! Reference source not found.*** | - | *Farmers weather station* | *GFS weather prediction model*<br><br>*Meteo records of Dacom andf KNMI* |
| *1.2 Whole Field Phytophthora Advice* | *GE required for specified services* | *Those mentioned under numbers: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12* | | *Tasks specified in 6.2.1.1.2 And whole 1.1* | - | | |
| *1.3 Bad weather Allert* | *GE required for specified services + Publish&Subscribe* | *Those mentioned under numbers: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12* | | *Tasks specified in 6.2.1.2* | - | | *Rain Radar data* |
| *1.4 Variety and canopy dependent Phytophthora advice* | *GE required for specified services* | *Those mentioned under numbers: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12* | | *Tasks specified in 6.2.1.3* | - | - | |
| *2.1 Assemble field data* | *GE required for specified services + Object Storage ?* | *DaaS + Those mentioned under numbers:6, 7, 8 and 9* | | *Tasks specified in 6.2.1.4* | - | - | |
| *2.2 Recipe formulation (Plan Operation)* | | | | *Tasks specified in 6.2.1.5* | - | - | - |
| *2.3 Task formulation* | *Object Storage ?* | *DaaS* | | *Tasks specified in 6.2.1.6* | - | - | - |
| *2.4 Scheduling* | | | | *Tasks specified in 6.2.1.7 + 1.1; Combine* | - | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | *weather data* | | | |
| *2.5 Real time monitoring 3)* | *GE required for specified services* | *DaaS + Those mentioned under numbers: 6, 7, 8 and 9* | | *Tasks specified in 6.2.1.8* | - | - | - |
| *3.1 Measure weather and soil variables* | *GE required for specified services + Gateway GE + Object Storage GE ? + Protocol Adapter ?* | *DaaS (Object Storage ?) + Those mentioned under numbers: 6, 7, 8 and 9.* | | *Tasks specified in 6.2.1.9* | - | *Soil moisture and weather sensors* | *eKo sensor system* |
| *3.2 Measure crop reflection* | | | | *Tasks specified in 6.2.1.10* | - | *Crop reflectance sensors* | *Yara / GreenSeeker / etc. proprietary sensor data*<br><br>*Satellite remote sensing data* |
| *4.1 Spraying* | | | | *Tasks specified in 6.2.1.11* | - | *(all ISO 11783 sensors)* | - |
| *4.2 Real time dose adjustment* | | | | *Tasks specified in 6.2.1.12* | - | *Crop reflectance sensors* | *Yara / GreenSeeker / etc. proprietary sensor data* |
| *4.3 Data Logging* | *GE required for specified services + Gateway GE + Protocol Adapter* | *Those mentioned under numbers: 6, 7, 8 and 9.* | | *Tasks specified in 6.2.1.13* | - | *(all ISO 11783 sensors)* | *ISO11783 CAN bus messages* |

### 6.2.1.15 Trial 421: Experimentation protocol

#### 6.2.1.15.1 Combine weather data. (Id = 1.1)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesCombineWeatherV20130425.docx .

| Taskid | Release Cycle | When | Expected Outcome | How measured | Tested GE's | FIspace services used | Baseline Apps used | Specific Apps | Additional Apps | IoThings used | External IOCT to be integrated. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1.1 | 1 | Aug 5 | GFS weather prediction for selected GFS grids | Data available | - | - | - | Is specific App | - | - | GFS weather prediction model |
| 1.1.2 | 1 | Aug 5 | Weather forecast in a narrow regional grid | Data is available | | - | - | Is specific App | - | - | - |
| | 2 | | | in data store | DaaS | | | | | | |
| 1.1.3 a | 1 | Aug 5 | Weather scenario for a defined location | Data is available | - | - | - | Is specific App | - | Local weather stations/sensors | Meteo records of KNMI |
| | 2 | | | in data store | DaS | | | | | | |

## 6.2.1.15.2 Whole Field Phytophthora Advice (1.2)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesWholeFieldPhytophthoraAdvise_SH.docx .

| Taskid | Release cycle | When | Expected result | How measured | Tested GE's | FIspace services used | Baseline Apps used | Specific Apps | Additional Apps | IoThings used | External IOCT to be integrated. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.2.1 | 1 | Sept 2 | Request will be processed | There comes an acceptance message | | | | | | | |
| | 2 | | | | Authetication | | App store | | | | |
| 1.2.2 | 1 | Sept 2 | Prediction for correct location. | Specify location of forecast. | | | | | | | |
| 1.2.3 | 1 | Sept 2 | Weather scenario is available | Weather scenario is available | | | | | | | |
| 1.2.4 a | 1 | Sept 2 | There is an advise for a product type at a certain date | Advise is plausible | | | | | | | |

### 6.2.1.15.3 Bad Weather Alert (1.3)

This is not formulated yet. The need for this process is questioned.

### 6.2.1.15.4 Variety and canopy dependent dose advise (1.4)

A detailed business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/FIspace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCaseVarietyAndCanopySpecificPhytophthoraAdvise.docx .

This functionality will be tested in a later stage.

### 6.2.1.15.5 Assemble Field Data (2.1)

| ***TaskId*** | ***Release Cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *2.1.1a* | *1* | *Sept 2* | *Correct formulated interface* | *Accepted by Partner App* | | | | | | | |
| *2.1.2* | *1* | *Sept 2* | *Correct Formulated interface* | *Accepted by partner app* | | | | | | | |
| *2.1.3* | *1* | *Sept 2* | *Correct Formulated interface* | *Accepted by partner app* | | | | | | | |
| *2.1.4a* | *1* | *Sept 2* | *Realised ISO11783 Task in database* | *Task can be printed* | | | | | | | |
| *2.1.5a* | *1 ?* | *Sept 2 ?* | *Executed operation is correct in interface* | *Accepted by partner app* | | | | | | | |

#### 6.2.1.15.5.1 Recipe formulation (Plan Operation) (2.2)

Recipe formulation is not described in detail yet.

| ***TaskId*** | ***Release Cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *2.2.1* | *1* | *Sept 2* | *Coding table with relevant product specification* | *Accepted by 2.2.2* | | | | | | | |
| *2.2.2* | *1* | *Sept 2* | *Correct specification of the spraying* | *Accepted by the Task-Formulation module 2.3.2* | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *operation following the specified interface* | | | | | | | | |

### 6.2.1.16 Task Formulation (2.3)

Task Formulation is not described in detail yet.

| ***TaskId*** | ***Release Cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *2.3.1* | *1* | *Sept 2* | *List of spraying operations to be carried out* | *Compare advised operations with the produced list.* | | | | | | | |
| *2.3.2* | *1* | *Sept 2* | *Correct specified ISO11783 TaskFile* | *TaskFile accepted by TaskController* | | | | | | | |

### 6.2.1.17 Scheduling (2.4)

A start for a business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/cSpace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesScheduling.docx .

This functionality will be tested in a later stage.

### 6.2.1.18 Real Time Monitoring (2.5)

Real Time monitoring is not described in detail yet.

### 6.2.1.19 Measuring weather and soil variables (3.1)

A start for a business process and use case description is given in http://www.atb-bremen.de/owncloud/index.php/apps/files?dir=/Shared/cSpace/Workpackages/WP400-UseCaseTrials/T420-FarmingInTheCloud/T421-SmartCropProtection/usecases/BPM&UseCasesMeasureWeattherAndSoilvariables.docx.

| ***TaskId*** | ***Release cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *3.1.2* | *1* | *Sept 2* | *Sensors installed, data in local database* | *Visualize* | | | | | | *Soil moisture and weather sensors.* | *eKo sensor system* |
| *3.1.3* | *1* | *Sept 2* | *Sensor data available following specified interface.* | *-* | | | | | | *See above* | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *2* | | | | *DaaS* | | *-* | *-* | *-* | *See above* | |

### 6.2.1.20 Measure Crop Reflectance (3.2)

Measure Crop Reflectance is not described in detail yet.

| ***TaskId*** | ***Release cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *3.2.1* | *1 & 2* | *June 24* | *Data available in proprietary (Yara) file format* | *Can be processed by 2.1.6* | *-* | *-* | *-* | *-* | *-* | *Refelctance sensors* | *Yara sensor system* |

### 6.2.1.21 Spraying (4.1)

Spraying is not described in detail yet. As spraying is a complex, but independent system only interaction with other processes will be described.

| ***TaskId*** | ***Release cycle*** | ***When*** | ***Expected result*** | ***How measured*** | ***Tested GE's*** | ***FIspace services used*** | ***Baseline Apps used*** | ***Specific Apps*** | ***Additional Apps*** | ***IoThings used*** | ***External IOCT to be integrated.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *4.1.1* | *1* | *Sept 2* | *ISO11783 Task-File can be processed* | *-* | | | | | | | |
| *4.1.2* | *1* | *Sept 2* | *Spraying is correctly executed* | *?* | | | | | | | |
| *4.1.3* | *1* | *Sept 2* | *ISO11783 Task-File with realised Task* | *Can be processed by 2.1.4* | | | | | | | |

### 6.2.1.22 Real Time Dose adjustment (4.2)

It is questioned whether Real time dose adjustment is a realistic business process to implement. The same effect will be realised by Variety and Canopy specific Phytophthora Advise as described in 6.2.1.3

### 6.2.1.23 Data Logging (4.3)

Data Logging is not described in detail yet.

## 6.2.2 Trial 422 Greehouse Management

#### 6.2.2.1 Experimentation Protocol

In order to define all the different preconditions, specifications and requirements of the trial an adapted version of the IEEE 829-2008 standard for testing documentation is planned to be used.

The basic components of the protocol are:

- LTP - Level Test Plan
- LTD - Level Test Design
- LTC - Level Test Case
- LTPr - Level Test Procedure
- LTL - Level Test Log
- AR - Anomaly Report
- LITSR - Level Interim Test Status Report
- LTR - Level Test Report

Based on the above mentioned standard and the presented components (LTP, LTD, etc.), an adapted version of it on the Greenhouse Management and Control Trial needs was created and is presented below:

| **Test Case Name:** | ***Greenhouse Management & Control (T422)*** | **Test Case Type:** | ***Use Case Trial*** |
|---|---|---|---|
| **Scenario:** | *"Managing complaints"* | | |
| **Created: (LTP)** | *(Date)* | **Last Change:** | *(Date)* |
| **Test Started: (LTP)** | *(Date)* | **Test Ended: (LTP)** | *(Date)* |
| **Partners: (LTP)** | *NKUA, OPEKEPE* | **Work Package:** | *WP 400* |
| **Status:** | *Defining requirements/ started/ finished (1st test) etc...* | | |
| | | | |
| **LTD – Pass/Fail Criteria (KPIs)** | *Here provide criteria that will determine the final outcome of the test* | | |
| **Final outcome:** | *Passed / Failed* | | |
| **LTC (Test Input / Output Data)**<br>***(Figure 14 in FInest D2.5 doc)*** | *Input:*<br>- ...<br>- ...<br>*Output:*<br>- ...<br>- ... | | |
| **FIspace Modules Involved** | *Here provide FIspace components involved in the particular scenario* | | |
| **LTPr (Preconditions)** | *Here provide conditions that should be met, before the start date of the experiment. (E.g., Mediator GE must be configured, deployed and running)* | | |
| **LTPr (Requirements):** | *(According to the standard, 'shall' corresponds to obligatory requirements, while 'should' refers to requirements of secondary importance)* | | |

| | |
|---|---|
| | - *The FMIS shall be already instantiated and connected to the FIspace platform*<br>- *The B2B collaboration module shall have been set-up accordingly to support the communication between the PinfS Baseline App and the FMIS service instance …*<br>- *…* |
| **LTPr (Actions/steps to be performed)** | 1. *Farmer opens the Managing Complaints FIspace app…*<br>2. *…*<br>3. |
| **LTD – Expected Results (corresponding to above action numbers)** | [redacted]*(To be filled before the start date of the experiment)* |
| **LTL (chronological record of details of actual events)** | *(To be filled during and after the experiment has completed)*<br>*Here provide the chronological record of relevant details about the actual execution of tests.* |
| **LITSR/LTR (results):** | *Actual outcomes of the experiment.*<br>*To be compared with the expected results form LTD above* |
| **AR (Anomaly Report)** | *Here provide for tests that failed the actual result, the reason why the test has failed, and –if possible- the impact of the Anomaly Report upon testing.* |

#### 6.2.2.1.1 Domain Apps specific apps

##### Contract Search

The input parameters from the End-Product Producer are presented in the table below:

| Field | Type |
|---|---|
| **End Product Producer** | Text |
| **Product** | Text |
| **Variety** | Text |
| **Location of Cultivation** | Text |
| **Quantity** | Number |
| **Delivery Date** | Date |
| **Max cost** | Number |
| **Agricultural Practices** | Text |
| **Allowable pesticides** | Text |

The State Agency will respond with the following dataset:

| Field | Type |
|---|---|
| **ID of farmer (AFM)** | Text |
| **Name and surname** | Text |
| **Variety** | Text |
| **Location of Cultivation** | Text |
| **Agricultural Practices** | Text |
| **Address** | Text |
| **Phone** | Phone |
| **Mobile phone** | Phone |

### 6.2.2.1.2 Information from Agriculturists

In order to implement certain functionalities of the Domain Specific Apps, Greenhouse growing specific information had to be collected from agriculturists. The table that follows demonstrates information helpful in order **trace Tomato consumers' problems to the source:**

| Maturity Stage | Handling | Condition | Duration | Problems |
|---|---|---|---|---|
| **any** | Harvesting | Rough handling, tight packing into harvesting containers, exposure to the sun for extended periods, unclean workers' hands, placing trash or culled fruit into the picking container with good tomatoes, dropping or throwing tomatoes in the picking container | | **Visible and latent damage** |
| **any** | Washing with chlorinated or non chlorinated water | When using recycled, non-potable wash water or water under pulp temperature, there are problems with trash and disease build-up. Increased risk of contamination by post-harvest pathogens | | |
| **any** | Packing | Poor packing house sanitation: Increased risk of contamination by post-harvest pathogens | | |
| **any** | Storage and transit | Mixing with other ethylene producing fruit or ripe tomatoes: Hastening of ripening | | **Reduced shelf life** |
| **firm yet well-ripened** | Storage | 33-35 degrees F | 21 days | **almost no shelf life and very poor flavour and colour** |

| | | | | |
|---|---|---|---|---|
| **any** | Harvesting, sorting, packing, storage | Fruit-to-fruit contact in storage, infected crop debris inside and outside the greenhouse, poor sanitation of workers, splashing infected water, raw manure | | **Foodborne diseases (e.g. Salmonella, Shigella, Escherichia, Listeria, certain viruses)** |
| **any** | Sorting | Poor sorting | | **misshapen, damaged, decayed, or cracked tomatoes** |
| **any** | Sorting | Poor sorting: Tomatoes with surface injuries that are entry points for pathogens | | |
| **Immature green** | Harvesting | | | **Poor ripening, low quality** |
| **Light red** | Storage | 50 degrees F | Longer than 14 days | **may result in reduced retail shelf life** |
| **Mature green** | storage | 58-60 degrees F, 85-95% RH | 21-28 days | **when stored for several weeks at 55 degrees F, they often develop decay and fail to ripen properly** |
| **Mature green** | storage | 0 degrees F | 6 days | **Comparable decay** |
| **Mature green** | storage | 5 degrees F | 9 days | **Comparable decay** |
| **Mature green** | Ripening post-harvest | Temperatures above 80 degrees F | | **tomatoes will appear to ripen but may not have the best eating qualities** |
| **Mature green** | Ripening post-harvest | Temperatures below 50 degrees F | | **Infection by fungi** |
| **any** | Harvesting, sorting, packing, storage | Fruit-to-fruit contact in storage, infected crop debris inside and outside the greenhouse, not discarding infected fruit at any stage (harvest, packing, storage) | Fruit spots are not always obvious at harvest, but develop 3-5 days after harvest | **Infection by fungi or bacteria, spots, dead tissue, mold etc.** |
| **Pre-harvest** | | Too high temperatures when tomatoes are ripening | tomatoes ripening in the field | **yellow shoulder (yellow colour on top while the rest of the fruit is red)** |
| **Pre-harvest** | | Too high temperatures (some varieties are more prone than others) and possibly low potassium levels | tomatoes ripening in the field | **Internal white spots** |
| **Pre-harvest** | | Plants exposed to low temperatures overnight, and/or excessive fertilizer, and/or tomato variety prone to developing hard | Tomatoes ripening in the field | **Hard white centres** |

| | | | | |
|---|---|---|---|---|
| | | white centres | | |
| **Ripe** | Storage | 40 degrees F | weeks | **loss of color, firmness, shelf life, and especially taste** |

Moreover, information concerning the plant development –in this case tomatoes growing in the greenhouse- will be used. The following example demonstrates information about the plant development conditions:

