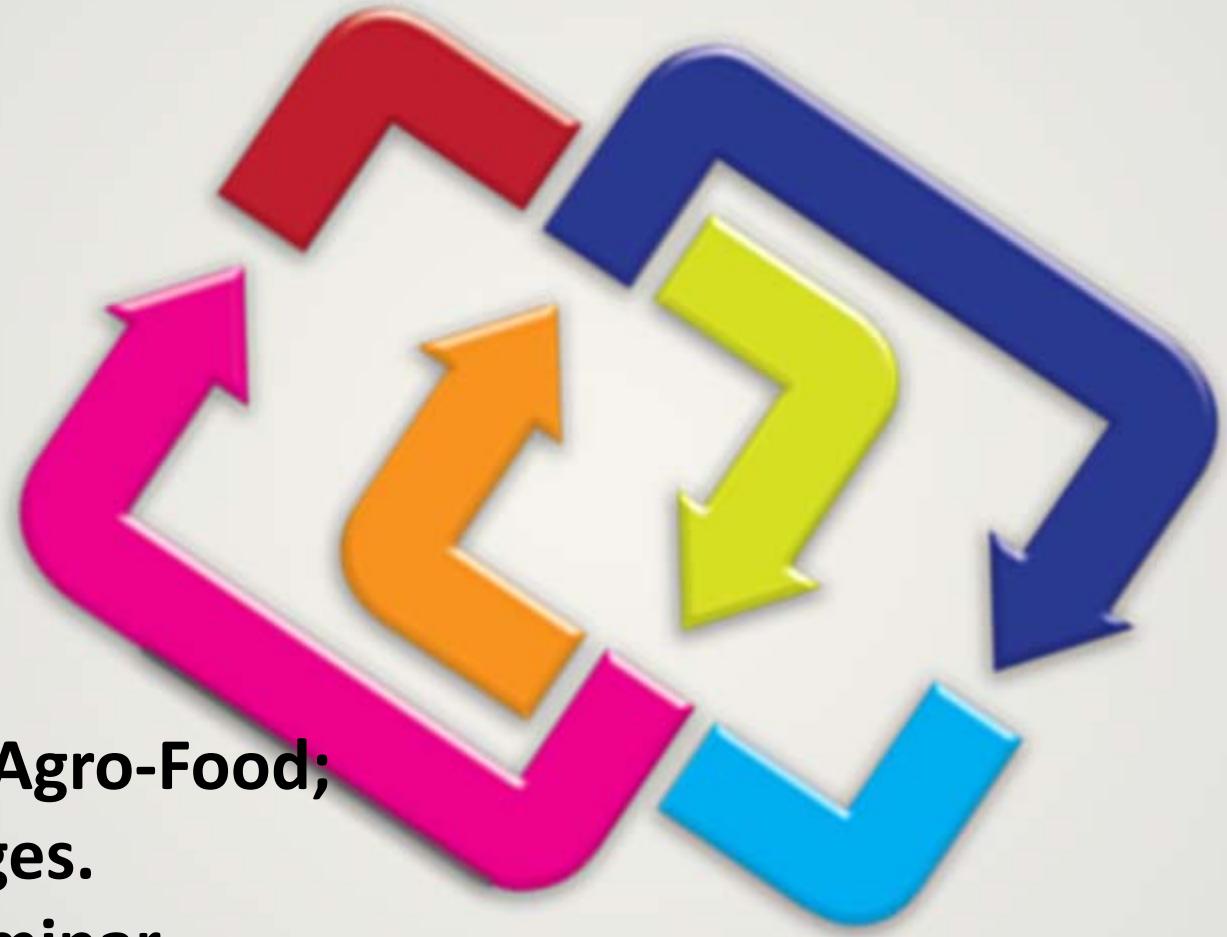

Communication in Agro-Food; Issues and Challenges. Interoperability Seminar

Groningen 26-09-013;

"**How the FIspace shall/must work!**

FIspace Business Collaboration

Prepared by :
Prof.ir. Adriaan (Adrie) J.M. Beulens
Wageningen University and LEI/DLO
September 26, 2013

Outline & Agenda

AIM of my talk is to inform about:

- Communication needs and Information Intensity of business processes and collaboration in Agro-Food Supply Chain Networks (AFSCN).
- The scope of these AFSCN. Worldwide and dynamic.
- Innovation Challenge in AFSCN to use technologies such as Future Internet, IOT, Sensors and Actuators for:
  - Specialized High Quality Products,
  - Effectiveness, Efficiency and Low Losses.
  - Customer satisfaction and transparency that can be trusted.
  - Reduction of Administrative Costs and Tasks. (E-Business, E-Government, etc.).
  - Competitiveness.
  - Sustainability.
- PPP projects that aim at helping to bring about Innovations.
- Summary and Concluding remarks.

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The Agro-Food Supply Chain Network: From Farm to Fork and beyond.

SAF,
cSpace

DAVINCI

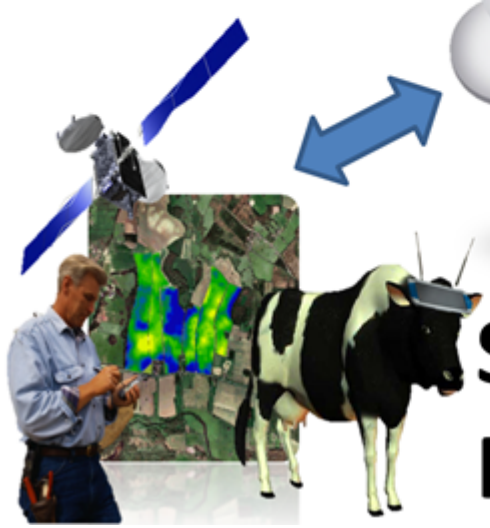
Smart Agri-Logistics and Processes

SAF,
cSpace

Future Internet

Smart Food Awareness

SAF,
cSpace
PPL



Smart Farming

Business Collaboration

AFSCN: Scope, Communication and Information Intensity

Scope, Communication and Information Intensity:

- Worldwide and dynamic sourcing of products, inputs and resources.
- Business Collaboration processes dynamic and change with the seasons (seasonal growing of crops).
- A great number of business partners. Farmers x.000.000 and y.ooo.ooo of processors and logistic server providers.
- Almost all SME's.
- Exception: Large consolidated firms at Input Side (e.g. Dow, Monsanto, John Deere, at Processor/Cooperative Side (e.g. Unilever, Friesland Campina, etc.) and Retail Side (AH, Tesco, etc.)

- **Strict legal regulations (safety and security and sustainability) to comply with.**
- **Strict quality certification requirements and schemes (BRC, IFS, etc.).**
- **Compliance with these provide for License to produce and Deliver!**

- **SME: Business, Collaboration and Reporting Processes are:**
  - Information and Communication Intensive.
  - One must be able to proof Object Integrity and the Integrity of its Digital Representations(products, resources/inputs, processes and relationships).
  - Need of Automated Processes and Interoperable Information and Communication Systems on a AFSCN scale in order to:
    - Produce Specialized High Quality Products,
    - Be Effective, Efficient and incur Low Losses.
    - Provide for Customer satisfaction and transparency that can be trusted.
    - To Reduce Administrative Costs and Tasks. (E-Business, E-Government, etc.).
    - To be Competitive and
    - Contribute to Sustainability.

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AFSCN: Scope, Communication and Information Intensity (2)

Situation in AFSCN with respect to use of ICT in brief:

- Increasing high levels of Automation in Primary and Production processes.
  (Smart farming etc., due to Technologies and Services)
- Increasing needs for interoperable systems in businesses (collaboration).
- Increasing attention for and usage of standards (GS1, UN/Cefact, Florecom, Agroconnect, EDI-Circle, ISOBUS,etc.)
- Cooperatives facilitate (?) farmers to use E-Business Systems (EDI).
- Use and Integration of standards is cumbersome and expensive. Too expensive for Farmers on their own.
- The dynamics of processes and and great number of SME's call for standards with little individual variation other than integration with own systems.
- Services Providers via Internet (connectivity problem).