**Plant development stages and conditions**

**Tomatoes**

| ***From sowing to growing*** | *Duration* | | *Temperature* | |
|---|---|---|---|---|
| *sow seeds 1,3 cm deep* | ***43 days*** | | ***10 ℃*** | |
| | ***14 days*** | | ***15 ℃*** | |
| | ***8 days*** | | ***20 ℃*** | |
| | ***6 days*** | | ***25 ℃*** | |
| | ***7 days*** | | ***30 ℃*** | |
| | ***10 days*** | | ***35 ℃*** | |
| *From sowing to transplanting* | ***4-7 weeks*** | | | |
| *From transplanting to beginning of harvest* | ***60-110 days*** | | | |
| ***Development stages*** | ***Favorable temperatures*** | | ***Temperature limits*** | |
| | Recommended | Excellent | Minimum | Maximum |
| A. Seedling nursery | | | | |
| **1. Germination** | 24-29 °C | 27 °C | 9-10 °C | 40 °C |
| **2. Plant development** | day: 18-23 °C | | 8-10 °C | |
| | night: 15-17 °C | | | |
| **3. Cold treatment (2-3 weeks)** | day: 13-16 °C | | | |
| | night: 11-13 °C | | | |
| B. Cultivation | | | | |
| **1. Plant development** | | | | |
| **- Soil** | 15-22 °C | | | |
| **- Environment** | day: 20-27 °C | | day: 13 °C | day: 32 °C |
| | night: 14-18 °C | | night: 9 °C | |

| | | | |
|---|---|---|---|
| **2. Pollination** | | day: 21 °C | |
| **3. Fruit setting** | night: 16-22 °C | | |
| **4. Fruit development** | | day: 23-25 °C | |
| Maximum lethal: | 48-50 °C | **Minimum lethal** | 0-1 °C |

## Cucumber

| STAGE | DAYS | TEMPERATURE |
|---|---|---|
| **From planting to germination** | 13 | 15°C |
| | 6 | 20°C |
| | 4 | 25°C |
| | 3 | 30°C |
| | 3 | 35°C |
| **From planting to transplanting** | 21-28 | |
| **From transplanting to beginning of harvest** | 30-45 | |

| ***Development stages*** | *Favorable temperatures* | | *Temperature limits* | |
|---|---|---|---|---|
| | Recommended | Excellent | Minimum | Maximum |
| A. Seedling nursery | | | | |
| **1. Germination** | 25-32 °C | 27-30 °C | 12-14 °C | |
| **2. Plant development** | day: 21-25 °C<br>night: 16-20 °C | | 8-10 °C | |
| B. Cultivation | | | | |
| **1. Plant development** | | | | |
| **- Soil** | 18-20 °C | | | |
| **- Environment** | day: 19-27 °C<br>night: 16-20 °C | | day: 10-14 °C<br>night: 10-13 °C | day: 30-32 °C |

### 6.2.2.2 Expert/Legacy Systems information

**Meteo Service**

The information available from the Meteo service's sensors is:

| Type of information | Measurement unit | Valid measurements range |
|---|---|---|
| **Air temperature** | C deg | **-40 C up to +60 C** |

| | | |
|---|---|---|
| **Air humidity** | % | **0% up to 100%** |
| **Wind Velocity** | m/s | **0m/s up to 50m/sec** |
| **Wind direction** | deg | **0 deg up to 360 deg** |
| **Solar radiation** | w/m2 | **0 w/m2 up to 2000 w/m2** |
| **Rain** | mm | **0mm up to 100mm for 10 min step** |
| **Barometric pressure** | mBar | **800mBar – 1150mBar** |
| **Ground humidity** | % | **5% - 60%** |
| **Period of sunshine** | min | **0min up to 10mim for 10 min step** |

### ESIT Traceability Platform

The input data that the traceability platform will use is:

| Description | Type | Example |
|---|---|---|
| **Product Bar Code** | char (15) | **5201005011045** |
| **LOT number** | char (30) | **L080513** |
| **Should «Illegal importation» be checked?** | int(1) | **1:"YES" / 0 : "NO"** |

The output of the traceability service is:

| Description | Type |
|---|---|
| **A/A** | int (3) |
| **Company** | <Analyzed below> |
| **Traceability procedure list** | <Analyzed below> |

| **Company** | |
|---|---|
| **Tax Payer Identification Number** | char (9) |
| **Company Name** | char (100) |
| **Address** | char (150) |

| **Traceability procedure list** | |
|---|---|
| **Procedure 1** | <Analyzed below> |
| **Procedure 1 Timestamp** | Date - time |
| **«Illegal importation» check result** | Positive / Negative / NA |
| **Next procedure Timestamp** | Date - time |
| **Previous procedure timestamp** | Date - time |
| **Procedure 2** | <Analyzed below> |
| **Timestamp Διαδικασίας 2** | Date - time |
| **«Illegal importation» check result** | Positive / Negative / NA |
| **Next procedure Timestamp** | Date - time |
| **Previous procedure timestamp** | Date - time |

...

...

...

| Διαδικασία n | <Αναλύεται παρακάτω> |
|---|---|
| **Procedure n timestamp** | Date - time |
| **«Illegal importation» check result** | Positive / Negative / NA |
| **Next procedure Timestamp** | Date - time |
| **Timestamp Προηγούμενης Διαδικασίας** | Date - time |

| **Procedure n** | |
|---|---|
| **Procedure name** | Text (100) |
| **Procedure n field list** | <Analyzed below> |

| **Procedure n field list** | |
|---|---|
| **Field 1** | <Analyzed below> |
| **Field 2** | <Analyzed below> |
| **....** | <Analyzed below> |
| **Field n** | <Analyzed below> |

| ***Field n*** | |
|---|---|
| **Type** | <Field type: Primitive or other> |
| **Name** | <Field name> |
| **Value** | <Field value> |

### Greenhouse FMS (EKETA)

The Greenhouse FMS that will be used from EKETA research institute is described below:

The following systems are controlled in the greenhouse:

- Heating system
- Ventilation system
- Cooling system
- Air mixing system
- Crop fertigation system

The above systems are controlled based on real time measurements of greenhouse climate and crop parameters that are described below:

Inside and outside the greenhouses:

- Air temperature
- Air relative humidity

- Solar radiation
- Wind speed and direction (only outside)

Inside the greenhouse:

- Crop temperature
- Cover temperature
- Substrate temperature and water content

The image below demonstrates an example screen of the Greenhouse control system:


*Figure 65. EKETA Greenhouse Control System*

**Greenhouse Control Systems (Agrostis) – Advice Request & Task Planning scenarios**

For the realisation of the Advice Request Scenario, from the Agrostis Company side (Farm Management Control Systems provider), the information required in order to effectively generate advices is related to:

- Type, covered area and location of the greenhouse
- Availability of the climatic control systems and its capacity
- Availability of a climatic controller
  - It will be considered that a climatic controller is able to control the systems related to heating, cooling, ventilation and irrigation.
  - The controller stores at least the following data:
    - Air temperature
    - Air vapour content
    - Ventilation
    - Irrigation (both water and fertilizer dosing)
- Crop characteristics
  - Crop variety
  - Day of transplanting
  - Quantitative information about the crop development (number or inflorescences, length of internodes, etc)
  - Pest management actions have been taken

### 6.2.2.3 Experimentation site

#### 6.2.2.3.1 Attica area farmers (NKUA - OPEKEPE)

OPEKEPE, the Greek State Agency for Agricultural Policies, and one of the three Greenhouse Trial partners has got in contact with four farm managers already in Megara, Attica, greater Athens area. Some basic information for these farm managers and their infrastructures follows:

| *User Short ID* | *TU-1* |
|---|---|
| ***Trial*** | Greenhouse Management & Control Trial – User1 |
| ***Name*** | Mr Barbinis Vasilis, Greenhouse Manager (Area Megara - Attikis) |
| ***Products*** | Mainly vegetables such as tomatos, lettuce, cucumber etc |
| ***Sensors*** | We will install in his greenhouse sensors for measuring Temperature, Luminoisity, Air Humidity, PH, EC(soil conductivity), Soil Moisture, CO2 |
| ***Software*** | He is going to use the NKUA expert system |
| ***Extra Info*** | He is supplier for big Greek supermarkets using QR numbers for each carrier of product (lot number, date etc).<br>He uses an application (from Agrodata) for declaring the appropriate traceability data for the cultivation (seeds, raw materials, date of production etc). |
| ***Goal*** | To maximize the control of his cultivation and to have a more transparent cultivation process for his co-partners and his customers. |

| *User Short ID* | *TU-2* |
|---|---|
| ***Trial*** | Greenhouse Management & Control Trial – User2 |
| ***Name*** | Mr Gousteris, Greenhouse Manager (Area Megara - Attikis) |
| ***Products*** | Mainly vegetables such as tomatos, lettuce, cucumber etc |
| ***Sensors*** | We will install in his greenhouse sensors for measuring Temperature, Luminoisity, Air Humidity, PH, EC(soil conductivity), Soil Moisture, CO2 |
| ***Software*** | He is going to use the NKUA expert system |
| ***Extra Info*** | He is supplier for big Greek supermarkets and caterings |
| ***Goal*** | To maximize the control of his cultivation and to have a more transparent cultivation process for his co-partners and his customers |

| *User Short ID* | *TU-3* |
|---|---|
| ***Trial*** | Greenhouse Management & Control Trial – User3 |
| ***Name*** | Mr Oikonomidis, Greenhouse Manager (Area Marathonas - Attikis) |
| ***Products*** | Mainly vegetables such as lettuce, cucumber etc |
| ***Sensors*** | We will install in his greenhouse sensors for measuring Temperature, Luminoisity, Air Humidity, Soil Moisture, CO2 |
| ***Software*** | He is using a software for the automatic lubrication (http://www.senmatic.com/greenhouse-technology) and in paraller he is going to use the NKUA expert system |
| ***Extra Info*** | He is supplier for small Greek supermarkets and open market |
| ***Goal*** | To maximize the control of his cultivation and to have a more transparent cultivation process for his co-partners and his customers |

| *User Short ID* | *TU-4* |
|---|---|
| ***Trial*** | Greenhouse Management & Control Trial – User4 |
| ***Name*** | Mr Loukisas, Greenhouse Manager, http://www.loukfarm.gr/company.php?lang=gr&jobID=2 (Area Thrakomakedones - Attikis) |

| | |
|---|---|
| ***Products*** | Mainly vegetables such as lettuce etc |
| ***Sensors*** | We will install in his greenhouse sensors for measuring Temperature, Luminoisity, Air Humidity, Soil Moisture, CO2 for our trial data |
| ***Software*** | He is going to use the NKUA expert system |
| ***Extra Info*** | He is supplier for small Greek supermarkets and open market |
| ***Goal*** | To maximize the control of his cultivation and to have a more transparent cultivation process for his co-partners and his customers |

### 6.2.2.4 Experimentation protocol

The business scenario provides a business context in which user „acceptance“ tests can be documented. User acceptance tests follow the classic approach found in all commercial software implementations. Each step of the test is numbered, described, identified with an actor, expected outcomes documented and input data described. Below the user acceptance test is provided for each one of the different scenarios of the Greenhouse Management and Control trial.

The following tables will be finally integrated inside the overall Experimentation template (IEEE 829 adapted template) that was presented for the Greenhouse Trial testing in earlier section.

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Advice Request Scenario** | | | | |
| **1** | The Farmer logins in FIspace (after having registered, downloaded and instantiated the specific app) and opens the FIspace Advice Request App. | Farmer | Login (un)succesful message, Advice Request App GUI presented to the user | Login credentials |
| **2** | Using the specific GUI of the App, he inputs information that has been collected from the various sensors installed in his/her Greenhouse. He may also add to this, some extra information manually input by him/herself. All this information is submitted by the farmer pressing the button „request for advice“ | Farmer | „Advice request was successfully sent“ if the data input was accepted by the system, otherwise „Invalid input. Please resubmit the data.“ | Sensor data, manual input |
| **3** | Whenever the advice is generated by the relevant back-end systems, it is forwarded back to the Farmer's instantiated App, who receives a notification. | Farmer | Notification for new Advice | |
| **4** | The Farmer clicks the notification and consults the received advice. | Farmer | Advice analysis is presented to the Farmer via the GUI | |

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Contracts Scenario** | | | | |
| **1** | The End-Product producer logins in FIspace (after having registered, downloaded and instantiated the specific app) and opens the FIspace Contracts App. | End-Product Producer | Login (un)succesful message, Contracts App GUI presented to the user | Login credentials |
| **2** | The End-Product Producer uses the input screen of the app, to submit all the information needed for the contract discover | End-Product Producer | „Request for collaboration was submitted succesfully“ if the input was valid, otherwise error message for re-inputting data. | <product, variety, location, cost, quantity, date, availability, agticultural practises, pesticide> |
| **3** | The back-end systems (State Agency etc.) generate the relevant list, filter it using | End-Product Producer | Notification for new Suggestions List of potential new | |

| | | | | |
|---|---|---|---|---|
| | the various input parameters from the app user and forward it back to the End-Product Producer's instantiated App, who receives a notification. | | partners available | |
| **4** | The End-Product Producer clicks the notification and receives the contracts suggestion | End-Product Producer | List is presented to the end-product producer via the the app's GUI | |

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Managing Complaints Scenario** | | | | |
| **1** | The End-Product producer logins in FIspace (after having registered, downloaded and instantiated the specific app) and opens the FIspace Managing Complaints App. | End-Product Producer | Login (un)succesful message, Managing Complaints GUI presented to the user | Login credentials |
| **2** | The End-Product Producer has already received a complaint from a consumer (external functionality). Using the app's GUI he/she inputs the complaint for analysis and feedback. | End-Product Producer | „Complaint received succesfully" or error message to re-input some information | Complaint in the relevant form |
| **3** | (Back-end analysis involving ESIT traceability platform etc.) End-Product Producer receives the notification in Managing Complaints' App when report ready | End-Product Producer | Notification available in app's GUI | |
| **4** | The End-Product Producer clicks the notifications and receives the analysis | End-Product Producer | Complaint analysis presented to the End-Product Producer | |

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Product Recall Scenario** | | | | |
| **1** | The State Agency employee after being informed about the health hazard that was discovered, logins in FIspace (after having registered, downloaded and instantiated the specific app) and opens the FIspace Product Recall App. | State Agency (for Agricultural Policies) employee | Login (un)succesful message, Product Recall GUI presented to the user | Login credentials |
| **2** | The user uses the input screen of the app, to submit all the information needed for the users discovery (that need to be notified) | State Agency employee | „Submission (un)succesful" message | Product information, LOT number etc. |
| **3** | (back-end traceability...) User receives a notification when the report is ready | State Agency employee | Notification presented in the Fispace Product Recall GUI | |
| **4** | The State Agency person clicks the notifications and receives the analysis | State Agency employee | List of stakehodlers that need to be notified | |

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Task Planning Scenario** | | | | |
| **1** | The Farmer logins in FIspace (after having registered, downloaded and instantiated the specific app) and | Farmer | Login (un)succesful message, Task Planning GUI presented to the user with existing task | Login credentials |

| | | | | |
|---|---|---|---|---|
| | opens the FIspace Task Planning App. | | list | |
| **2** | Via the GUI of the app, the Farmer can review already submitted tasks (from the Farm Manager), enter the accomplished tasks and the tasks that need to be done from his side | Farmer | „Submission (un)succesful“ message | 1. accomplished tasks<br>2. tasks to be done |
| **3** | Apart from the back-end processing of the task list (meteo service, GH FMIS etc.) the Farm Manager who is also using the Task Planning App receives a notification | Farm Manager | Notification in Farm Managers' Task Planning App | |
| **4** | The Farm Manager clicks on the notification and sees the task list input from the user, together with information from the back-end systems. He/She creates new tasks if needed and sends back the task list for processing form the back-end systems | Farm Manager | „Submission (un)succesful“ message | Create new tasks and re-submits them |
| **5** | The Farm Manager receives the task plan after the processing from the back-end systems | Farm Manager | Notification for updated task plan | |
| **6** | The Farm Manager approves (or not) the final Task Plan and submits it back to the Farmer | Farm Manager | „Submission (un)succesful“ message | Final Task Plan |
| **7** | The Farmer receives a notification when new Task Plan is available. By clicking it, the list opens via the app's GUI | Farmer | Notification for new Task Plan received, new Task Plan presented to the Farmer | |

#### 6.2.2.5 Match requirements with baseline Apps functionalities

The Baseline Apps functionalities, which have been identified according to the descriptions of the Baseline Apps so far, are presented below. For each one of the Baseline Apps, the scenarios which will use them are mentioned and the functionality that will be required:

- **Product Information Service (PInfS)**
  - Advice Request scenario: The FIspace Agrosense FMIS service as well as the Greenhouse FMS advisory system retrieve information from PinfS in order to generate the advice
  - Contracts scenario: The Back-end FMIS system is communicating with PInfS in order to retrieve information like product cost, availability, pesticide and quantity and respond back suggestions.
  - Managing Complaints scenario: The Consulting Firm as well as the Back-end System of the scenario is connecting to PinfS baseline app to retrieve information concerning the product for which the complaint has been announced.
  - Product Recall scenario: The ESIT traceability platform as well as the Back-end Service are retrieving information form PinfS regarding the hazardous pesticide that has been discovered: for which products is it used, what kind of fertilizer is used etc.
  - Task Planning scenario: The Back-End Task Planning service is using the PInfS app to collect data useful in order to generate the requested Task Plan.

- **Business Profile/Marketplace Operations Apps (former Business Services app)**
  - Contracts scenario - Desired functionality from the Baseline App: **Stakeholder/potential partner matchmaking support** functional requirement from Business Profile Baseline App will be used, in order to discover new potential partners and create new business collaborations.