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AFSCN: Scope, Communication and Information Intensity (3)

Situation in AFSCN with respect to use of ICT in brief (continued):

- Dilemma:
  - Farmers and other SME's need Interoperable Information and Communication Systems and cannot afford to develop themselves.
  - Standards are to be contributed to via Cooperatives and Standards Organizations.
  - They need help to develop 'Apps', integrate standards and services with own systems.
  - They need an Infrastructure that facilitates the development, develops and brings resources together (connects them) that can used to configure IS and Communication Systems for Collaborating Partners.
- This is a variation of the problem depicted by Fred van Blommestein).
- The (low) adoption rate of communication standards in the horticultural sector has also been described by us in 2010.
- We have been working during the last decade and more on developments that will encompass and facilitate access to standards, reference models and configuration methods and tools that will make it possible to increase adoption.

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Motivation and Impact

Agri-Food, Transport and Logistics:

- EU turnover: 1,500 billion €
- Efficiency: 148-220 billion € savings
- Sustainability: 26.5% of CO_2 emissions

Challenge: Future Internet and Technologies must and will facilitate:

- **… seamless cross-organizational collaboration** (information exchange, communication, coordination of activities)
- **…unprecedented transparency, visibility and control of processes** (using Internet-connected sensors and IoT devices)
- **…rapid, easy, low cost development and deployment of customized solutions** (apps and services)
- **…agile formation of business networks and ecosystems** (social networks and app/service markets)

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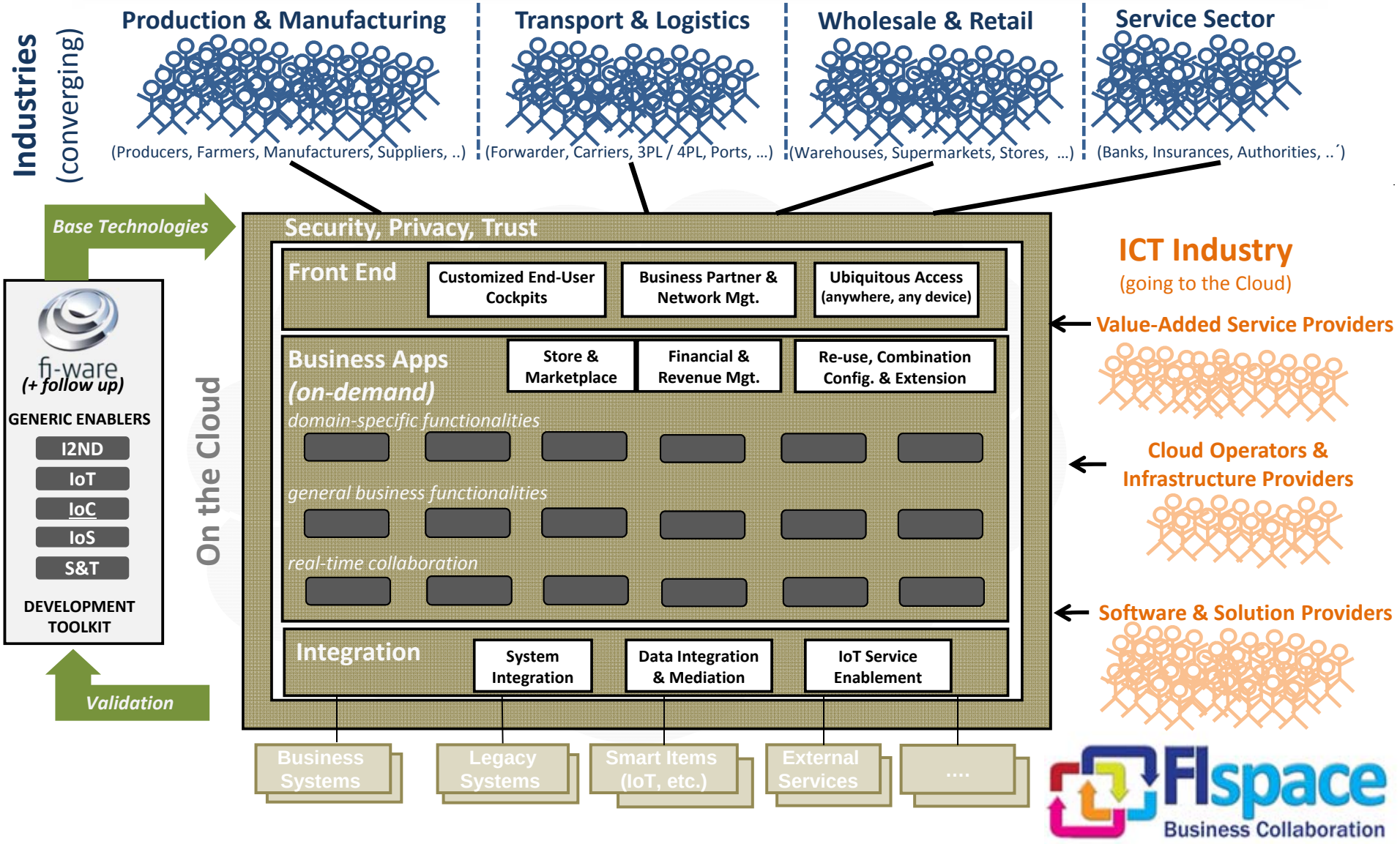
Overall Vision

A General Cloud-based Platform for Collaborative Business Networks



Examples of Business Needs

Spraying Advice

FIspace
Business Collaboration

Presenter: Prof.ir. Adrie Beulens

AFSCN: Examples of Communication and Information Intensive Business Processes

Examples of Communication and Information Intensive Business Processes:

- In difficult regulative world is crop spraying ensuring compliance of great importance. Hence Spraying advice systems.
- CQL in Flowercase.
- Crop Management for Potatoes.

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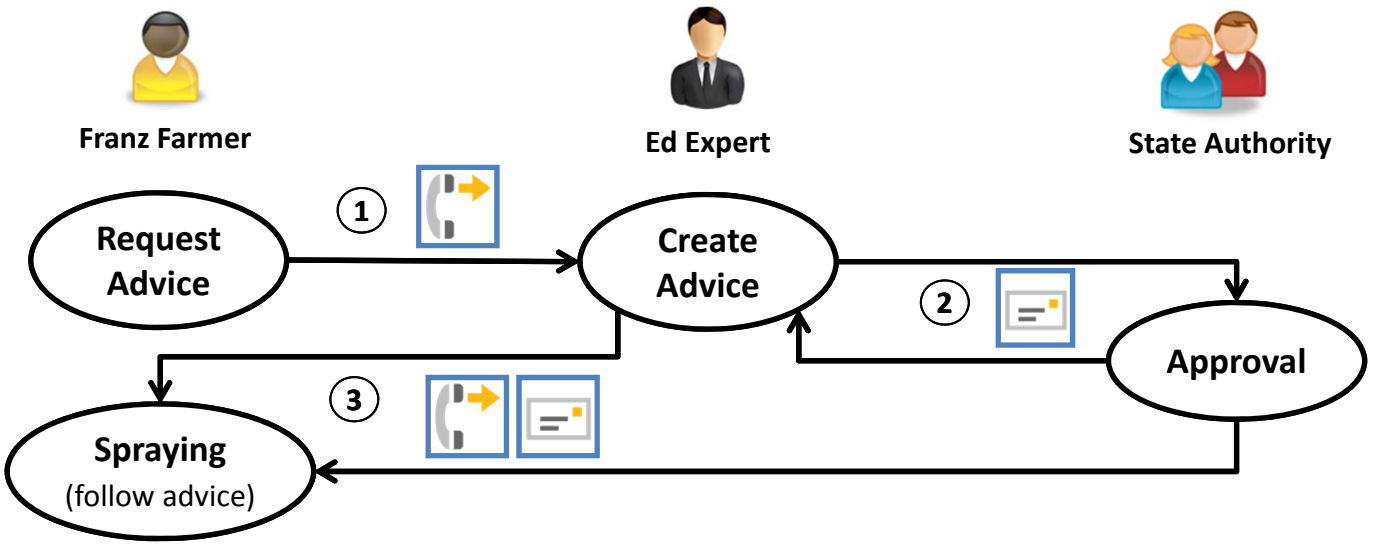
Illustrative Example: Spraying Advice