- **Real-time Business SLA Management (former Contract Management app)**
  - Task Planning scenario: In order to perform the needed dispatching of the request for the Task Planning, the Task Planning scenario is planned to use Epic 1/ Feature 1/ Story 1: As a **business partner in a contract** I want to **model the SLAs of my domain** so that I **can interact with other partners in an easier way.**
  - Contracts scenario: Useful for the particular scenario is the following functionality described in the Business SLA Management Epic stories: As a **business partner in a contract** I want to **search for other business entities** inside FIspace Platform so that I **can propose new contracts to these business entities.**

#### 6.2.2.6 FIWARE GEs to be used

| ReqID | Funtionality |
|---|---|
| Mediator GE | The Mediator allows you to<br>• Expose a REST web service as a SOAP web service<br>• Expose a service with an xml payload with any different xml structure for the payload<br>• Expose old ASCII delimited message used through old protocols such as FTP, as web services with an xml payload, both SOAP or REST |
| Publish Subscribe Context Broker GE | Clients can register to context producer applications, update context information, being notified when changes on context information take place, with a given frequency. |
| Gateway Data Handling GE | Gateway Data Handler GE is basically a Complex Event Processor, based on Esper library for java. It provides a RESTful management API for the configuration and management of its components. It is flexible in the sense that you define your own xml-based event types, as well as the rules that apply on these events, and the actions that are performed when these rules trigger. The rules are EPL based, which is a form of SQL like language. |
| Object Storage GE | Provides robust, scalable object storage functionality through a restful API. Inherits highly available, distributed, and scalable features of OpenStack Swift. |
| Data Handling PPL GE | The Data Handling GE mainly focuses on revealing certain attributes according to specific privacy and security conditions. It supports integrated data handling, in particular through two-sided detailed data handling based on XACML. The PPL language supports the enforcement of a number of obligations, which are bound tightly to data. For instance, one can impose a specific retention period, as well as the production of user's notifications and/or logging under certain conditions. |
| Complex Event Processing GE | REST calls can be used to place input values into CEP, while some rules have already been defined. Rules follow the idea of the following format: "IF *Temperature* > 5 && *User* == Franz Farmer THEN *an_action*", while the REST call shall input something like "*Temperature* = 10; *User* = Franz Farmer".<br>In brief, the following procedure should be followed:<br>• Via a web interface a configuration file is created in which we define<br>  ○ The REST interface from which the input is expected<br>  ○ The rules to be monitored<br>  ○ The REST interface to which the output is sent, after an event has occurred<br>• Afterwards, the configuration file is sent via SCP to the VM where CEP is running and a script is being executed for the whole process to begin. |

#### 6.2.2.7 Business Collaboration objects definition – Description of Business Layer Models for each Scenario

***Advice Request***

In the Advice Request scenario the main Business Actors involved are the Farmer, one FMIS legacy system and the Greenhouse Advisory System (Back-end System). The farmer collects information from the various sensors installed in his/her Greenhouse. Moreover, he may input some extra information manually. This data is gathered and sent as a request for advice via the domain specific FIspace Advice Request App –that is connected to the FMIS legacy system- to FIspace platform, which dispatches the message to the Back-end Advisory system. The information-advice is forwarded via FIspace back to the Farmer, who handles the notification he receives in the Advice Request FIspace app, accordingly.

***Contract search***

An End-Product Producer company is willing to discover farmers to create new contracts with them, for accomplishing certain business procedures. Via the Contract Search FIspace app, the Farmer sends a request for new farmers' discovery of a specific product in a specific area (other search criteria can exist like price, period of collaboration, amount of product etc.). The FIspace platform, using the B2B collaboration module is dispatching the request to the State Agency for Agricultural Policies, which provides a list of farmers. This information is then filtered and forwarded to the farmers' back-end systems for retrieving information like cost, availability, quantity etc. The finalised and filtered information is sent back to the Farmer who made the request, via the GUI of the Contract search FIspace app. The Farmer chooses to set-up or not new contracts using the retrieved suggestions.

***Managing Complaints***

An End-Product Producer receives a complaint from an end consumer. The end-product producer uses the Managing Complaints FIspace app to input the complaint in order to analyze and manage it. The notification of the complaint is forwarded to the Managing Complaints App instance that Consulting Firm is using. Via B2B Collaboration Module of FIspace, a request for collecting relevant data is forwarded to a Product Traceability Platform and to the Back-end System provider. The collected data concerns LOT numbers, "Sold to" information, transport dates, fertilizer info, pesticide etc. A report is generated which contains information about the involved players, the food chain, extra logistics information from the Traceability Platform, and is then forwarded to the Consulting Firm, which receives a notification. The Consulting Firm is analyzing the problem and sends the analysis back to the End-Product Producer.

***Product Recall***

A health hazard is discovered by a State Agency for Agricultural Policies due to a pesticide. The State Agency is using the FIspace Product Recall App and sends a request after inputting the relevant information to discover the users of the hazardous pesticide. The request is forwarded via FIspace core modules to the FIspace Back-end System service, which creates a report containing information like LOT number of the product in which the hazardous pesticide was discovered, pesticide data, fertilizer information, environmental data etc. After collecting farmer's data, the request for discovering the users of the pesticide is forwarded to the Product Traceability Platform. Another report is generated from the traceability platform and is also forwarded back to FIspace core. The FIspace Product

Recall app that the State Agency is using is collecting all the above mentioned information and is creating notifications for all the relevant stakeholders (Farm manager, Trader, Logistics, Retail Store, end-consumer etc.)

***Task Planning***

A farmer is using the FIspace Task Planning specific app to plan his/her next tasks. The legacy FMIS service, which is connected to FIspace, receives this request. It aggregates the data received from the Farmer and is making a request for Task Planning. The FIspace platform, via the B2B Collaboration Module, is dispatching the request to different services for retrieving useful information: to a Meteo Service Provider, to the Farm Manager who is creating some tasks to be done and afterwards to the Greenhouse Back-end System FIspace service, which generates an initial Task Plan. The Task Plan is forwarded once more to the Farm Manager for approval. Finally, via the FMIS service connected to the Task Planning app of the Farmer receives the final Task Plan, and the Farmer is able to review the Task Plan using the Task Planning App's GUI.

### 6.2.3 Trial 431 Fish Distribution and (Re-)Planning

The following table shows a summary of the setup of the Fish Trial (subtask 431).

| Task | | Collaboration | | | | Task Details | | | |
|---|---|---|---|---|---|---|---|---|---|
| Task ID | Task | Actor | Role | Partner | Role | Scope and Boundaries of the task | Parameters to be measured | Any preconditions that must be met for the task to be carried out | Any pertinent documents and their unique identification numbers |
| 1 | Create shipping demand and publish to marketplace | APL,<br>MSC,<br>T&F | LSC,<br>Shipper | Feeder Line | LSP | Fish exporters use the FIspace platform to publish demand for container shipping on marketplaces. | Definition of demand.<br>Forecast of transport need. | 1) The fish exporter's purchase order (pickup and delivery place and time, cargo description, transport item, amount)<br>2) Rules set up for NCL to ensure that they receive these transport demands<br>3) Functionality:<br>Transport demand handling, marketplace submission, publish to NCL. | The fish exporters purchase order (purchaseID) |

| Task | | Collaboration | | | | Task Details | | | |
|---|---|---|---|---|---|---|---|---|---|
| Task ID | Task | Actor | Role | Partner | Role | Scope and Boundaries of the task | Parameters to be measured | Any preconditions that must be met for the task to be carried out | Any pertinent documents and their unique identification numbers |
| 2 | Treatment of requests for shipping | NCL | LSP, carrier | NCL | LSP, carrier | The carrier NCL answers the pending requests for shipping by sending offers to the fish exporters. | The share of requests that are turned into a confirmed booking.<br>Volume: Minimum 10 requests per week. | Information about the demand: Number of containers, freeze/not freeze container, from/to location, from/to time, weight | Need a Fispace ID to identify the request (transport demand, offer, etc).<br>Softship ID for booking. When a Softship ID has been created, these two IDs must be related. |
| 3 | Receive offer(s) from carriers | APL, MSC, T&F | LSC, Shipper | NCL | LSP, Carrier | APL receives offers from carriers, accept or reject offers, make normal or confirm reservations. | Less manual work for fish exporter, lower price due to better utilization of transport capacity, use of forecast to find replacement cargo. | NCL must have entered an offer. | Same as previous |
| 4 | Treatment of pending reservations | NCL | LSP, carrier | NCL | LSP, Carrier | When the departure day approaches, the carrier requests a confirmation of reservations. The shipper confirms by prepaying the shipment.<br>Which type of reservations/bookings? | The part of bookings that are paid in advance. | Some reservations must be sent. Some of them must be "pending" | List of pending confirmations viewed by NCL |
| 5 | Confirmation of booking | APL, MSC, T&F | LSC, Shipper | NCL | LSP, Carrier | The shippers respond to the request for confirmation of reservation sent by NCL. | The part of offers that are being accepted/confirmed. | Some non-binding reservations needed | Overview of non-binding reservation needed |
| 6 | Early anticipation of cancellations | NCL | LSP, Carrier | NCL | LSP, carrier | Compute confirmation probability for pending confirmations.<br>Compute cancellation probability for bookings | Verification of the app's ability to compute the correct probabilities for cancellation and confirmation. | Historical information on customers and reservation statuses.<br>Cargo tracking information | Pending confirmation list, list of bookings |
| 7 | Late cancellation by the fish exporter | APL | LSC, shipper | NCL | LSP, Carrier | 6 hours before departure, because of problems with the Brazilian customs regarding the import license, APL needs to cancel the shipment. | A Code explaining the reason for cancellation | Booking must exists | Booking ID from FIspace and Softship |

| Task | | Collaboration | | | | Task Details | | | |
|---|---|---|---|---|---|---|---|---|---|
| Task ID | Task | Actor | Role | Partner | Role | Scope and Boundaries of the task | Parameters to be measured | Any preconditions that must be met for the task to be carried out | Any pertinent documents and their unique identification numbers |
| **8** | Sending new offer to re-book the late cancellation | NCL | LSP, Shipper | NCL | LSP Shipper | NCL receive notifications of cancellations of bookings (binding reservations) and handles these cancellations by first offering a new departure time to the shipper, and secondly by finding replacement cargo for filling up the capacity now available. | Number of replacements of total cancellations (per voyage). Time and resources used to find replacement cargo | Receiving cancellation, New voyages defined | Booking ID from FIspace and Softship, Booking details |
| **9** | Search for single cancellation replacements | NCL | LSP Carrier | NCL | LSP Carrier | Find a best possible match for a cancelled reservation, with a number saying how well it fits (regarding from-port, to-port, amount, pickup and delivery dates | Percentage of goods found in this way | Overview of available capacity, list of relevant demands | VoyageID, voyage details, demand details |
| **10** | Finding replacement cargo through capacity-based search for shipping demands per vessel | NCL | LSP, Carrier | NCL | LSP Carrier | It is now 4 hours before departure, and NCL is now looking for replacement cargo for filling as much capacity as possible in the short time window remaining. The chart displays the capacities of a vessel between the single ports on the voyage and the capacity utilization rate for each part of the tour. The carrier finds the best possible matches (covering maximum capacity) and sends offers to the respective shipper(s). Basically the same as the previous step | Percentage of goods found in this way | Overview of available capacity, list of relevant demands | VoyageID, voyage details, demand details, booking details |

Table 21 Summary of Experiment Definition

### 6.2.3.1 Appendix Y: Fish trial Experimentation protocol

This section contains a description of the user acceptance test script to be used during the testing by the actors of the fish trial.

| STEP | ACTOR | PROCESS DESCRIPTION | EXPECTED RESULT | TEST DATA |
|---|---|---|---|---|
| **Create shipping demand** *Fish exporters use the FIspace platform to publish demand for container shipping on marketplaces* | | | | |
| 1 | APL | Logs in and open the section "My transport plans" | A list of current transport plans is displayed | Figure 66 |

| | | | | |
|---|---|---|---|---|
| 2 | APL | APL logs in and open the field "Shippings" | A list of current pending bookings waiting to be paid (open reservations) and confirmed/prepaid bookings is displayed | Figure 67 |
| 3 | APL | Click on the icon "create a new shipping demand". | A window "create shipping demand" appears, containing a purchase number generated automatically by FIspce | Some specific Purchase number, for instance "64511-AD415-45453-JS555" from Figure 67 |
| 4 | APL | Fill up the fields "specify origin / destination address" for each leg of the transport plan, and register the information about the shipment. | | Figure 70 - Figure 70 |
| 5 | APL | In the box "Publish demand on the following marketplaces", cross the box "Finest platform" and "Public Market Place A", then click on "search" | | |
| 6 | APL | Confirm by clicking on "create shipping demand" | The window disappear and the user is sent back to the initial page displaying an overview of planned shipments, pending bookings waiting to be paid (open reservations) and confirmed bookings | |
| 7 | APL | Wait for offers | ∞ ∞ Information processing / reply from other parties<br>The shipping demand is registered in FIspace and external market places, thus accessible by any carriers searching the Marketplace for transport needs on a particular route. The carriers send booking offer to the shippers by answering the request, through the FIspace platform. | |
| 8 | MSC, T&F | Other fish exporters do the same procedure, and register demands for shipping from Ålesund to Rotterdam corresponding to the same voyage (date). | | |
| **Treatment of requests for shipping**<br>*The carrier NCL answers the pending requests for shipping by sending offers to the fish exporters.* | | | | |
| 9 | NCL | Log in and open the field "shipping demands" | The page displays a list of all shipping requests which correspond to routes/voyages covered by NCLs vessels. | |
| 10 | NCL | NCL selects all the shipping requests matching the next voyage of the vessel Tina. | The requests from APL, MSC and T&F appear on the list. | Figure 71 |
| 11 | NCL | Checks capacity, and sends offer to each of the fish exporters. Waits for confirmation. | ∞ ∞ Information processing / reply from other parties ∞∞<br>The offer is received by APL. | |
| **Receive offer(s) from carriers**<br>*APL receives offers from carriers, accept or reject offers, make normal or confirm bookings.* | | | | |
| 12 | APL | Go back to the field "shippings" (transport plans), select the shipment on focus (Nr 64511-AD415-45453-JS555 , Ålesund to Rotterdam, departure Oct. 20th), and click on "View shipping details and bookings". | A window appears, showing three tables: (1) current binding or prepaid (confirmed) bookings (empty), (2) the non-binding bookings (pending bookings waiting to be paid - open reservations) (empty), and (3) the received offers. The "Received offers" table contains 3 offers (from NCL, Eimskip, and ECL) with each set of price levels (non-binding booking waiting to be paid, and binding bookings that have been paid). | Figure 72 |
| 13 | APL | APL selects the offer from NCL, in order to make a booking (with late payment due date or earlier payment due date). | A window opens and gives two alternatives:<br>— Alternative A: (non-binding) pending bookings waiting to be paid (open reservations)<br>— Alternative B: (binding) Confirmed bookings, with early payment due date (pre-paid)) | |
| 14 | APL | Click on "make a non-binding booking" (alternative A) | The offer disappears from the "received offers" table, and appears in the "nonbinding booking" table, with status "pending". | |
| 15 | APL | Rejects the offers from Eimskip and ECL by first selecting the offer, then clicking on | The column "status" in the "received offers"-table is updated to | |

| | | | | |
|---|---|---|---|---|
| | | "decline offer" | "declined" for both carriers. | |
| 16 | APL | Logs off | ∞ ∞ Waiting for information processing / reply from other parties ∞∞<br>The pending bookings or declinations are communicated to the carriers. | |
| 17 | T&F, MSC | T&F and MSC follow the same procedure and accept the offer from NCL: T&F as a binding / pre-paid booking, and MSC as a non-binding booking (late payment). | ∞ ∞ Waiting for information processing / reply from other parties ∞∞<br>The carrier NCL receives the bookings and transfers them to own planning system (for preparing discharge/loading lists and stowage plan). | |
| **Treatment of pending bookings**<br>When the departure day approaches, the carrier requests a confirmation of bookings. The shipper confirms by (pre)paying the shipment. | | | | |
| 18 | NCL | Log in, select the voyage, and open the field "offer pending confirmation". | The page displays a list of all pending bookings (reservations) received so far. The status column shows whether the offer has been pre-paid, accepted as non.-binding booking with late payment due date, rejected, or not answered yet. NCL can see that the offer sent to APL has been "accepted as non-binding reservation". | Figure 73 |
| 19 | NCL | 72 hours before departure, NCL needs the shippers to confirm the pending booking. Selects the non-confirmed pending bookings (reservations) and click on "request for confirmation". | ∞ ∞ information processing∞∞<br>The request is received by APL, and T&F, and accepted as a confirmed booking by paying the transportation (pre-paid reservation). | |
| 20 | NCL | NCL receives an notification from FIspace and checks the page "offer pending confirmation" | The offers have now the status as "accepted and pre-paid", since they have been accepted by the shipper. | |
| 21 | NCL | To transfer the information to the back end system Softship, click on "transfer all confirmed". | The info is received by the back end system, and NCL can update the operational plan for the given vessel / voyage. | |
| **Confirmation of booking**<br>The shippers respond to the request for confirmation of reservation sent by NCL. | | | | |
| 22 | APL | APL receives a notification from FInest, logs is and open the page shipping. | The table "pending bookings (non binding reservations)" is updated, and the column "status" for the given shipment displays "please confirm". | Figure 74 |
| 23 | APL | Select "confirm booking" | A window opens, and gives the possibility to choose between pre-paid (with discount – confirmed booking) or post-paid (pending) booking. | |
| 24 | APL | Select "pre-paid". | [Transaction effectuated through another system]. | |
| 25 | APL | Go back to the page "shipping" | The offer appears in the "confirmed booking (binding / prepaid reservation)" table, with status "pre-paid" | |
| 26 | APL | Logs off | ∞ ∞ information processing ∞∞<br>The reservations are communicated to the carrier(s). | |
| 27 | T&F | T&F does the same procedure. | | |
| **Early anticipation of cancellations** | | | | |
| 28 | NCL | 48 hours before departure, NCL is still waiting for some confirmation | The "offer pending confirmation" displays the pending bookings (non-yet-confirmed reservations), together with a probability of confirmation.<br>For T&F, the probability is of 30%, which is based on the absence of confirmation and past booking history from the shipper. | |
| 29 | NCL | NCL notice the low probability for confirmation from T&F, and opens for more bookings. | | |
| 30 | NCL | 24 hours before departure, NCL receives a warning from FIspace, indicating a possible cancellation of one of the bookings | The booking from MSC appears with 40% probability of cancellation, due to tracing information indicating that the cargo has not yet arrived at the terminal. | |
| 31 | NCL | NCL notice the low probability for confirmation from MSC, and opens for more bookings. | | |

| | | | | |
|---|---|---|---|---|
| **Late cancellation by the fish exporter**<br>*6 hours before departure, because of problems with the Brazilian customs regarding the import license, APL needs to cancel the shipment.* | | | | |
| 32 | APL | Go to the field "shippings" and select the concerned shipment (Nr Nr 64511-AD415-45453-JS555 , Ålesund to Rotterdam, departure October 20th 2012), click on "View shipping details and bookings" | Shipment details appear. | Figure 75 |
| 33 | APL | Find the shipment in the "binding and prepaid booking", and then click on "cancel prepaid booking". | A pop up window appears with a warning regarding cancellation penalties. | |
| 34 | APL | Click on "Cancel booking". | ∞ ∞ Waiting for information processing / reply from other parties ∞∞<br>The cancellation is communicated to the carrier via FInest. The carrier search for solutions to offer later departure time to the shipper. | |
| **Sending new offer to rebook the late cancellation:**<br>*NCL receive notifications of cancellations of confirmed bookings (binding reservations) and handles these cancellations by first offering a new departure time to the shipper, and secondly by finding replacement cargo for filling up the capacity now available.* | | | | |
| 35 | NCL | NCL receives a notification from FInest, logs in , and goes to "recent cancellations" | A table appears with a list of all the approaching departures (according to remaining time before gate closing). | |
| 36 | NCL | To view the status of cancellations of the vessel Anna, leaving in xx hours, click on the vessel's raw in the table. | A table appears below summarizing all the cancellations made to the voyage of the vessel Anna. | Figure 76 |
| 37 | NCL | In order to keep the customer's booking, NCL proposes to NG to rebook the cargo to a later departure on one of NCL's vessels.<br>Select the cancellation from APL that has just arrived, and clicks on "new offer". | A new window showing the cancelled booking is displayed | |
| 38 | NCL | NCL select a new departure date and time, propose a discount for rebooking, and click on "send offer" | ∞ Waiting for information processing / reply from other parties: ∞<br>The offer is received by APL. | |
| 39 | APL | APL received a notification from FIspace.<br>Go back to the overview of planned and reserved shipments by clicking on the field "shippings". | On the line corresponding to the recently cancelled shipment, the status is changed to "new offer received" | |
| 40 | APL | Open the offer, and click of accept | The list of "shippings" is updated with a new departure date/time, with the same carrier, and status is "pending booking (reserved)". | |
| **Search for single cancellation replacements**<br>*The aim is to find the "100% match" for a cancelled booking, which means from the same port to the same port and with the exact same amount* | | | | |
| 41 | NCL | Go back to the "cancellations Anna" table, select the cancellation from APL, and click on "search alternatives".<br>In this scenario, the Alternative A is chosen. | A window "Search for single cancellation replacements" opens. The window displays the information about the booking being cancelled, together with a list of open demands that FIspace has identified through the Marketplace, and that resemble the recent cancellation. This list of "candidates" for the given voyage also shows the % match between each candidate and the booking cancellation (quantity, origin, destination etc.).<br>— Alternative A: 100% match. Sending direct offer<br>— Alternative B: less than 100% match. Different origin & destination (additional transport needed). Sending offer using a Freight Forwarder. | Figure 77 |
| 42 | NCL | Choose the one with 100% match, coming from the fish exporter T&F, and click on "send an offer directly". | ∞∞ Waiting for information processing / reply from other parties ∞∞<br>The offer is received by T&F as a last minute booking offer, accepted as a binding booking. | |
| 43 | T&F | *Describe the shipper receiving the offer right before departure and sending a confirmation to NCL* | | |

| | | | | |
|---|---|---|---|---|
| 44 | NCL | Open the offer pending confirmation | see the status from the offer made to T&F as "accepted" | |
| 45 | NCL | Select it and click on "transfer selected", | ∞∞ Information processing ∞∞<br>The booking is transferred to the back-end system (and the operational plan and discharge / loading list can be updated). | |
| **Finding replacement cargo through capacity-based search for shipping demands per vessel**<br>*It is now 4 hours before departure, and NCL is now looking for replacement cargo for filling as much capacity as possible in the short time window remaining. The chart displays the capacities of a vessel between the single ports on the voyage and the capacity utilization rate for each part of the tour. The carrier finds the best possible matches (covering maximum capacity) and sends offers to the respective shipper(s).* | | | | |
| 46 | NCL | Go back to the "recent cancellations" field, select the vessel Anna, and click on "find shipping demand for vessel". | A window opens, with a chart displaying the entire planned voyage of the vessel Anna, the ports of call, the scheduled departure date, the remaining time before gate closing, and the capacity utilization between each port.<br>On the top, you can see a "shipping demand filter" enables the carrier to refine the search. | |
| 47 | NCL | Fill up the "filter window", by selecting "direct", between 2 and 1 hour, and max TEU. | Above the chart, you see a list of shipping demands (retrieved by Finest on e-market places) matching the capacity offered by the voyage of the vessel Anna. | |
| 48 | NCL | Select the first shipping demand (clicking on it) | A green bar appearing automatically on the voyage chart, showing that xx % of the capacity of Anna would be covered by that shipment on the stipulated itinerary. | |
| 49 | NCL | NCL selects the shipping demand and click on "send offer"<br>Repeat the same procedure for all the shipping demands identified. | ∞ ∞ Information processing / reply from other parties ∞∞<br>The offer is received by APL. NCL waits for reply. | |

Table 22 Use Acceptance Test Script

### 6.2.3.2 Figures for the acceptance test script

The figures in this section are from the FInest mockups and prototypes described in FInest deliverables D8.2 and D7.4.

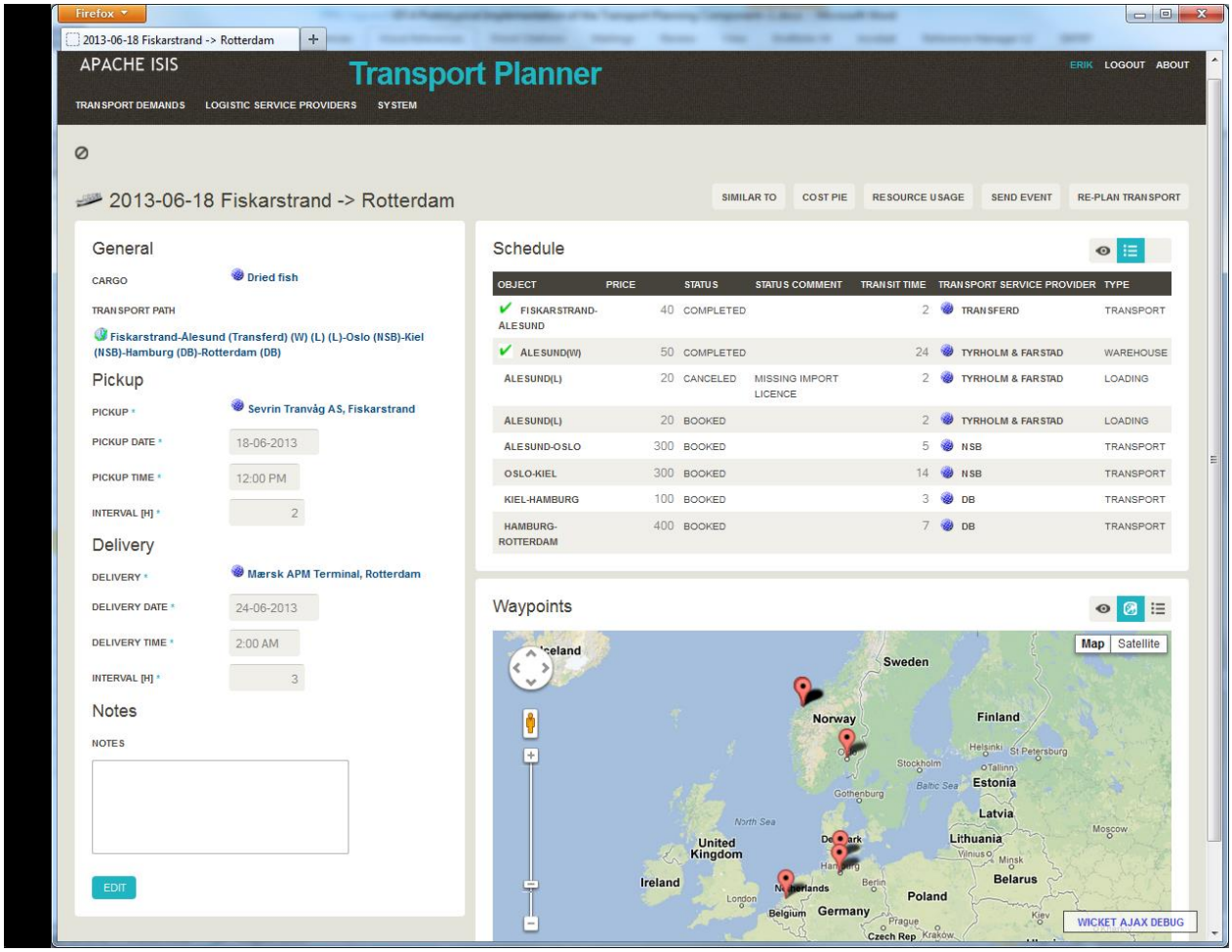
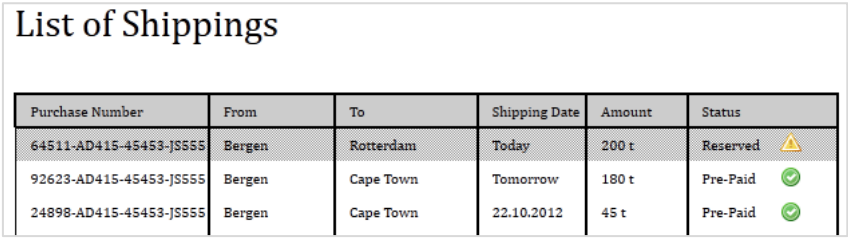



Figure 66 Overview of current transport plans



List of Shippings

| Purchase Number | From | To | Shipping Date | Amount | Status |
|---|---|---|---|---|---|
| 64511-AD415-45453-JS555 | Bergen | Rotterdam | Today | 200 t | Reserved |
| 92623-AD415-45453-JS555 | Bergen | Cape Town | Tomorrow | 180 t | Pre-Paid |
| 24898-AD415-45453-JS555 | Bergen | Cape Town | 22.10.2012 | 45 t | Pre-Paid |

Figure 67 Overview of shipper's current reservations

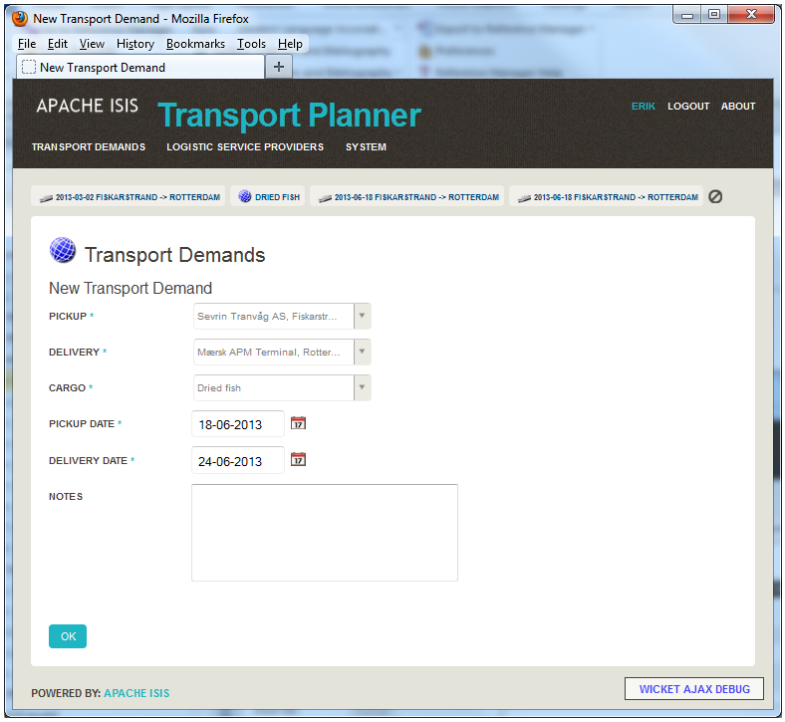



Figure 68 Shipment details a

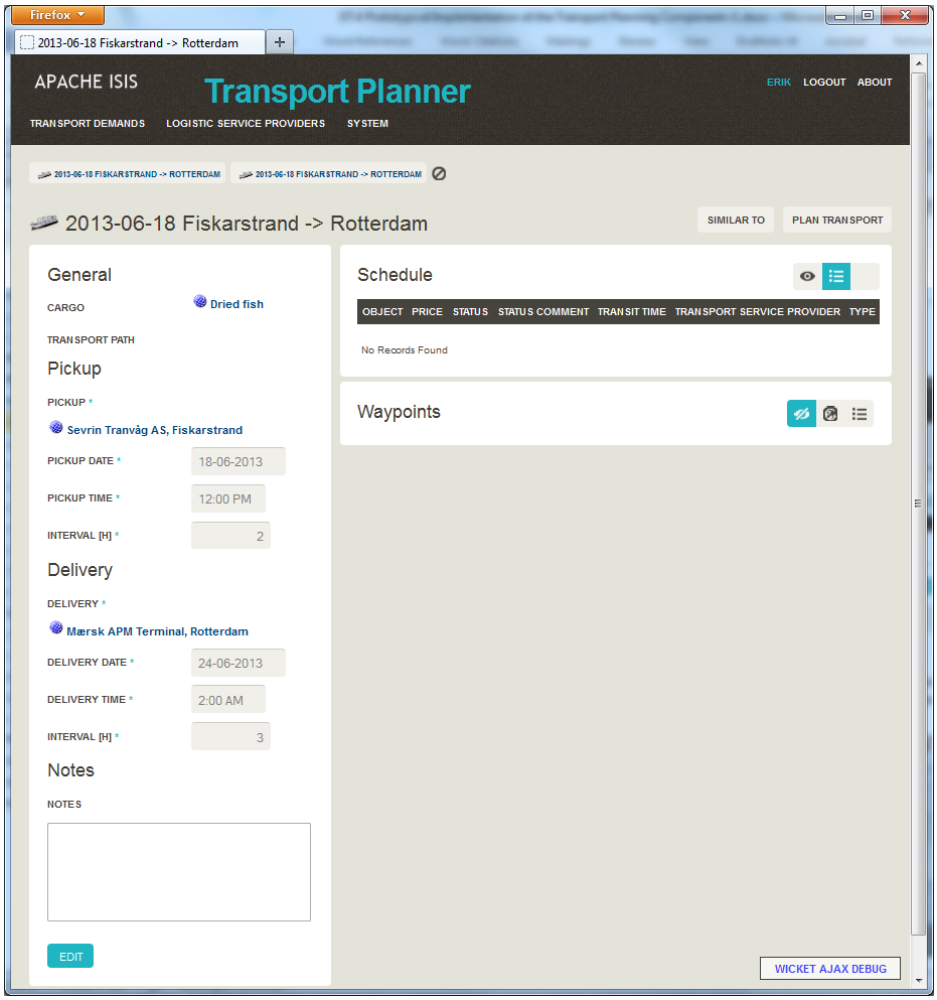



Figure 69 Shipment details b

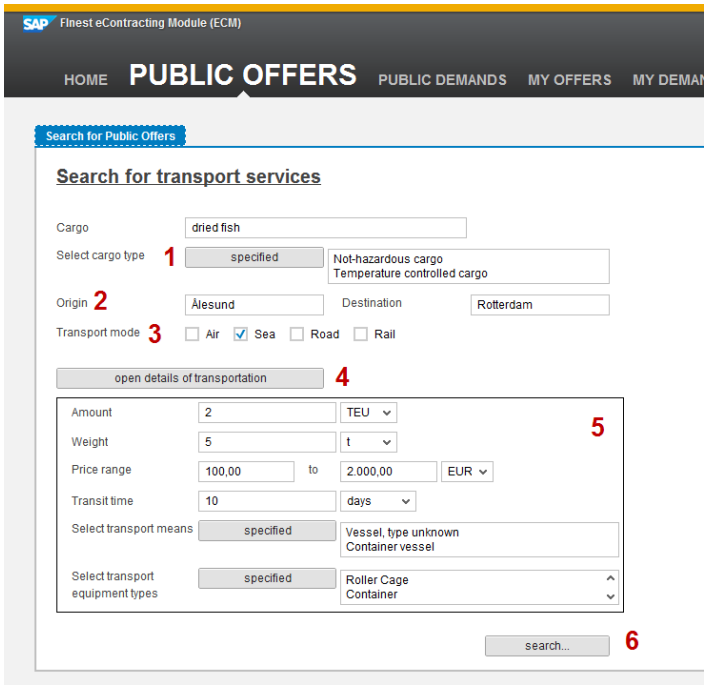



Figure 70 Shipment details c

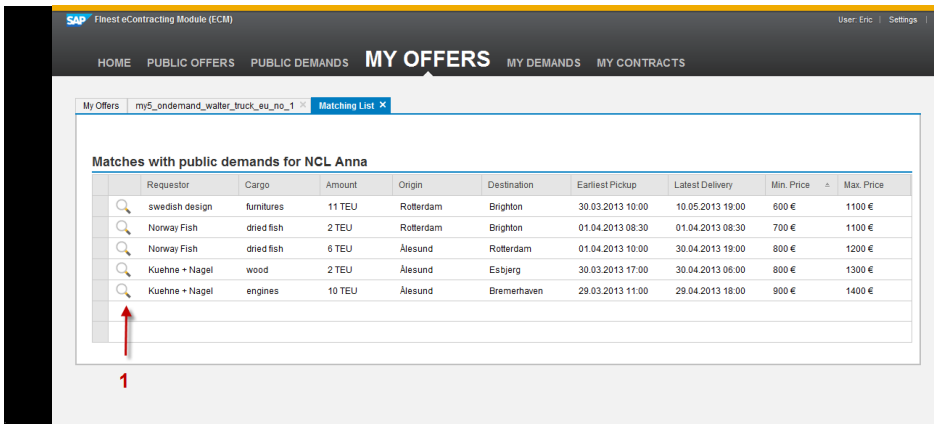



Figure 71 Offers matching demand

[redacted]