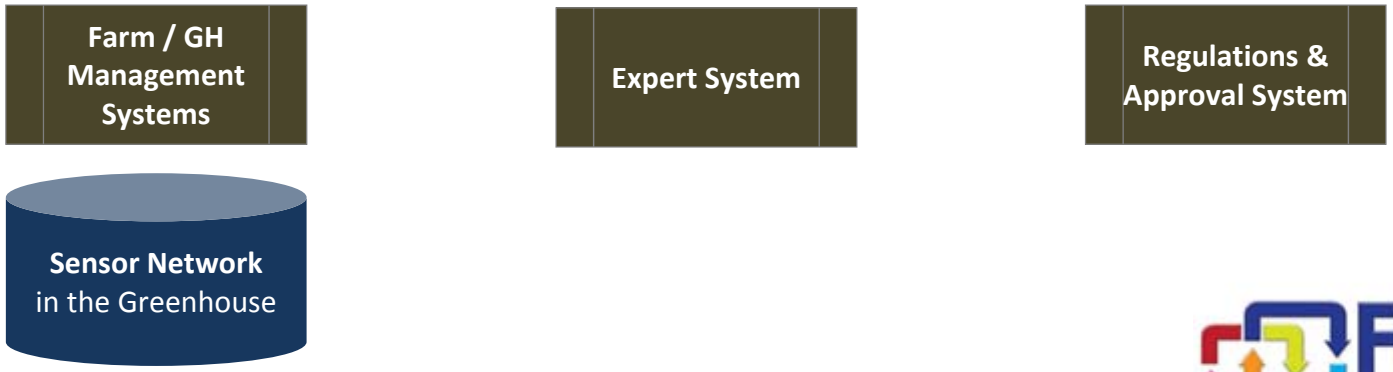
***Scenario**: get expert advice for spraying to handle disease on tomatoes*

AS IS

Collaborative Business Process



Back-End Systems



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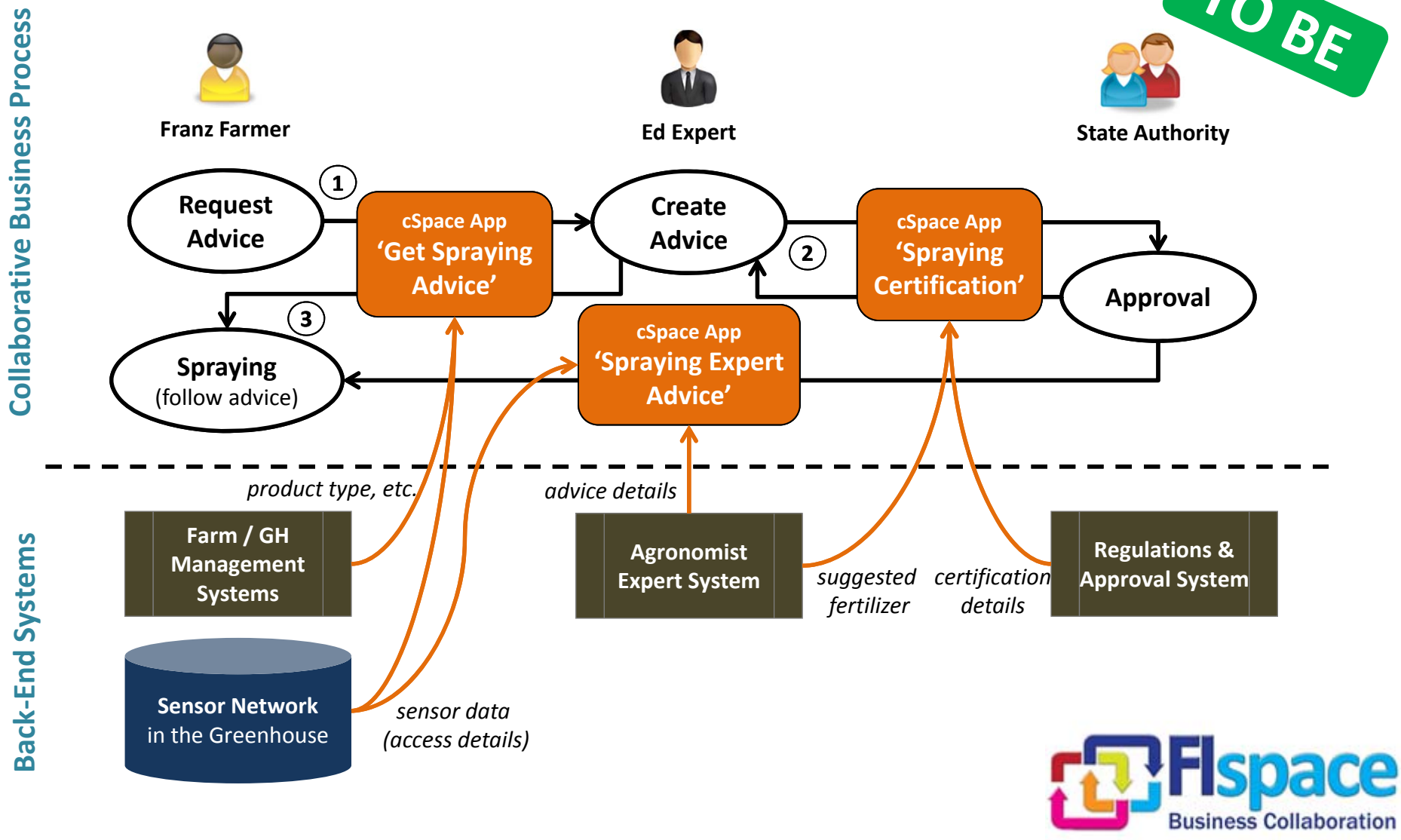
Illustrative Example: Spraying Advice

(from Kick-Off Meeting)

***Scenario**: get expert advice for spraying to handle disease on tomatoes*

TO BE



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‘Get Spraying Advice’ App (for Farmer)

initial design

My Advices (history overview): …

Request for Advice

send

Receiver: (contacts) find

Product Type: (select from list)

Description of Request:

(provide details of request)

Sensor Data: (enter link) browse

Advice & Interaction

Get Advice Details: PDF

Interaction with Advisor: send

(e.g. additional questions)

Inform Authority on Spraying: send

Rate Advice: ☆☆☆☆☆

Status Overview

request send → advice in preparation → awaiting spraying approval → advice & approval given

FIspace Business Collaboration

‘Give Spraying Advice’ App (for Expert)

initial design

My Advice Requests (overview): …

Request Details

Requester: *customer details*
<***Franz Framer***>

Product Type: *product details*
<***Tomatoes / Brandywine***>

Description of Request: *get as PDF* *print*

(details as entered by requestor)

Get Sensor Data: *access online*

- *download:* *(format)* *save*
- *import to:* *(destination)* *browse*

Advice Preparation

Short Overview: *send*

(brief description of advice)

Detailed Advice: *(documents)* *upload*

Additional Information Requests: *send*

(enter requests, e.g. additional sensor data)

Spraying Approval

Receiver: *(authority)* *find*

Approval Request Details: *send*

(brief description)

Status Overview

request received → **advice in preparation** → **awaiting spraying approval** → **advice & approval given**

FIspace Business Collaboration

The FIspace Apps (sample design)

Illustrative Example: Spraying Advice

Franz Farmer

My Advices (history overview): ...