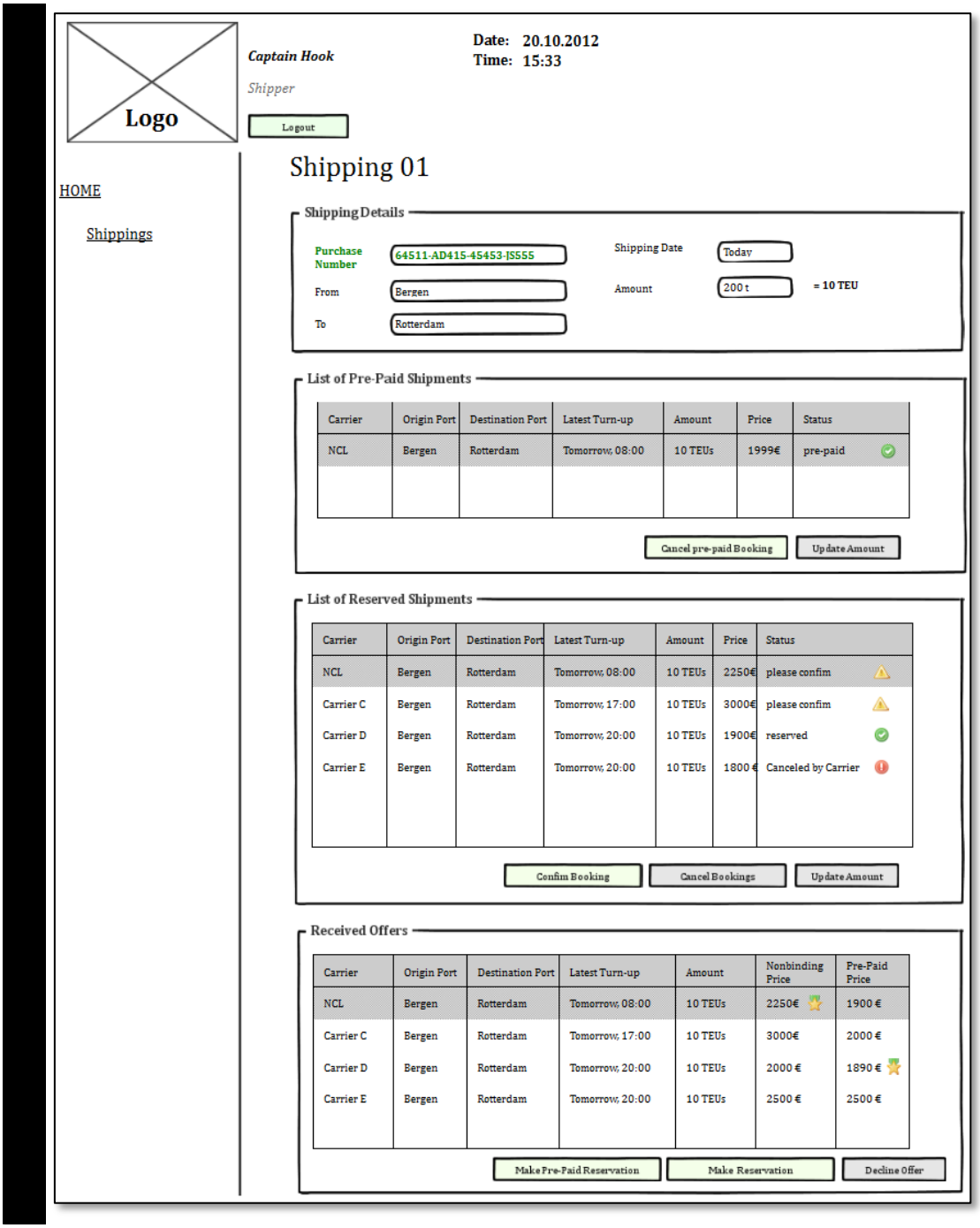



Figure 72 Offers received by the shipper

| Customer | Vessel | Origin Port | Destination Port | Departure | Amount | Status |
|---|---|---|---|---|---|---|
| Shipper X | Anna | Bergen | Ålvik | Today, 17:00 | 10 TEUs | Accepted |
| Shipper Y | Anna | Bergen | Ålvik | Today, 17:00 | 15 TEUs | Rejected |
| Shipper Z | Anna | Ålvik | Haugesund | Tomorrow, 08:30 | 50 TEUs | Offer Sent |
| Shipper Q | Lady Clarissa | Rotterdam | Trondheim (orkanger) | 22.02.2012, 17:00 | 10 TEUs | Offer Sent |
| Shipper Y | Lady Clarissa | Rotterdam | Trondheim (orkanger) | 22.02.2012, 17:00 | 7 TEUs | Rejected |

Figure 73 Offer pending confirmations (view from carrier side)

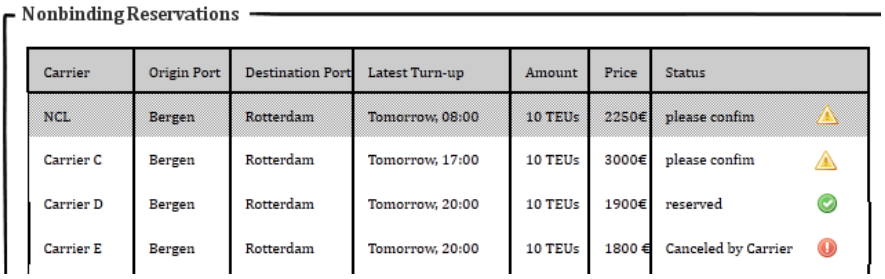



Figure 74 Overview of current non binding reservations (view from shipper side)

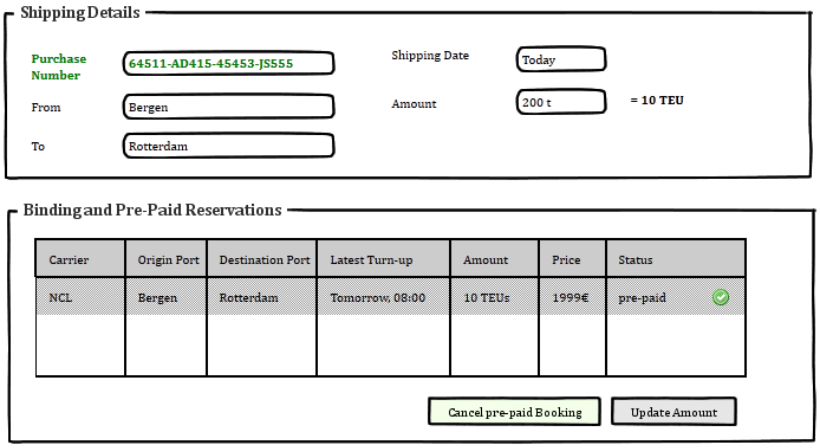



Figure 75 Shipment detail

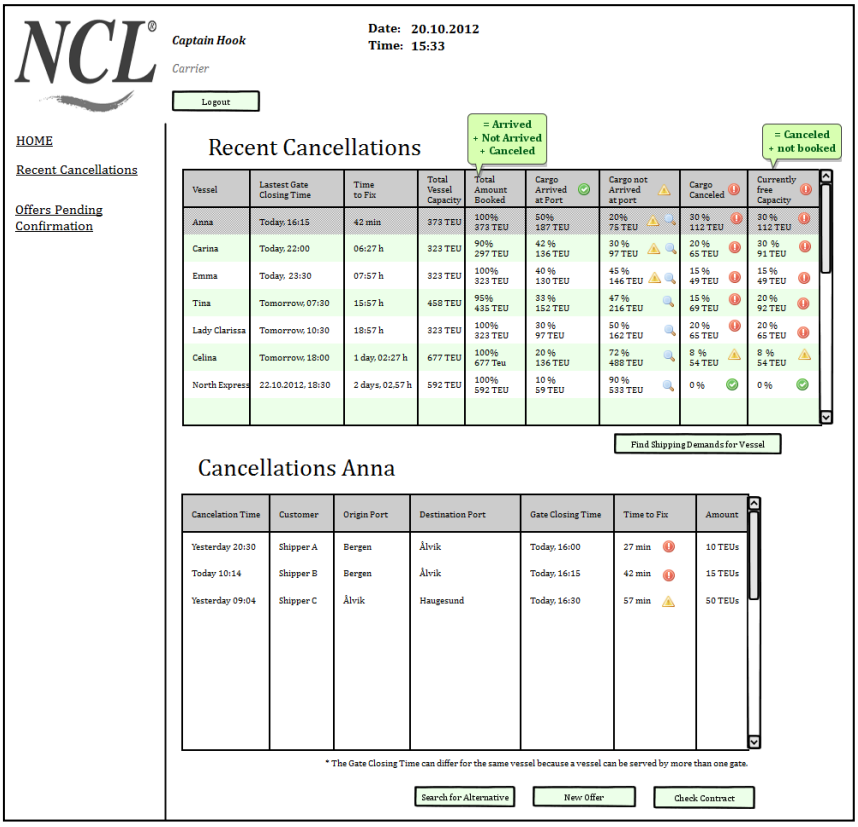



Figure 76 Summary of recent cancellations

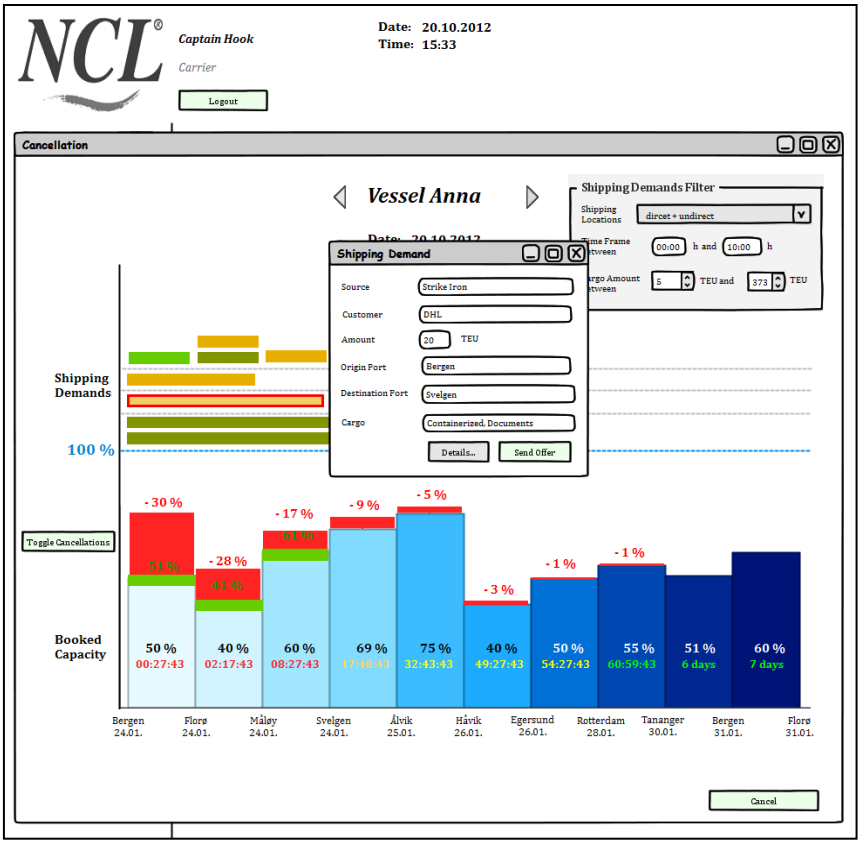



Figure 77 Search for single cancellation replacements

### 6.2.4 Trial 432

#### 6.2.4.1 Interaction between Data Container and Apps

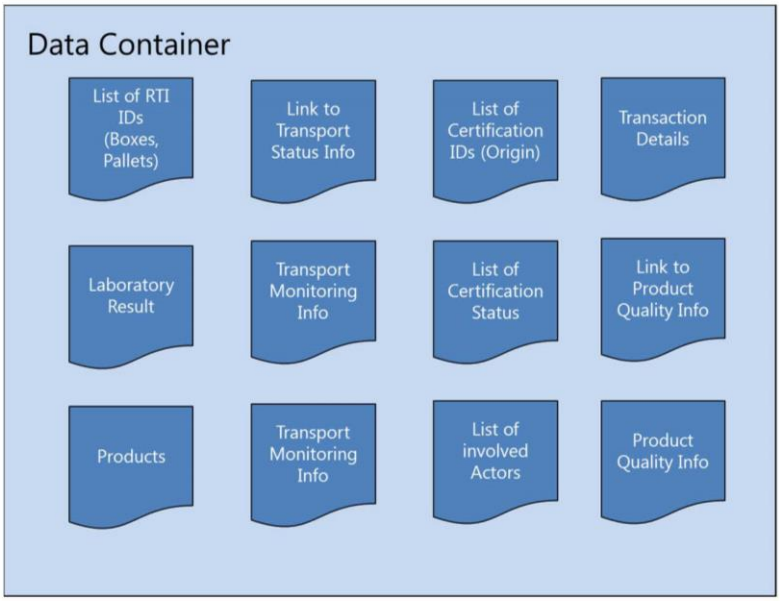



Figure 4: Data Container and Information Elements with relevance to the FFV App

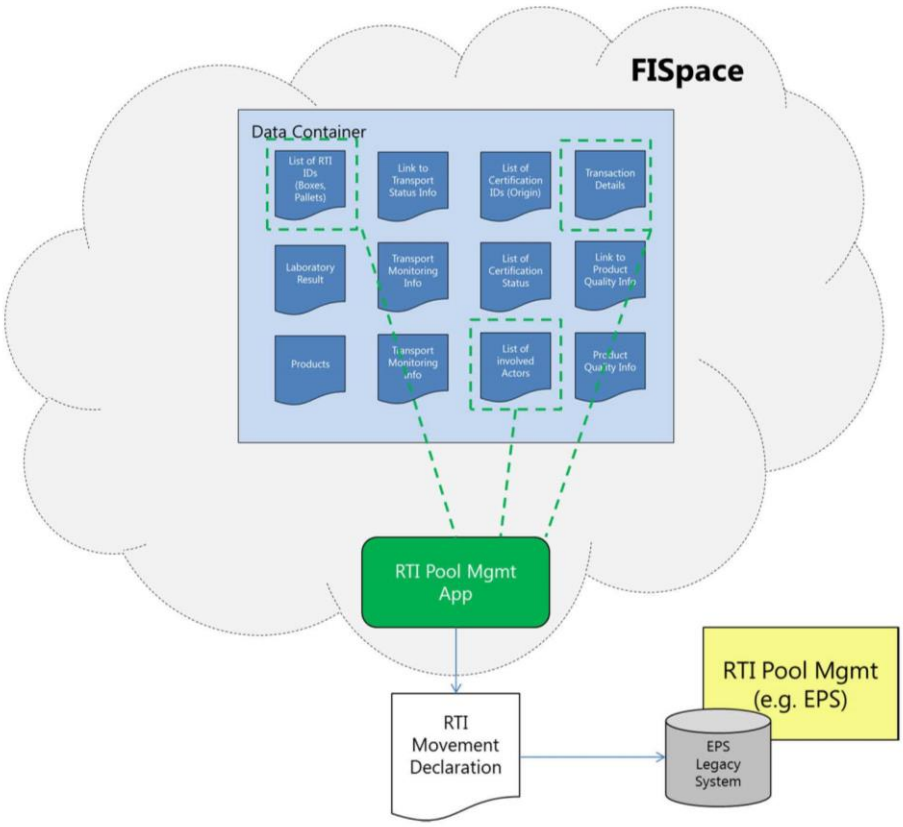



Figure 5: App and Data Container Interaction

### 6.2.4.2 Use Cases (Apps)

**Product Quality Information (forward communication)**

The target group of this sub use case are traders, which want to provide additional product-related information on their products to their customers (retailers). The information provision is closely linked to a delivery of products between a trader and a customer. Each delivery contains various RTI Boxes (filled with products) on RTI pallets. Each delivery is uniquely identified with the GLN of the supplier and a DeliveryID (figure B1-1).

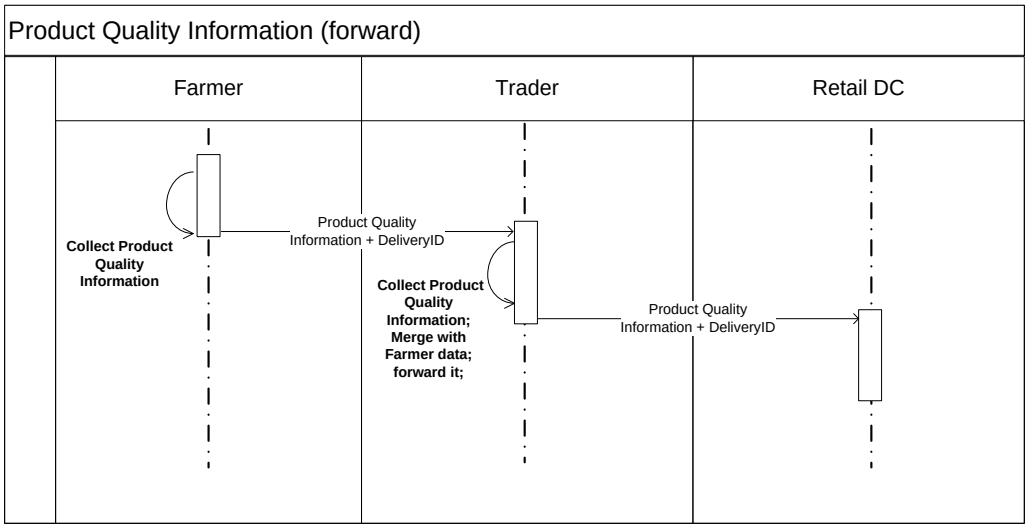



Figure B1-1: Forwarding of Product Quality Information using different instances of the FFV App

The scope of the App is the bundling of information related to the products and the delivery. This means that the App should have one or more interfaces to existing legacy systems at the Trader (supplier) to receive the necessary basic information for matching product information to a DeliveryID. The aggregation of product information for the delivery is done in existing systems, the forwarding of this information package is the main scope of the App.

**Product Quality Information Elements**

Product Quality Information as such can be described as the virtual representation of the products' quality status. The relevant product quality information elements are collected and processed at the quality management department of the Trader. The sources of these information elements can be various actors, including e.g. farmers, laboratories or the trader itself. The trader aggregates this information to a set of Product Quality Information Elements that are of relevance for a specific delivery.

Table B1-1 is a selection out of a large pool with other Product Quality Information Elements, but has been reduced by the stakeholders for the experimentation in the Trial. Additional elements such as social standards applied in agricultural production, environmental standards, carbon footprint and other related elements.

Table B1-1: Product Quality Information Elements considered in the FFV Trial

| Element | Description | Source |
|---|---|---|
| Origin | Origin of a product is based on traceability data (which member delivered which product, which supplier delivered which product)<br>The origin information can be a Global Location Number (GLN) AND the country of origin (legal minimum requirement). | Trader |
| Product Identification | Global Classification Number (GS1 GPC or GTIN) | Farmer / Trader |
| | | |
| Date of harvest | (based on member information provided together with the delivery) | Farmer |
| Place of harvest | (optional, Field or GPS location information) | Farmer |
| Certification Scheme | Name of certification (in the Trial: GlobalGAP) and the number under which the company is filed at the certification body (GGN number). This could be a list of GGNs for various certified Farmers contributing to a delivery. | Farmer / Trader |
| Results of Analytical Examination | (biological, chemical laboratory results) | Laboratory / Trader |
| Product characteristics | Brand name (“Pink Lady”),<br>Cultivar (Apple “Gala”),<br>Size,<br>Weight, | Trader |
| Product Handling Advise | includes data on optimal storage temperature, light, humidity and additional information such as “wash / peal / cool before consumption” | Trader |
| Packaging | All products are traded in a specific primary and possibly in a secondary packaging. The primary packaging defines the bundle size (e.g. “six apples in a tray”).<br>Example:<br>“EPS-cont 246” (= Euro Pool System RTI Box Type 246) represented by a GTIN | Trader |
| Delivery Reference | GLN + DeliveryID | all |

**Information Collection Process at the Trader**

The collection of relevant information elements for the envisaged Product Quality Information Record (see table B1-1) takes place in different departments and different processes.

**Origin:** Origin information is collected at the registration of delivered goods (Who delivered what & when)

**Product Identification:** Some customers provide GTINs for the products, some don't.

**Date of Harvest:** Provided at the registration of delivered goods

**Place of Harvest:** Provided at the registration of delivered goods as LOT Nr. or more detailed information

**Certification Scheme:** Is managed in a certification process in which farmer, trader and certification body are involved. The certification scheme participant number comes from the certification body and is known to farmer and trader.

**Results of analytical examination:** The results of pre-harvest laboratory control are

**Product Characteristics:** Are usually fixed in categories, but the evaluation in which category the delivered products are fitting is done at the quality check.

**Product Handling Advise:** The product handling advice is a standard information for specific products

**Packaging:** The Packaging depends on the retail order, which determines the way the products have to be packed. For RTI Boxes this could be the type of box or later in the process the number of the RTI Box itself.

**Delivery Reference:** The delivery reference is created for each delivery that is prepared.

**All information elements are stored distributed in different systems (Product Information Management Systems, ERP Systems, …) so it is an important requirement for the companies to be able to provide the required data set OR that the app needs a functionality to puzzle together information elements from different systems (automatically?).**

An overview is provided in the following Figure B1-2.

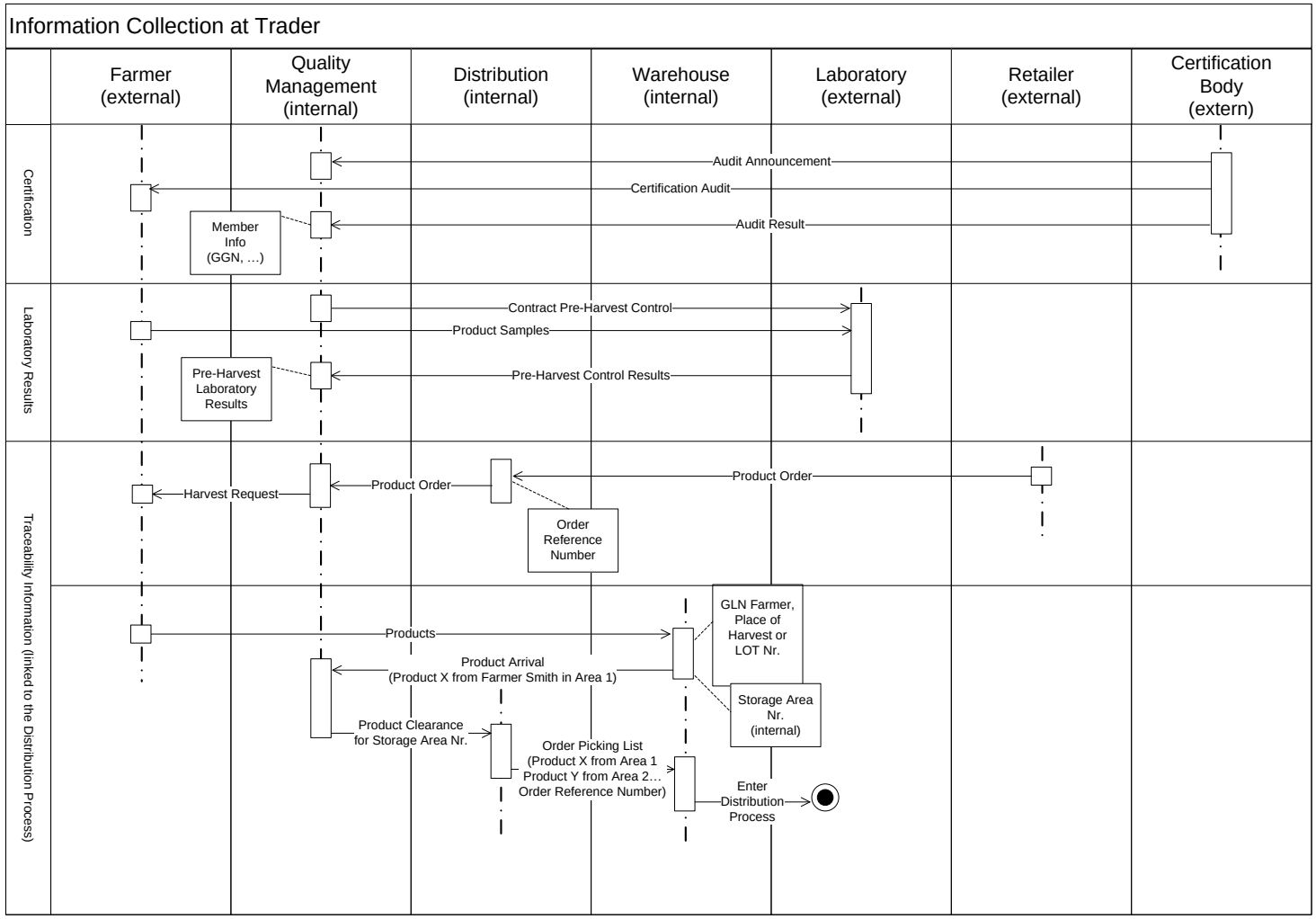



Figure B1-2: Information Collection Processes at Trader

Product Quality Feedback Information (backward)

The target group for this sub use case is the customer side of the transaction. The scope of this sub use case is to enable the provision of product quality feedback information to suppliers in order to support supply chain integration and improvement activities at the supplier side of the transaction (figure B3).

The scope of the App is to take up product quality information from the assessment by a quality manager evaluating the products at the customer (e.g. in the inbound logistics process) and send it backwards to the supplier, which could send it backwards to its supplier.

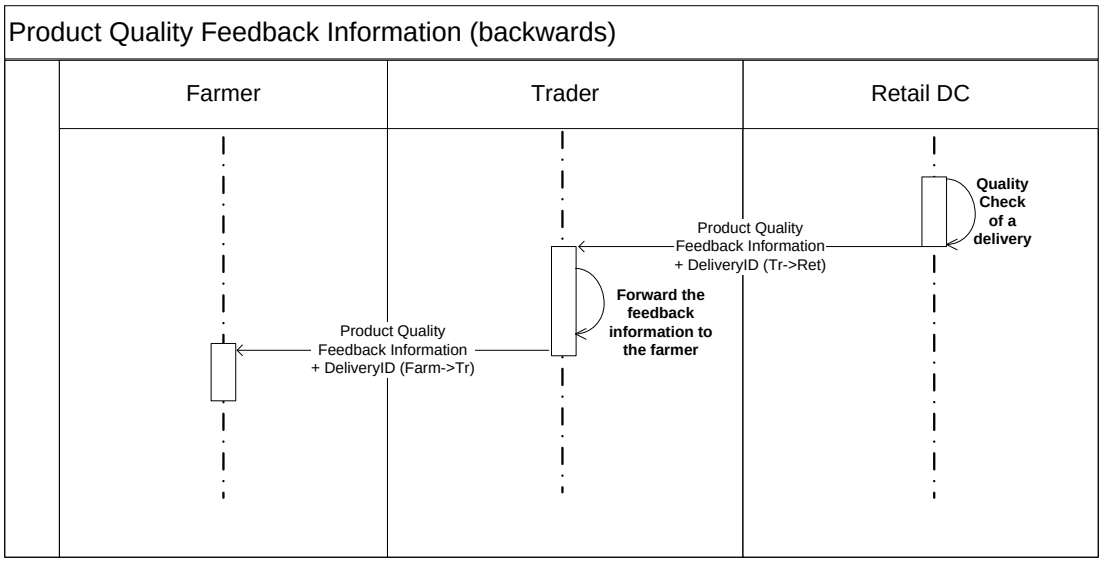



Figure B2-1: Basic sequence for provision of Feedback Information backwards in the chain using different instances of the FFV App

**Product Quality Feedback Information Elements**

The list presented below in table B2-1 presents a list with Product Quality Feedback Information Elements, the stakeholders have agreed upon for the experimentation in the Trial.

Table B2-1: Product Quality Feedback Information Elements considered in the FFV Trial

| Element | Description | Source |
|---|---|---|
| Transaction Identification | Origin of a product is based on traceability data (which member delivered which product, which supplier delivered which product)<br>The origin information can be a Global Location Number (GLN) AND the country of origin (legal minimum requirement). | Retailer |
| Date of Control | Date, when the product has been controlled | Retailer |
| Place of Control | Place were the product has been controlled | Retailer |
| Product Quality Status | Indication of the ranking of the product quality | Retailer |
| Results of Analytical Examination | Laboratory results from the Quality Control Samples taken at the Retailer | Laboratory / Retailer |
| Delivery Reference | GLN + DeliveryID | All |

**Information collection process for Product Quality Feedback Information**

To be clarified with EDEKA

**Certification Status Information**

The exchange of Certification Status Information is considered as a sub use case in the FFV Trial extending the initial Product Quality Information Exchange Use Case by the Certification Status of the Suppliers. The certification of agri-food companies according to different sets of requirements from different certification bodies is a pre-requisite for the marketability of fresh fruits and vegetables for most retail organizations. In the FFV Trial this role is represented by GlobalGAP, which is publishing the certification status of certified farmers in a public database. Every farmer has a unique GlobalGAP Number (GGN) based on the GS1 GLN scheme. This is also true for various other certification bodies, such as e.g. Q+S (Q+S participants number). The Certification Status Information Sub Use Case is therefore transferable to all certification bodies for various Standards (e.g. Environmental and Social Certification Standards).

In the FFV Trial, this information element describing the Supplier of a product, is considered as an additional element for a specific delivery of products. Usually, a delivery of products between traders and Retailers is an aggregation of different deliveries from different farmers. The information need for retailers is related to the certification status of these, to the retailer unknown, farmers. Therefore a list with GlobalGAP numbers (GGNs) is a request formulated by retailers to their suppliers.

Following the train of thought depicted in figure 5 (Sequence of different Business Collaboration Objects), a product at the point of sale could be part of different Business Collaboration Objects in the past. In this case, the Trader has to be supported by the extraction of GlobalGAP Numbers from a previous transaction and the forwarding of a new set of GlobalGAP Numbers for an upcoming transaction (Figure B3-1).

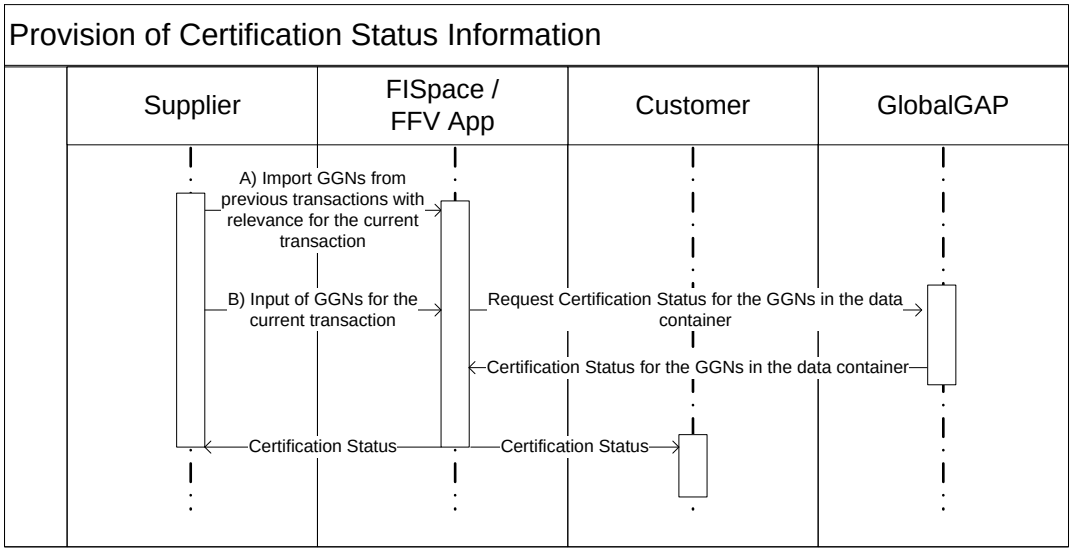



Figure B3-1: Provision of Certification Status Information

The sequence depicted in the previous figure is following a simple sequence between Supplier, GlobalGAP, the FISpace / FFV App and the Customer. The supplier identifies the farmers providing products for this specific delivery using their GGNs. The App requests the Certification Status from the Certification database of GlobalGAP and aggregates it to a list, which is provided via the App.

**Pool Management of Returnable Packaging Items (RTI Boxes)**

The exchange of information with RTI Pool Management is the third application case in the FFV Trial. In different RTI Pool Concepts, the declaration of a movement of RTI Boxes or Pallets is required for organizational purposes such as e.g. creating a financial transaction and changes in customer stocks related to RTI assets. This is especially important in clearing or time-based rental concepts, where the costs for an RTI are calculated in relation to the time this item is staying in a specific company. The declaration of a RTI movement (from Actor A to Actor B) and the confirmation that this RTI movement is completed are therefore essential parts of the delivery process (Figure B4-1). This application case is additionally the only case in which only information is taken out of the data container by the RTI Pool Management.