Request for Advice send

Receiver: (contacts) find

Product Type: (select from list)

Description of Request:

(provide details of request)

Sensor Data: (enter link) browse

Advice & Interaction

Get Advice Details: PDF

Interaction with Advisor: send

(e.g. additional questions)

Inform Authority on Spraying: send

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Status Overview

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Ed Expert

My Advice Requests (overview): ...

Request Details

Requester: customer details <*Franz Framer*>

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- download: (format) save
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Short Overview: send

(brief description of advice)

Detailed Advice: (documents) upload

Additional Information Requests: send

(enter requests, e.g. additional sensor data)

Spraying Approval

Receiver: (authority) find

Approval Request Details: send

(brief description)

Status Overview

request received → advice in preparation → awaiting spraying approval → advice & approval given

State Authority

analogous ...

FIspace Business Collaboration

FIspace Operational Model

Illustrative Example: Spraying Advice

Franz Farmer

Ed Expert

State Authority

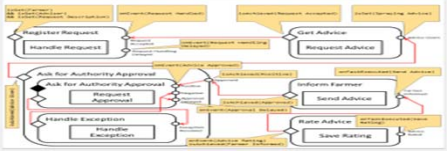
Front-End

analogous

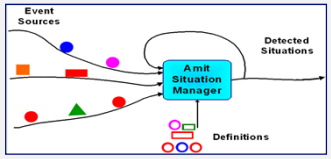
build-in features

Platform

Business Entities



Events



Access Control

User Profiles

- Notification Settings
- Access Permissions

System & Data Integration

Business & Legacy Systems Integration

Data Integration

IoT Integration

connected Systems

Farm Mgt System

Agronomist Expert System

Regulations & Approval System

Sensor Network in Greenhouse

Security-Privacy-Trust

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Example of Business Needs:
Flower Case

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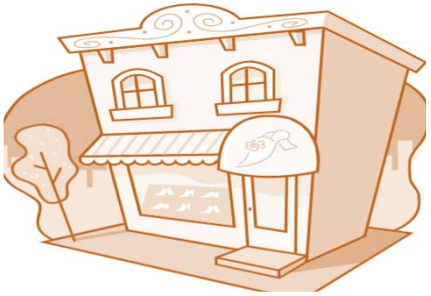
Business Collaboration

Presenter: Prof.ir. Adrie Beulens
and Dr. Cor Verwdouw.

STAKEHOLDER'S DRIVERS, GOALS AND REQUIREMENTS

Long term contracts between grower and trader

More flexible delivery moments for growers and tranporters



Store specific replenishment orders

Reduced duration of shop replenishment processes

Product specific information gathering

Real-time control product environment conditions

Most important stakeholder requirements

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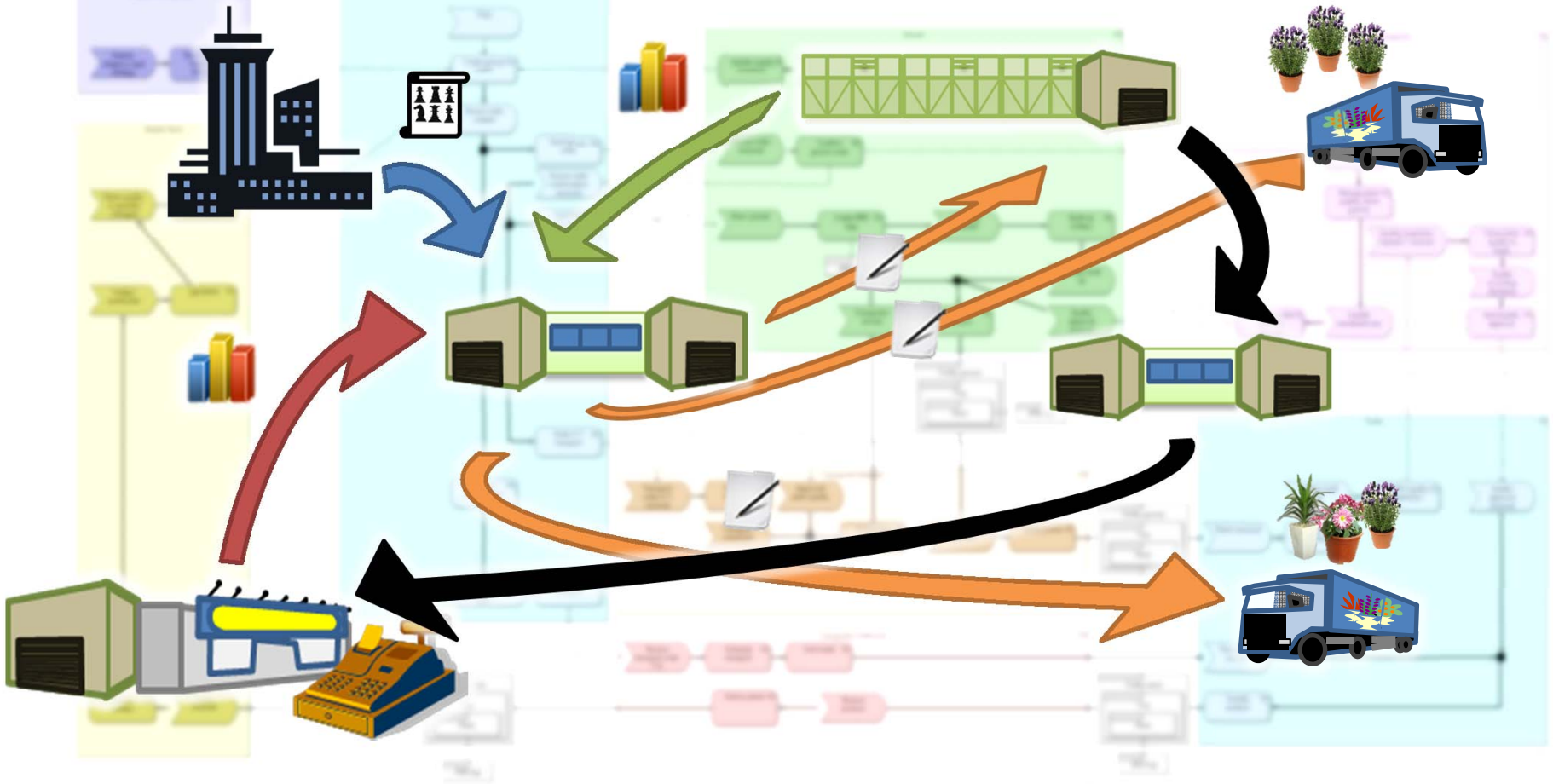
INFORMATION SYSTEM TARGET ARCHITECTURE



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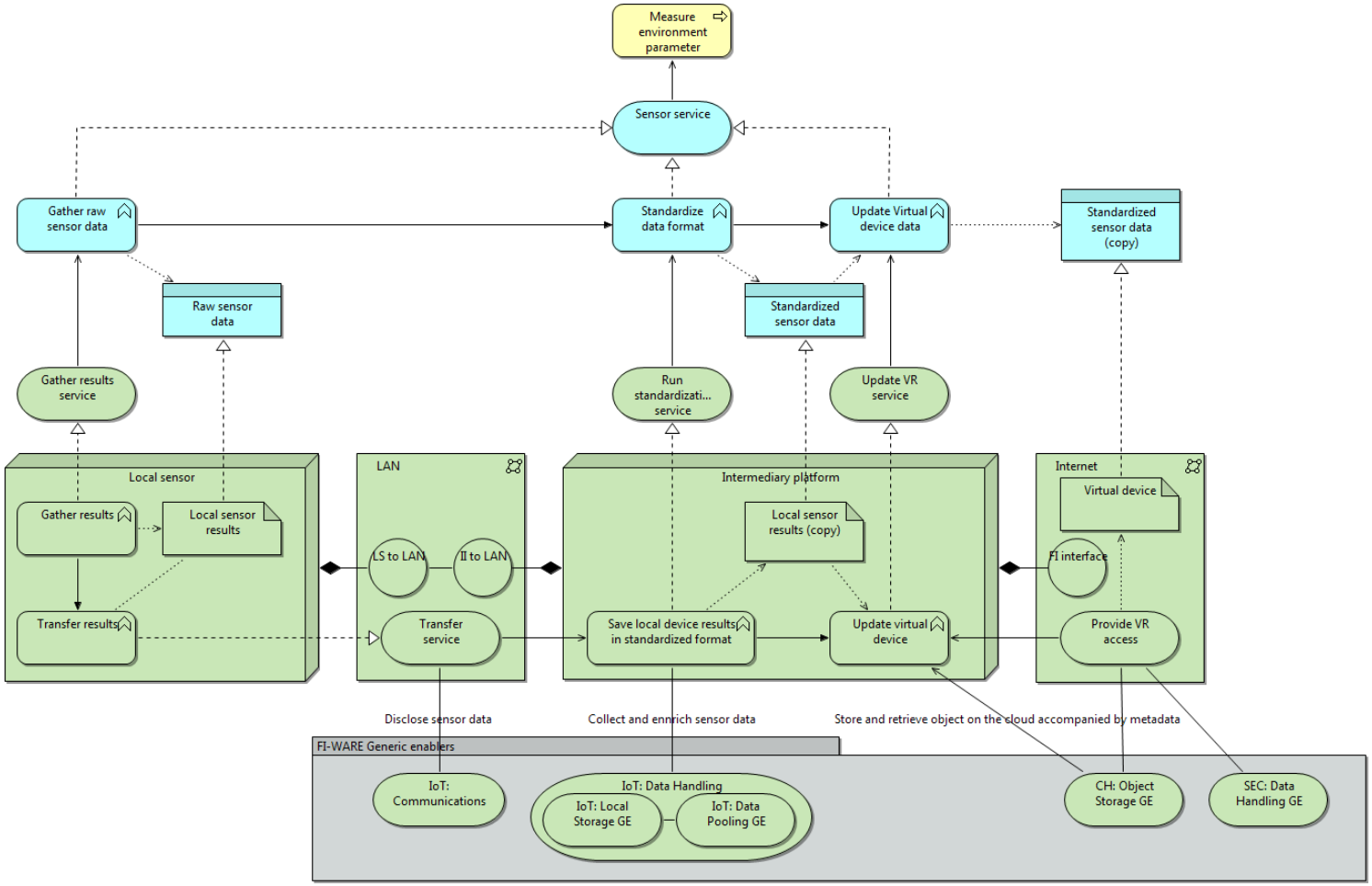
INFORMATION SYSTEM TARGET ARCHITECTURE

Business layer

Application layer

Technology layer

Link to FI-WARE GEs



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STATE OF THE ART ENABLING TECHNOLOGIES

Simulated screens to demonstrate the concept

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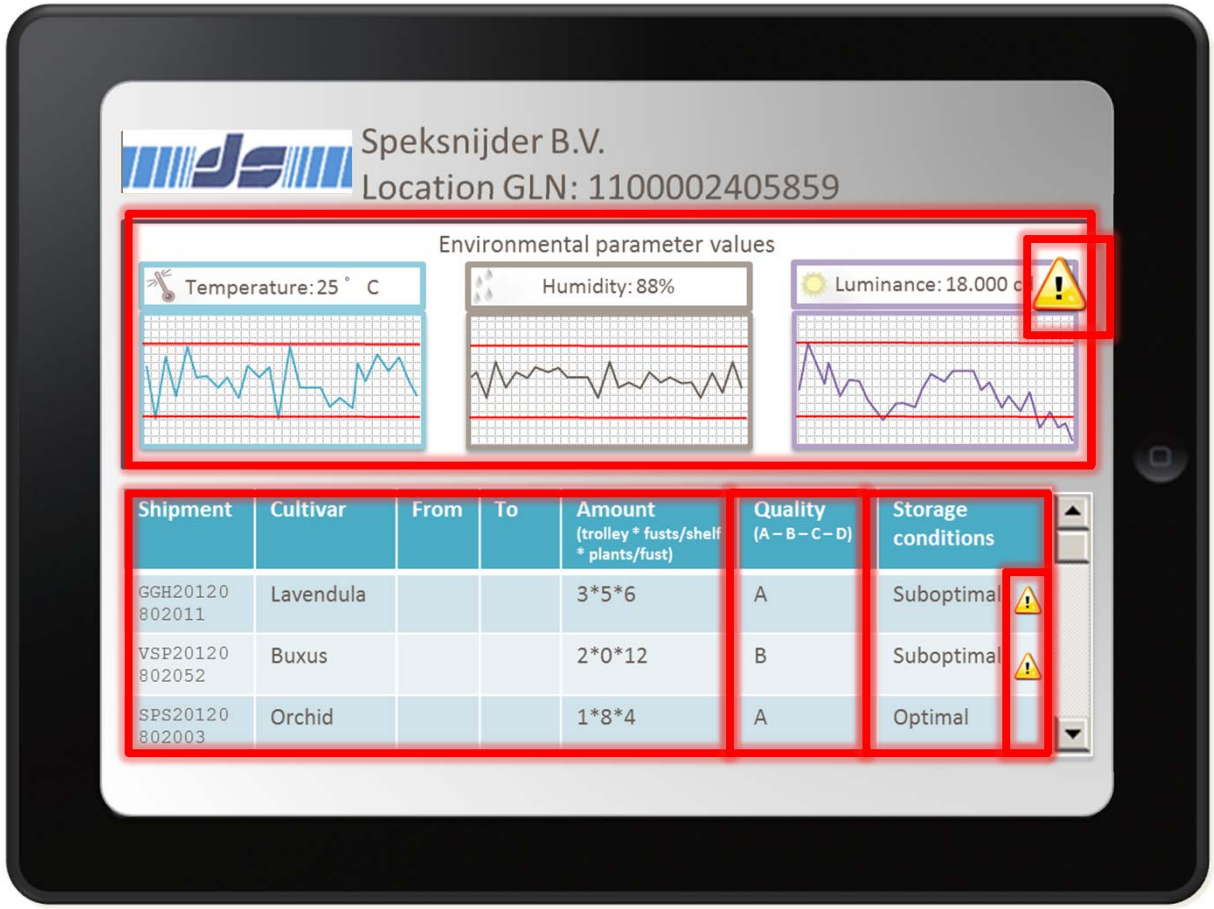
SELECTION OF PILOT COMPONENTS



- Overview of conditions
- Overview of cultivars in docking area
- Quality of cultivars
- Appropriateness of storing conditions for cultivars present
- Alarms for problem notification