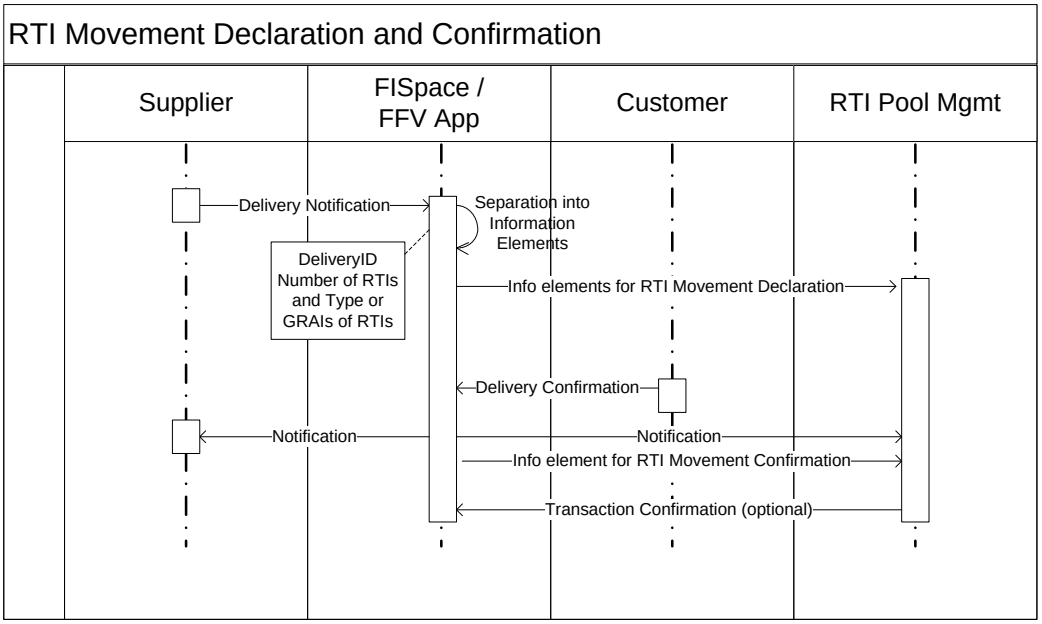



Figure B4-1: Provision of Information on RTI Movements to the RTI Pool Management

The sequence depicted in the previous figure B5 starts with the input of information from the Supplier (Trader; here Delivery notification) to the App in order to create a new business collaboration object. The delivery notification is separated by the App into different Information Elements (e.g. Products, RTI Boxes, RTI Pallets, Supplier GLN, Customer GLN), whereas the RTI Pool Mgmt has access rights to specific elements (RTI Boxes or RTI Pallets and Supplier GLN, Customer GLN) from this record. These information elements are used to create a RTI Movement Declaration at the RTI Pool Management, which is confirmed by taking out the Delivery Confirmation Information from the Data Container. This requires a notification that the delivery process is finished, which is put in the data container by the Customer (Retail DC) after reception of the delivery and also received by the Supplier (Trader). Additionally a transaction notification from the RTI Pool Management after successfully processing the RTI Movement could be places into the data container as information element for the Customer and the Supplier.

**Transport Status Information**

The access to Transport Status Information is considered as a tremendous challenge for actors in all sectors because of the various transport service providers facilitated for physical transport of goods. Transport Service Providers operate highly sophisticated systems to monitor their transports and follow various regulations for the transport of different goods. The data is usually collected in legacy systems at the Transport Service Providers. This information is of relevance for all agri-food actors (Trader, Retailer).

The following sequence (Figure B5-1) describes how the link to this monitoring data is provided via the App.

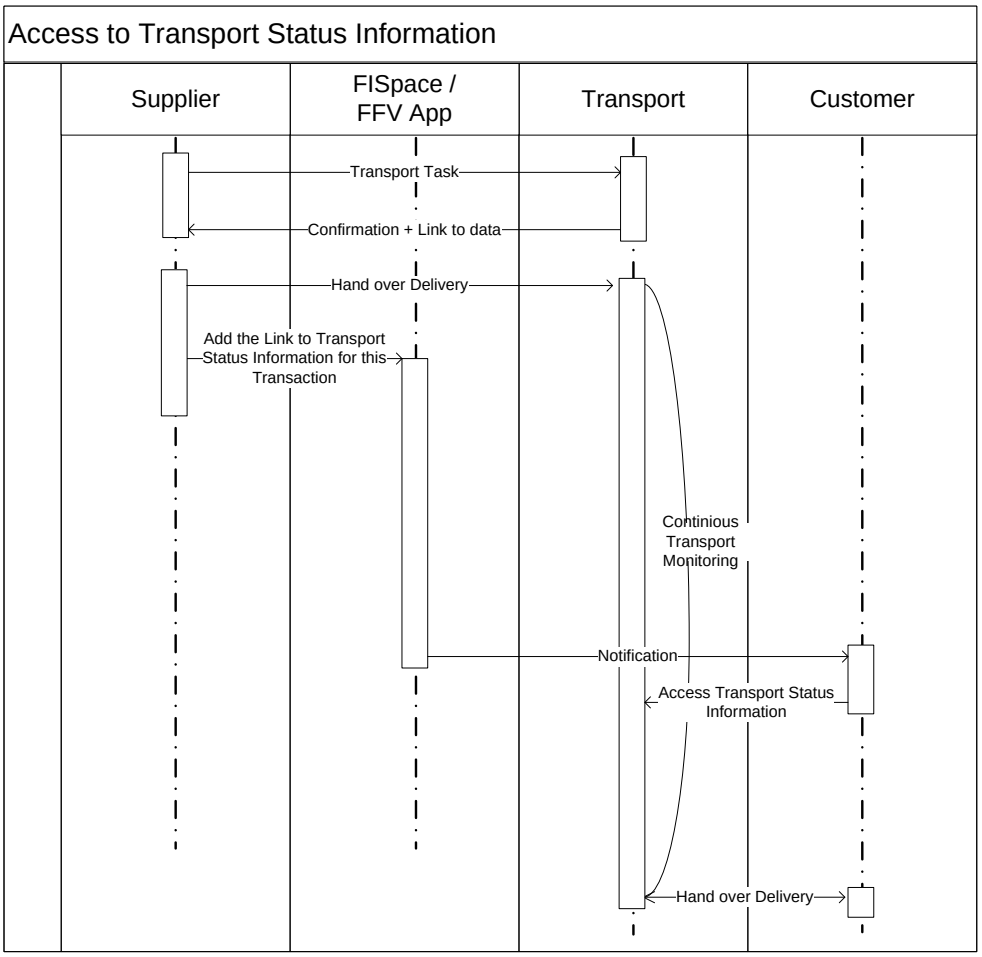



Figure B5-1: Access to Transport Status Information

The Transport Service provider provides a Link to his monitoring system together with a reference for the transport task he has been contracted for. This Link is added to the business collaboration object (delivery between trader and retailer). A notification about the existence of Transport Status Information is send to the Retailer. The Retailer can access the Transport Status via the link or the App provides the Transport Status by integrating the data from the transport service provider via an interface and displays it to the user.

**Analytic Service Provider (Laboratory) Integration**

The integration of additional service providers or other involved actors is a challenge because of linking additional services to an existing transaction. The integration of an analytic service provider (Laboratory) is envisaged in order to import laboratory results concerning products handled in a physical transaction. Usually, these laboratory results are transferred via e-mail or traditional mail services to the contractor (Trader or Retailer). In order to speed up the process, this application case should offer an integration option to the existing product quality information data sets. Traders and Retailers contract laboratory analysis services for quality control purposes. The laboratory creates a reference number and takes product samples from fields or warehouses for analysis. The samples are examined and results are created for this specific reference. This laboratory reference can be mapped to a delivery from a supplier. The integration of data requires an option to pull data for a specific reference from a laboratory service database. After receiving the laboratory result data set this data can be integrated into a Product Quality

Information data set for a specific delivery containing evaluated products. The sequence is described in the following figure B6-1.

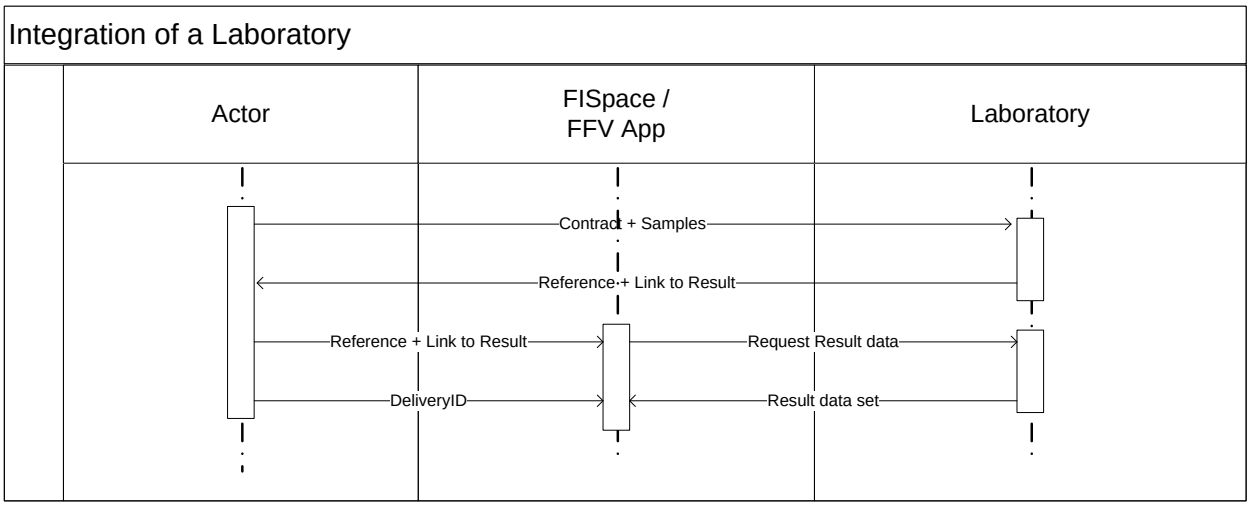



Figure B6-1: Integration of Laboratory results into the FFV App

### Deviation Management and Exception Reporting

The deviation management and exception reporting is the most crucial point for our stakeholders. The role of the App is to provide functionality that compares the as-is product and process quality status, represented by all previous information packages, with actor specific expectations and requirements for products and the distribution process. Based on this evaluation, exception notifications (so called exception reporting) are send to all relevant actors involved in distribution process, which also includes possibly other chain actors that received products from the same source. These notifications have to be spread along identifiable transactions containing the same product from the source (often a uniquely identifiable farmer).

The role of the Deviation Management App is to provide functionality that compares the as-is quality status with the to-be quality status of a product based on the information elements provided by e.g. the Transport Status App, the Laboratory Result App, the Product Quality Information App, the Certification Status App and send notifications to relevant actors (customer, supplier), in case something related to the quality status of a product is out of a predefined accepted range.

### Marketplace for fresh Fruits and Vegetables and Product Quality Information

The idea of an online marketplace for products is nothing new in the FFV sector. Many online marketplaces failed in the past, because the products offered were not tangible enough regarding product quality and therefore the concept failed. The same holds true for auctions, which are losing of importance in the past years for the same reason. The current rate of seasonal contracts, which allow way more influence on the supplier, compared to short-term contracts is approximately 70:30. However, the importance of these short-term contracts is still high, due to uncalculatable impacts on the availability of products. The aim of the Marketplace App described here should therefore enable the offering of products within a network of known suppliers and customers that know each other together with the product quality information available. The marketplace is therefore not only the management of the transaction itself, but also can include buying product information for the offered product as an additional item, or provide the product quality information right away together with the product offer. The App filters product offers according to specific product requirements (e.g. packaging in RTI boxes + pesticide level under 70% of the legal allowed borders) and provides matching product offers to the user.

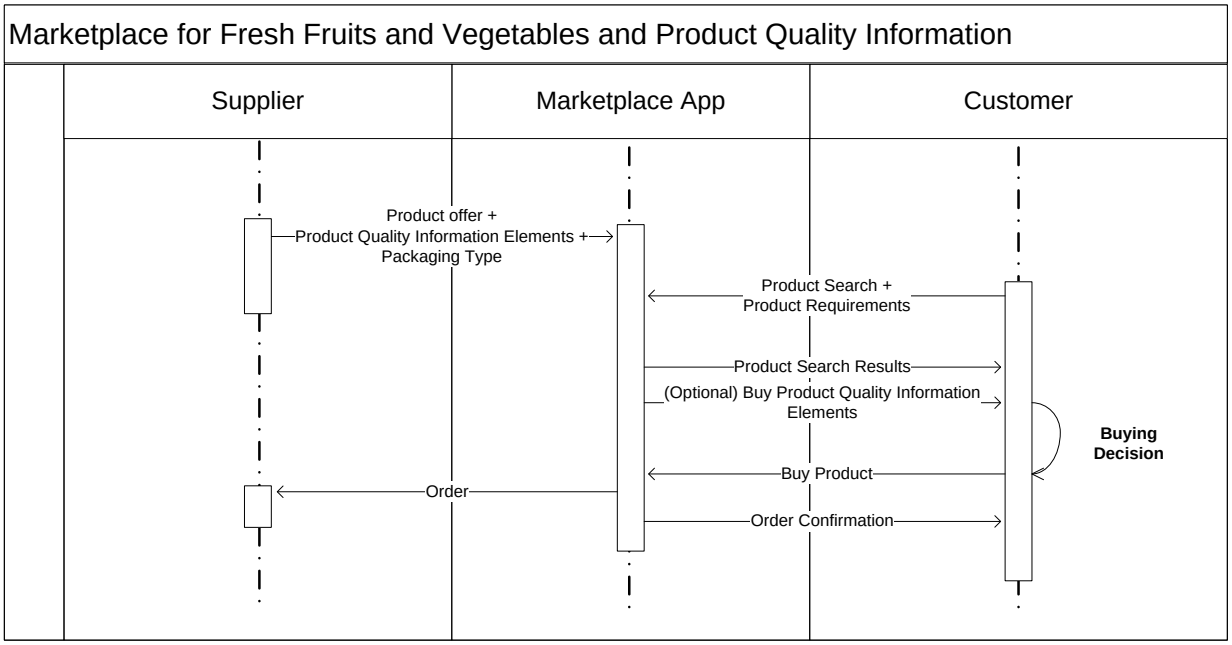



Figure B8-1: FFV Marketplace App

### 6.2.4.3 Technical Requirements

**Aggregating a batch, assigning an ID & data**

| | |
|---|---|
| **Name** | FFV-01-01 – Aggregating a batch, assigning an ID & data |
| **Description** | The FIspace app shall support the virtualisation of the delivery, the unique identification of the delivery (or parts of it), and finally assigning product data as well as results from laboratory analysis that shall be published to customers. |
| **Actors** | Outgoing goods department |
| **Assumptions** | The request for produce, the offer and finally the order are managed within the existing systems, building on the existing business relations. Also the product details and the laboratory analysis are stored and provided by existing systems or by the product related documentation received from suppliers. |
| **Steps to be supported** | • The user starts the app with its log in and accesses a personalised user interface in relation to the organisation and starting with the view on the latest deliveries with a status (e.g. not started, in work, batch completed, finalised). This view could list all deliveries, deliveries assigned to a specific place (e.g. warehouse gate 5) or to a specific employee.<br>• For each new delivery that is selected to be picked, the user itself or the FIspace platform generates an ID that is unique in combination with the identification of the organisation (e.g. GLN).<br>• The user selects a delivery to be worked on and assigns those unique IDs (e.g. crate numbers, pallet IDs, incoming batch/delivery numbers) that were used for internal traceability.<br>• Available product data and laboratory analysis results are assigned to the delivery or parts of it.<br>• As soon as the picking is finalised, the user can change the status (i.e. from “in work” to “batch completed”).<br>• The FIspace platform instantiates a virtual representation of the batch/ delivery in the platform. |
| **Non-functional** | It need to be further clarified if apps that shall be used in a warehouse environment need to be able to run on specific hardware (e.g. IP65 compatible) or if the usage of e.g. Android based tablets is also possible.<br>Usage of a web-browser as tool to access user interfaces.<br>Interfacing with existing systems to import existing data (e.g. delivery details, product data, laboratory analysis). Generally several actors are generating a delivery note, based on the DESADV standard.<br>There might be k:n:m relations between orders, deliveries and sites of the organisations (when using the GLN, it enables the identification of the company and different location references of the company, like several super markets and distribution centres of a retailer). |
| **Issues** | Assuring continuous connection to the FIspace platform that is hosted in the Internet from a warehouse environment (e.g. at a trader or distribution centre) or at the farm in case the farmer is picking a delivery for the trader. |