Mock-up quality monitoring screen

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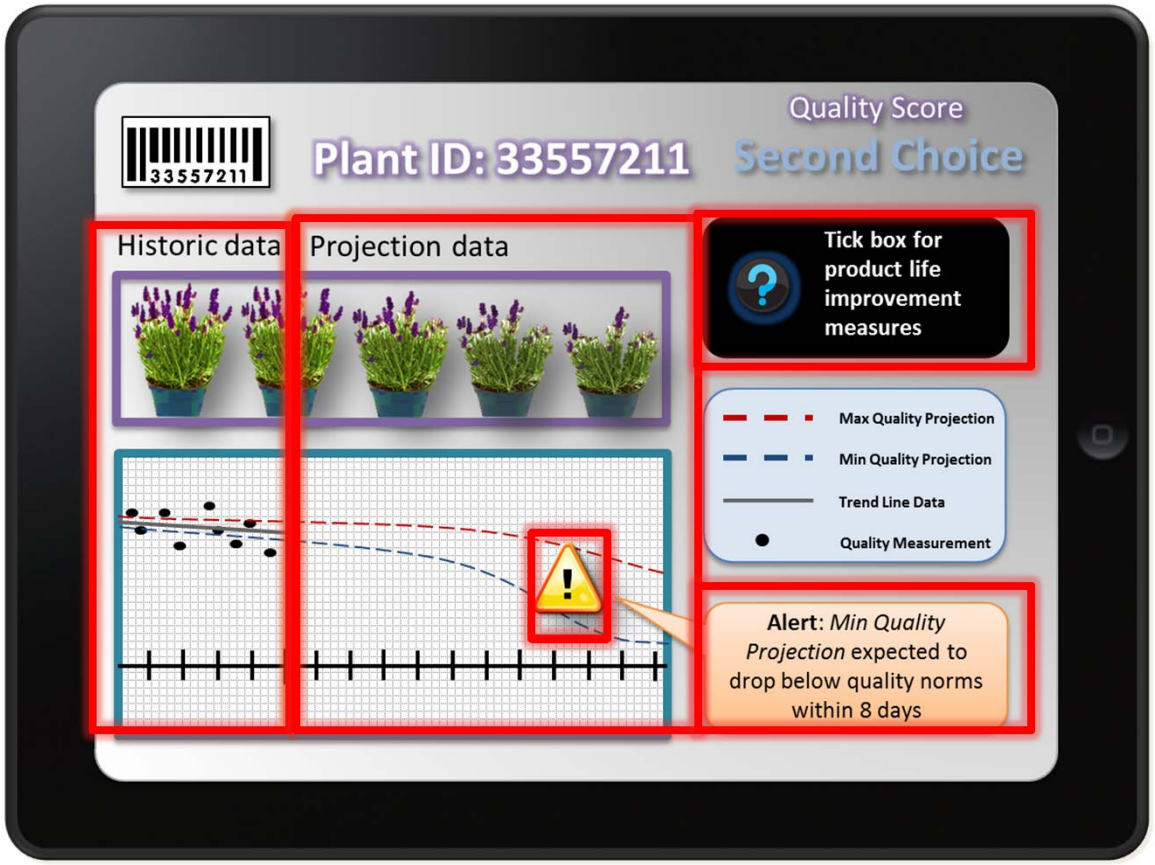
SELECTION OF PILOT COMPONENTS



- Historic quality trajectory based on measurements
- Simulated quality based on decay models
- Alarms for expected quality problems
- Advices for interventions

Mock-up quality simulation screen

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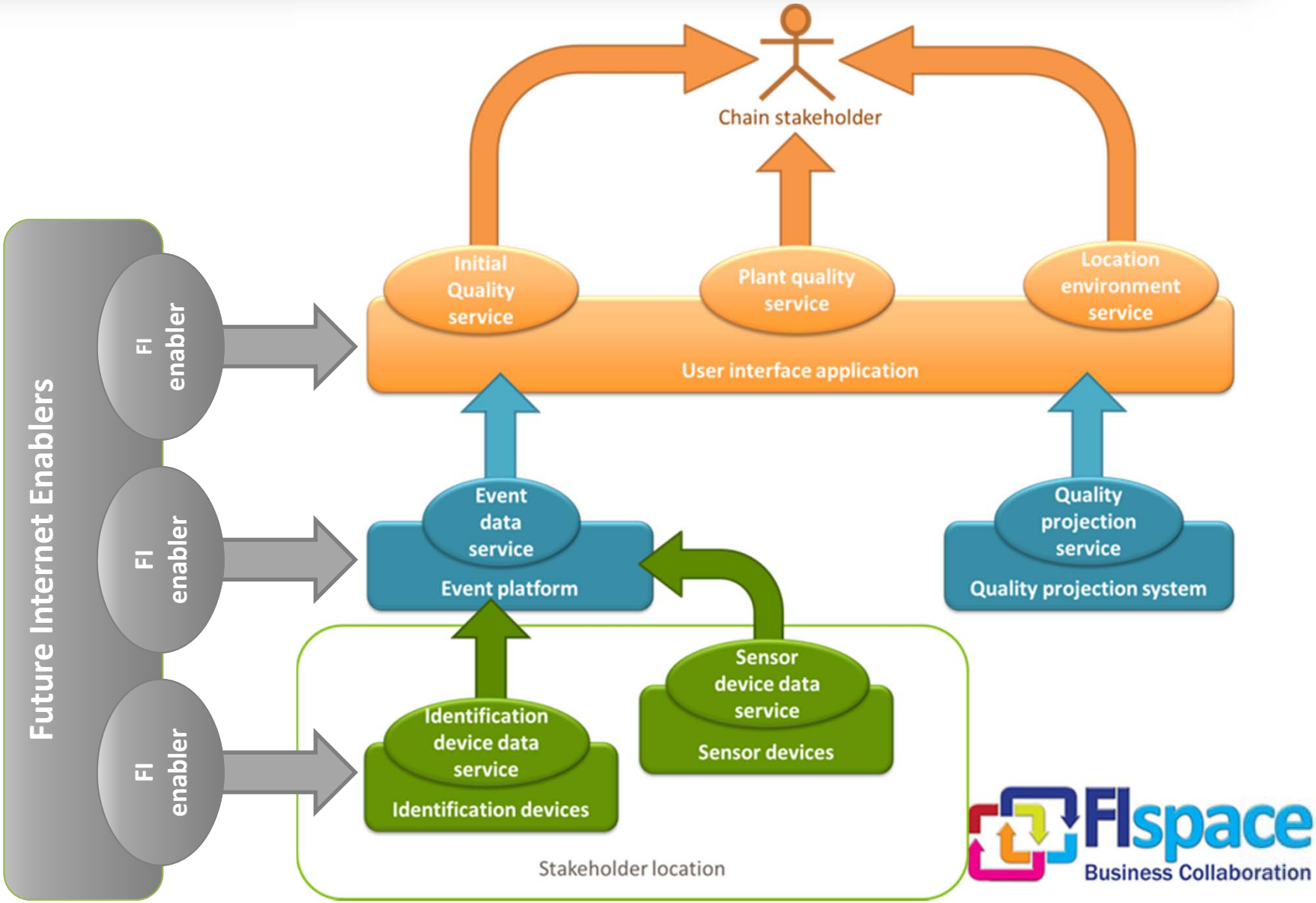
SOLUTION ARCHITECTURE



Example of Business Needs: Precision Agriculture Case

Potato Crop Man Cycle.

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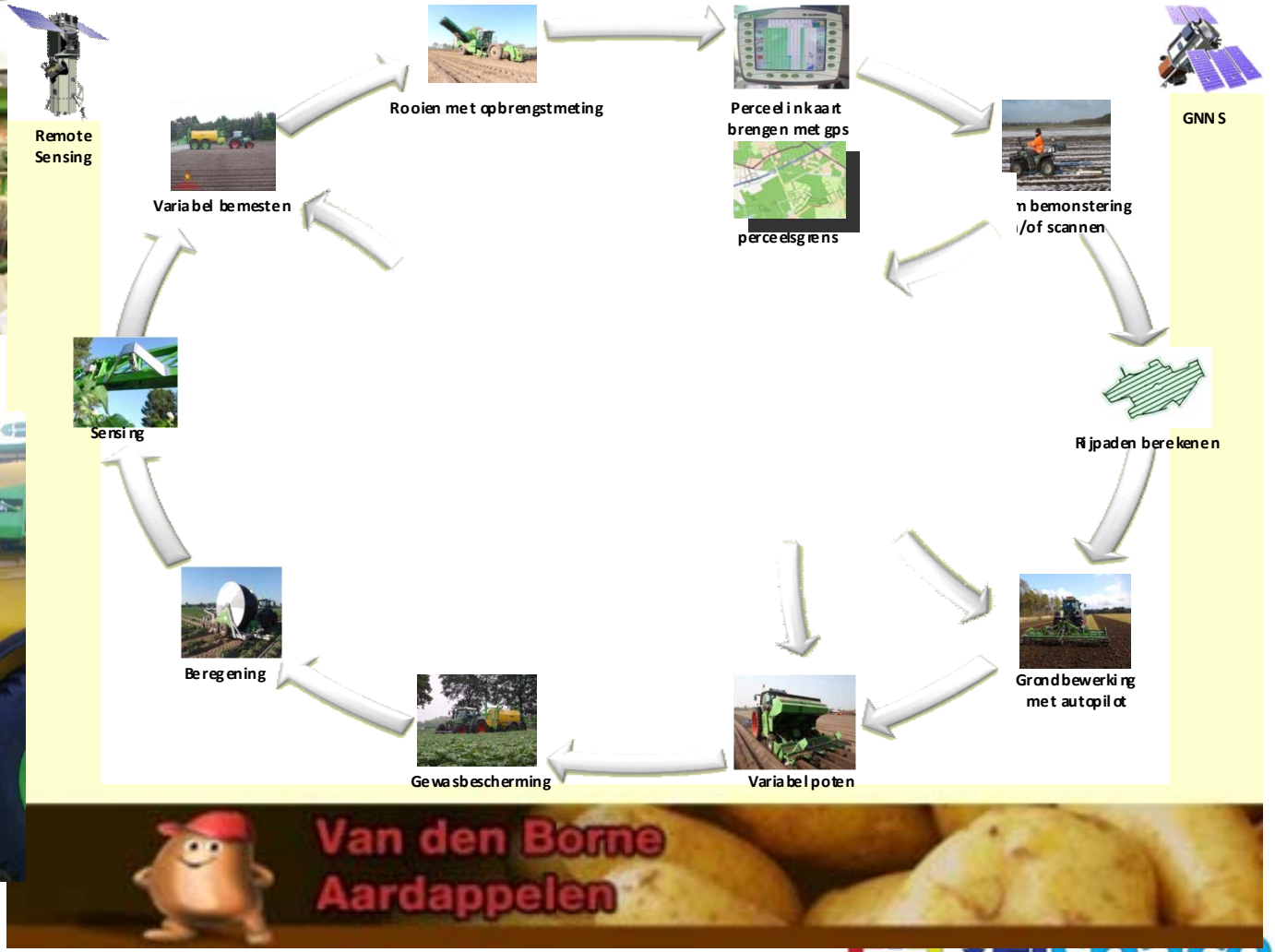
Business Collaboration

Presenter: Prof.ir. Adrie Beulens

Precision Management and control of Crop is difficult.

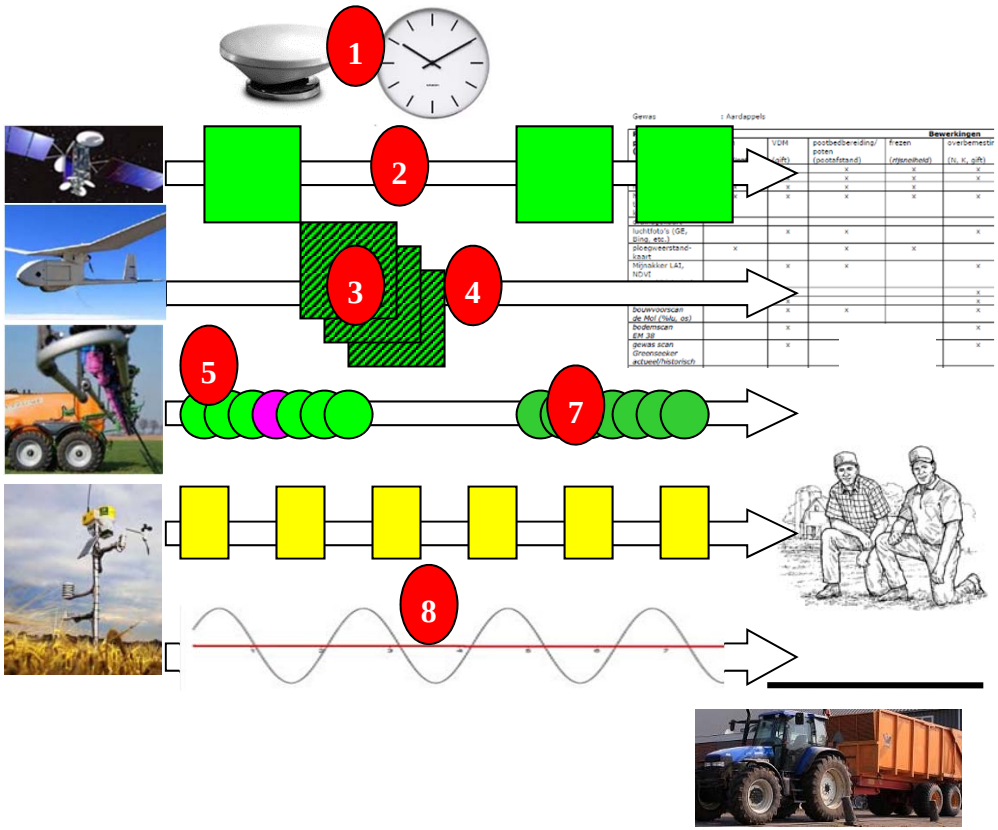


Rispace Business Collaboration

Data acquisition dimensions and ‘challenges’!

Information for Production improvement:

1. Note Time, Location (Geo) and Resource Tag.
2. Collect Satellite Images when needed and necessary.
3. Process and (filter) images.
4. Combine ‘or Fotoshop’ Images into a coherent and comprehensive Image of a percel.
5. Ensure complete overlap for area of interest and extrapolate.
6. Fix/skip unreliable Images.
7. Calibrate sensors.
8. Translate into relevant information.