**Check for required reaction**

| | |
|---|---|
| **Name** | FFV-02-01 Check for required reaction |
| **Description** | The feedback provided by customers is analysed according to specific rules. As soon as a situation arises that might have an impact on future deliveries, related reactions are initiated to avoid negative feedback/ issues with the same or other customers. |
| **Actors** | Quality Assurance |
| **Assumptions** | This task is considered as a background task and should allow the automatic analysis of feedback provided. Analysis results would be relevant for specific future deliveries or could cause generic improvements to be initiated. |
| **Steps to be supported** | • The user can define rules for analysing the quality feedback.<br>• Rules are listed and can be further edited/ deleted.<br>• Based on the rules and interest for feedback, all relevant customers are notified in relation to the supplied deliveries that the supplier would like to receive the feedback.<br>• As soon as an issue arises, the user will be notified to further investigate the feedback and analysis results.<br>• The user can directly identify batches from incoming/outgoing deliveries that might be concerned and specify an explicit measure that shall be taken into account. This is only relevant if there are still parts of deliveries in the organisation that could be forwarded to customers.<br>• Generic improvements are also tracked.<br>• Reactions/improvements are also stored and the related root/cause relation to the customer quality feedback is stored to enable the proposal of potential improvement measures in similar future cases. |
| **Non-functional** | A data model needs to be developed that could be used to gather quality assessment feedback as well as enable the analysis of the feedback.<br>Data shall be archived or deleted as soon as the analysis is carried out. |
| **Issues** | It might be difficult to automatically analyse qualitative and not structured feedback from customers.<br>It shall be further discussed if it makes sense that the customer also indicates events of problems that shall be anyway analysed by the supplier. |

**Mapping data from incoming batch to the current delivery**

| | |
|---|---|
| **Name** | FFV-03-01 – Mapping data from incoming batch to the current delivery |
| **Description** | It needs to be checked if there is information available from own suppliers and if it is of use to make it available to own customers. To enable this, the mapping of incoming and outgoing goods needs to be made. |
| **Actors** | Outgoing goods department |
| **Assumptions** | The organisation needs to maintain an internal traceability process that allows in the internal handling or processing to map a produce to the initially incoming deliveries. The aggregation level could vary in accordance to the overall business requirements.<br>In the FFV trial, generally the smallest group of objects are packed products in a crate that is uniquely identified. However, identification alternatives are the usage of pallet IDs, deliveries or other batches, like the mapping of one type of produce that was delivered at one day by explicitly identified farmers. Subsequently, e.g. a batch of apples would be mapped to some 5 farmers that delivered the same type during one day to the trader.<br>Such internal mappings might be supported by ICT systems or by simple paper based solutions. |
| **Steps to be supported** | • The user can select the produce type or types that is/are aggregated in a delivery.<br>• The app is offering a selection of uniquely identified deliveries from suppliers that would be relevant.<br>• Based on the internal traceability (based e.g. on labels on boxes and pallets), the user is mapping a part or the overall delivery to the outgoing products (i.e. to the overall delivery or a part of it).<br>• Finally the FIspace platform adds the relation to information of other chain actors to the virtual representation of the batch/ delivery in the platform. |
| **Non-functional** | Due to the time constraints in real world processes, the user expects a direct response from the app and an interaction in real-time. |
| **Issues** | On the one hand, the amounts of incoming and outgoing goods are tracked in the organisation and especially in their order management systems. However, it could be tricky to track the specific amounts arriving and leaving via the app. Therefore, it might be problematic to provide the appropriate selection of incoming deliveries that could be selected for mapping to the outgoing delivery.<br>Usage of explicit IDs might help that are forwarded/updated throughout the internal processes that can be scanned or type in the app for the mapping. |

**Define access rights for recipients/ customers**

| | |
|---|---|
| **Name** | FFV-04-01 Define access rights by recipients/ customers |
| **Description** | The supplier of the produce shall be enabled to define the access rights for all the data that is provided to its customers. |
| **Actors** | Quality Assurance // Sales // Outgoing goods department (to be clarified in detail) |
| **Assumptions** | At the moment of preparing the delivery, the supplier as owner of the produce is the only authority that can decide on access rights that are granted to external parties.<br>Some information items need to be provided as defined by law (e.g. type of produce, origin, commercial category) and must not be hided by an information system.<br>The interest is to provide the information as an added value service that is coupled to certain agreements, rules and benefits.<br>The overall information (i.e. the content) shall be stored decentralised, only sharing the links to the data.<br>Third party business relationships (i.e. business interaction graphs within the chain/ overall supply network) with other third parties must not be presented to a FIspace users, since this would reveal the business interactions of suppliers, customers, competitors and could result in a severe reluctance to adopt the FIspace platform. Already the pure existence of this data in the platform could be considered as a threatening factor by potential platform users.<br>There might be the need to mask the initial origin of available information, presenting the content (e.g. product, transaction and laboratory analysis data) but not to reveal the identity of the supplier's supplier. |
| **Steps to be supported** | • The quality assurance is defining and generating standard data sets and possibly with sub-sets in relation to the products that are sold by the organisation.<br>• The data sets can be changed and deleted.<br>• Customer profiles can be generated, changed and deleted. The profiles are determining generic data access rights for the specific customer (i.e. including transport and RTI providers).<br>• The data access shall be basically assigned as determined by the general data access profiles per customer.<br>• Due to specific reasons, the sales or even the warehouse management can overrule the generic rules and specifically allow another setting of access right in relation to a specific order/ delivery.<br>• Due to specific situations like a food crisis, also additional information might be revealed that were initially not available by customers.<br>• The availability of added-value information might be a matter for negotiating specific service level agreements and might require generic payments or payments by use.<br>• Finally, the data access rights by the customers can be displayed for each delivery and in relation to the specific produce. |
| **Non-functional** | The protection of business relevant data must be fully supported and any unauthorised access must be denied.<br>The implicit disclosure of data must be avoided that is not intended to be revealed to third parties (e.g. masking addresses via proxy that would reveal the data origin).<br>Only authenticated and trusted users shall have access to data.<br>Any business relevant and sensitive data must be stored in an encrypted form, minimising the risks in cases of unauthorised access. |
| **Issues** | Masking of IP addresses and URIs when storing data decentralised at those actors that generated the data might impose a challenge to assure anonymity.<br>Available business relation data (e.g. like interaction graphs in a business network) could jeopardise competitiveness of actors and could cause non-acceptance of the |

| | |
|---|---|
| | platform by business users. |

**Initiating transport and RTI clearance**

| | |
|---|---|
| **Name** | FFV-05-01 Initiating transport and RTI clearance |
| **Description** | The transport organisation is informed about the data that shall be tracked during transport or being provided to the supplier and/or customer. The start of transport is communicated and the amount of sent RTIs is forwarded. |
| **Actors** | Outgoing goods department |
| **Assumptions** | The usage of specific transport providers can dynamically change.<br>The RTI providers are an accompanying partner in the supply chain that are generally providing their RTIs to the farmers and collecting it from retailers.<br>RTI usage is paid by first supply chain actors as a rental fee. On top of that, a deposit is paid to the RTI provide to cover loss of RTIs. |
| **Steps to be supported** | • The delivery is assigned to the specific transport provider. After loading the shipment, the start of transport is indicated by the outgoing goods department.<br>• The user at the transport provider can subscribe for a specific delivery, enabling the individual user to publish relevant information to the supplier as well as to the customer.<br>• The number and type of RTI that left the supplier are tracked. |
| **Non-functional** | The user interface that shall be used by the transport provider must not require specific hardware, but a mobile device with a web browser.<br>In cases a transport provider needs not to further collaborate with the other business partners, it shall be investigated if the user needs to explicitly register on the platform at all or could use a kind of one-time access that directly expires after delivering the shipment. |
| **Issues** | Dynamic change of transport providers and required training for the usage of the app as well as of the FIspace platform.<br>It might happen that a transport provider carries multiple shipments on one transport vehicle. The app must allow such multiple assignments and monitoring with different user access rights as well as underlying data sets that are used. |

**Clearance of RTI movements**

| | |
|---|---|
| **Name** | FFV-06-01 Clearance of RTI movements |
| **Description** | The movement of RTIs along the chain are monitored and the required payments with respect to the deposits are identified. |
| **Actors** | RTI provider clearing |
| **Assumptions** | The RTI provider asks for a rental fee and a deposit when providing the RTI. To not overburden the initial actor in the chain with paying all the deposits even when the RTI already left the actor, the clearance is done. Each actor in the supply chain/ network shall only owe that amount of deposits to the RTI provider that is equal to the number and type that are currently owned by the actor. Therefore, the change in RTI possession is regularly balanced in collaboration between the RTI provider and the actors.<br>After handing over the delivery to the transport provider, it is “finalised” for the supplying organisation. |
| **Steps to be supported** | • The RTI movements from the actors in the supply chain/ network are compiled and can be listed for individual actors in the chain. The movements are presented on a daily basis, accumulating the amounts of RTI in relation to their type.<br>• The actual number of RTIs and their type that are in possession of an actor is consolidated on a daily basis. The RTI provider as well as actors in the chain can access the overview.<br>• The increase or decrease of RTIs per type is calculated on a daily basis.<br>• The RTI type specific deposit can be edited and a basic amount of RTIs that need not to be reimbursed at an actor can be defined per organisation/site.<br>• The payment streams are calculated and can be communicated to the RTI provider’s customers covering customisable periods. |
| **Non-functional** | All reported movement data is logged and can be archived to assure the appropriate documentation for billing purposes. |
| **Issues** | Compatibility of the approach to the business models of different RTI providers (e.g. EuroPoolSystem in FFV or ContainerCentralen in FP trial) |

**Transport and tracking of dynamic information**

| | |
|---|---|
| **Name** | FFV-07-01 Transport and tracking of dynamic information |
| **Description** | The transport provider is enabled to track and publish relevant information to the supplier and customer. |
| **Actors** | Transport provider // Truck driver |
| **Assumptions** | The transport providers are offering quite heterogeneous abilities to monitor and track relevant data and events. A most simple scenario assumes the usage of an internet enabled device via the web browser. A more complex scenario could integrate the legacy system of the transport provider that is already monitoring and tracking relevant data and events.<br>Operational solutions for data monitoring would need the integration with IoT or legacy systems at the transport provider side.<br>In the FFV pilot, especially publishing of events like deviations and estimated arrival times are of relevance.<br>On a longer term also monitoring data could be added to the product data. This needs to be further harmonised with the Flower and plants trial. |
| **Steps to be supported** | • The user is overtaking a delivery from a supplier, defining the information to be monitored and tracked.<br>• The transport provider can add additional data to the overall shipment that is provided by the supplier (e.g. temperature measurements), publish events that are of interest for the supplier or customer (e.g. departure, estimated arrival, delay, breakdown) as well as modify specific data that need to be accumulated over the lifetime of a produce (e.g. food miles).<br>• The supplier as well as the customer can subscribe to the monitored and tracked information as well as identify the related communication channels and contact persons. |
| **Non-functional** | The user interface that shall be used by the transport provider must not require specific hardware, but a mobile device with a web browser.<br>In cases a transport provider needs not to further collaborate with the other business partners, it shall be investigated if the user needs to explicitly register on the platform at all or could use a kind of one-time access that directly expires after delivering the shipment. |
| **Issues** | Availability, access and costs of mobile Internet, especially in international transport scenarios. |

**Identification and Checking of incoming goods**

| | |
|---|---|
| **Name** | FFV-08-01 Identification and Checking of incoming goods |
| **Description** | The incoming delivery is uniquely registered and checked as prerequisite for the internal processing in the organisation. |
| **Actors** | Incoming Goods Department |
| **Assumptions** | The request for produce, the offer and finally the order are managed within the existing systems, building on the existing business relations. The product details and transaction data is stored and provided by existing systems or by the product related documentation received from suppliers. |
| **Steps to be supported** | • The user starts the app with its log in and accesses a personalised user interface in relation to the organisation and starting with the view on the current deliveries that need to be registered and checked. This view could list all deliveries, deliveries assigned to a specific place (e.g. warehouse gate 5) or to a specific employee.<br>• For each arriving delivery, the user itself or the FIspace platform generates an ID that is unique in combination with the identification of the organisation (e.g. GLN).<br>• The user selects a delivery to be worked on and assigns the unique IDs (e.g. crate numbers, pallet IDs, incoming batch/delivery numbers) that shall be used for internal traceability.<br>• The amount and type of received RTIs is checked and confirmed or updated accordingly.<br>• The available product related data from the supplier can be accessed, if required e.g. for the quality assessment.<br>• The quality assessment is carried out and it is identified which information shall be provided to the supplier.<br>• As soon as the reception is finalised, the user can change the status (i.e. from “arrived” to “checked”).<br>• The FIspace platform changes the ownership with respect to the delivery and its elements. |
| **Non-functional** | It need to be further clarified if apps that shall be used in a warehouse environment need to be able to run on specific hardware (e.g. IP65 compatible) or if the usage of e.g. Android based tablets is also possible.<br>Usage of a web-browser as tool to access user interfaces.<br>Interfacing with existing systems to import existing data (e.g. delivery details, product data, laboratory analysis). Generally several actors are generating a delivery note, based on the DESADV standard.<br>There might be k:n:m relations between orders, deliveries and sites of the organisations (when using the GLN, it enables the identification of the company and different location references of the company, like several super markets and distribution centres of a retailer). |
| **Issues** | Assuring continuous connection to the FIspace platform that is hosted in the Internet from a warehouse environment (e.g. at a trader or distribution centre). |

**Handling of Deviations**

| | |
|---|---|
| **Name** | FFV-09-01 Handling of Deviations |
| **Description** | Using the results of the incoming goods check and the data delivered by the supplier it is decided, if a deviation needs to be handled. |
| **Actors** | Quality Assurance |
| **Assumptions** | The FFV supply chain is relatively short and the overall life-cycle duration from farm to fork can only be some days. Laboratory analysis might only be available after the produce was already received. As soon as any additional information is available, the quality assurance needs to check if there is any deviation. |
| **Steps to be supported** | • The user can define rules for analysing available data.<br>• Rules are listed and can be further edited/ deleted.<br>• As far as possible, the rules are processed automatically for the deliveries.<br>• As soon as an issue arises, the user will be notified to further investigate issue.<br>• The user can directly identify batches from incoming/outgoing deliveries that might be concerned and specify an explicit measure that shall be taken into account. This is only relevant if there are still parts of deliveries in the organisation that could be forwarded to customers.<br>• Reactions/improvements are also stored and the related root/cause relation to the customer quality feedback is stored to enable the proposal of potential improvement measures in similar future cases. |
| **Non-functional** | A data model needs to be developed that could be used to specify rules and identify deviations.<br>Data shall be archived to document the reactions. |
| **Issues** | Certain actors are already using approaches/ systems for handling deviations. Those need to be taken into account accordingly. |

**Internal processing & handling, maintaining batch relation**

| | |
|---|---|
| **Name** | FFV-10-01 Internal processing & handling, maintaining batch relation |
| **Description** | The mapping of incoming deliveries, unique identification, supplier relation and related product information can be accessed at any time. |
| **Actors** | Warehouse management |
| **Assumptions** | The internal processing and handling is very specific for each entity in the supply chain. Each organisation has to internally assure this procedure. Hence those basic tracking processes are not supported by the app. However, the initial generated identification of the arrived goods can be used to access the related product information. |
| **Steps to be supported** | • Entering an ID via a user interface/scanner that will list one or a selection of received deliveries.<br>• Available product information can be accessed. |
| **Non-functional** | To be clarified |
| **Issues** | The aggregation as well as disaggregation of deliveries imposes quite complex demands on traceability measures. Especially the generation of aggregated batched can destroy the 1-to-1 traceability from farm to fork. |

### 6.2.4.3.1 Appendix D: Experimental Layout

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Exp. 1** | The trader checks that product and process information received from farms (or identified by initiator) fits with needs of retail. Information cluster (container) is linked with product ID and provided to retail. Provision either by a push action or for pull. | Initiator: Trader<br>Recipient: Retail | Initiator: Preferred supplier<br>Recipient: Transparency and trust | Product and process data |
| **Exp. 2** | Retail clusters information of relevance to trader and/or farms, links it to product deliveries and provides to trader/farms. Provision either by a push action or for pull. | Initiator: Retail<br>Recipient: trader/farms | Transparency and basis for process and product improvements | Product and process data |
| **Exp. 3** | Traders inform (push) RTI service about outgoing RTIs, retailer (push) informs RTI service about incoming RTIs | Initiators: Trader, Retail<br>Recipient: RTI service | Transparency in whereabouts of RTIs, efficiency in box management | Outbound and inbound of RTIs |
| **Exp. 4** | Cert service provides trader (pull) with link to cert information for integration with product and process information of deliveries that are communicated to retail (experiment 1) | Initiator: trader,<br>Participant: Cert service<br>Recipient: retail | Transparency and trust | Data from certification provider |
| **Exp. 5** | Laboratory results are added (pull) to product and process information of deliveries that are communicated to retail (experiment 1) | Initiator: Trader<br>Participant: laboratory<br>Recipient: retail | Transparency and trust | Laboratory results, ID of deliveries |
| **Exp. 6** | Trader provides retail with information on logistics of deliveries | Initiator: Trader<br>Participant: transport<br>Recipient: retail | Efficiency gain, better planning | Transportation data |
| **Exp. 7** | Laboratory results are added (pull) to product and process information of deliveries; in case of food safety deficiencies or quality deviations an immediate exception report has to be communicated to retail (experiment 1) or food safety authorities | Initiator: Trader<br>Participant: laboratory<br>Recipient: retail,<br>food safety authoritiy | Transparency and trust | Laboratory results, ID of deliveries |
| **Exp. 8** | In case of deviations in transportation agreements, transport service informs retail and trader immediately on consequences. | Initiator: transport<br>Recipient: retail<br>trader | Efficiency gain, better planning | Transportation data |

| Step | Description | Actor | Expected Outcomes | Required Inputs |
|---|---|---|---|---|
| **Exp. 9** | In case of deficiencies in supply, retail would like to get an overview on potential supplies that would meet requirements, trader provide access to their potential supplies for retail to search | Initiator and recipient: trader, retail | Efficiency gain, better planning | Data on supplies, data on needs |

FIspace

Business Collaboration