After: P Paree en A Beulens, 2012

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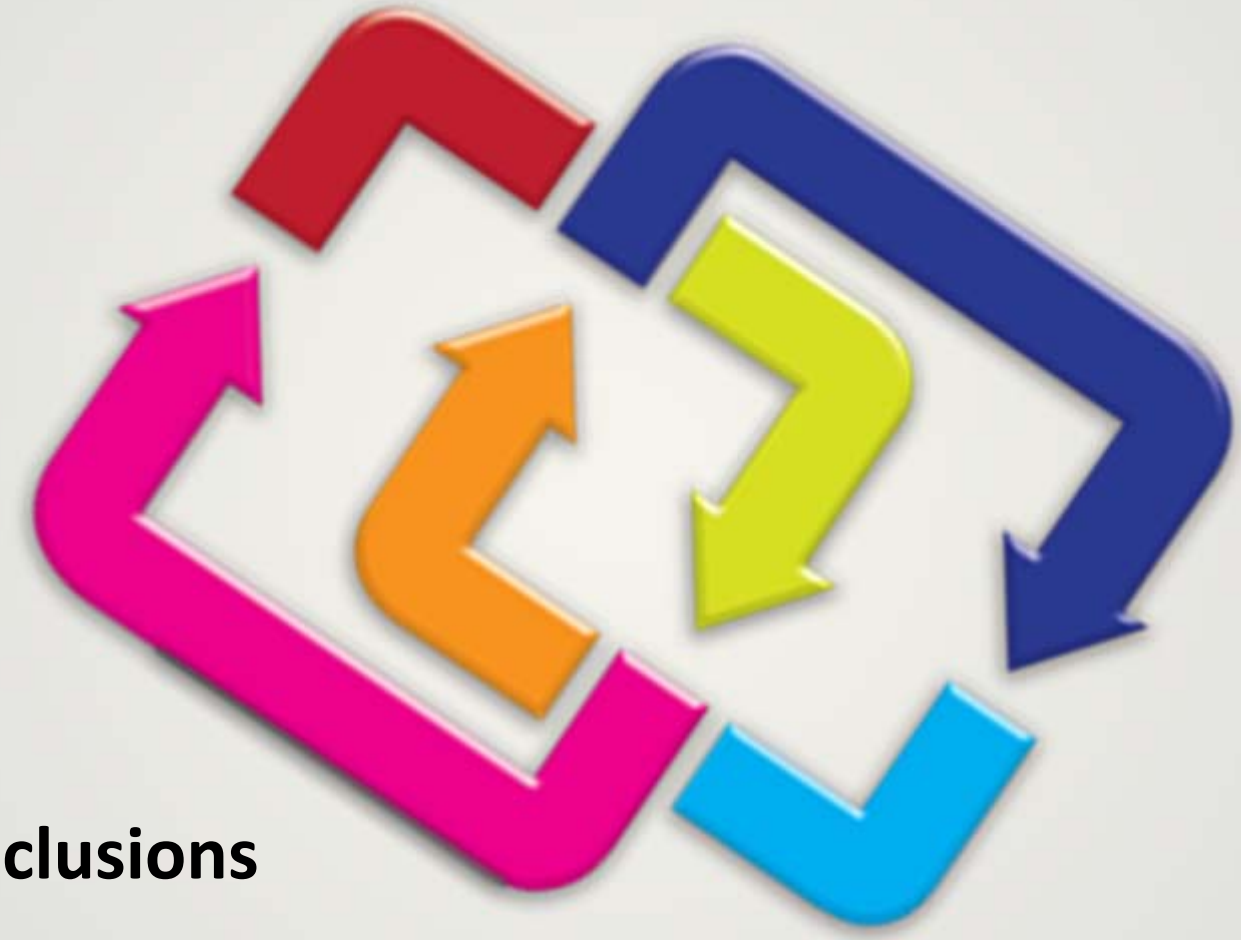
Small scale pilot: What you may see!



Summary & Conclusions

Part 3

FIspace
Business Collaboration

Presenter: Prof.ir. Adrie Beulens)

Summary and Conclusions (1)

Situation in AFSCN with respect to use of ICT and Communication:

- Examples describe the (type of) information and communication needs.
- There is a great variety of types of needs.
- One of the Greatest Dilemma's:
  - How can we design and develop the infrastructure(s), tools, reference models and standards while cooperating with all parties of interest including Cooperatives and Standards Organizations?
  - How can we come up with a feasible Organizational Approach for such developments and infrastructure?
  - Etc.
- We have opted for an approach as now in development (Smart Agrifood and FIspace).
- Some Keypoints:
  - FIspace Infrastructure (services and internet based).
  - Contributing to the configuration problem on the level of (instances of) Business collaboration processes. Simply said: make the configuration problem as simple as installing and configuring an App on your mobile.
- This is a variation of the approach of the communication problem depicted by Fred van Blommestein).

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Summary and Conclusions (2)

- **Details of our intentions and Approach:**
  - Go far beyond the time allocated to me today.
  - Are similar to other EU PPP projects.
  - Have a great many technical challenges still ahead of us.

- **Thank you.**
- **Questions?**

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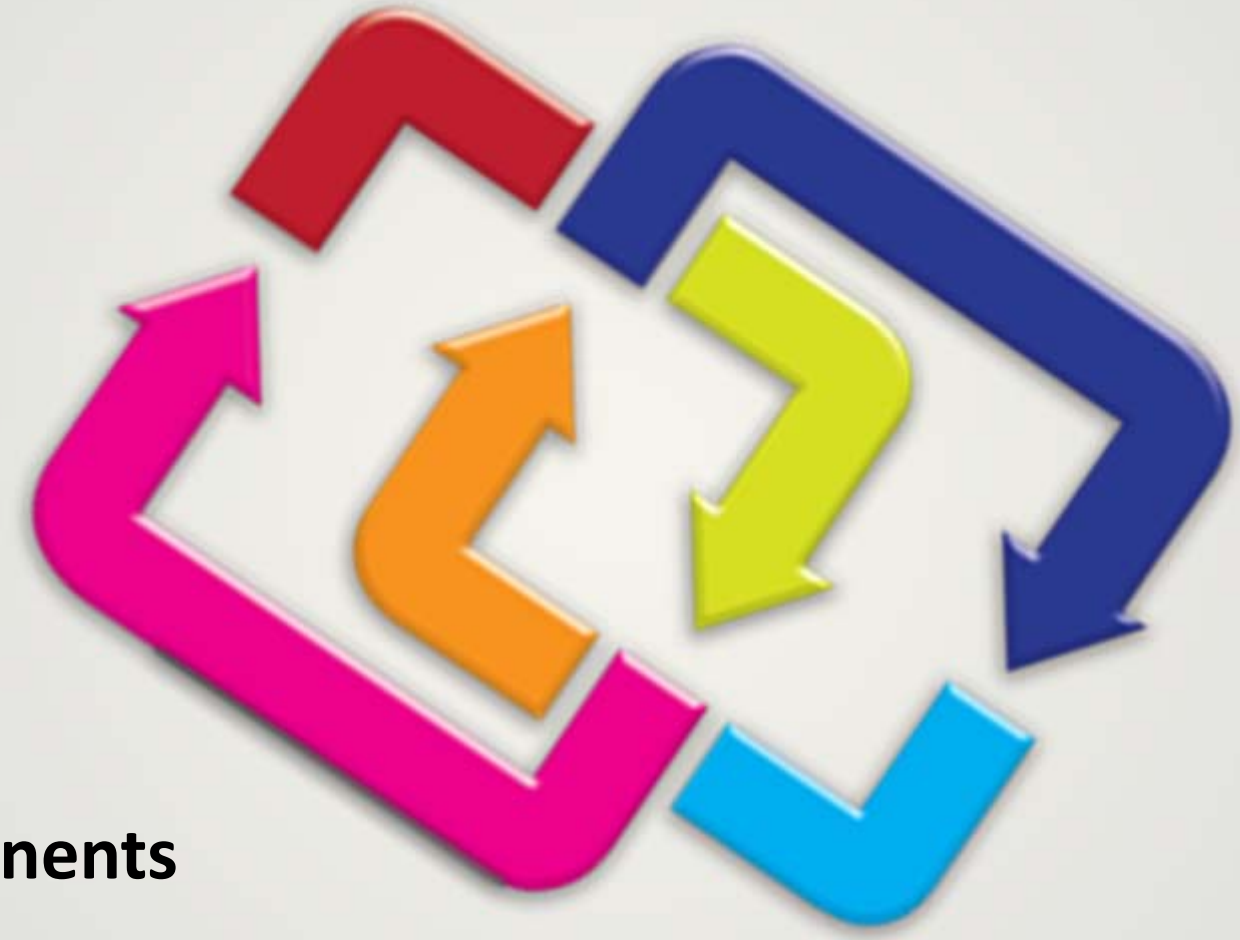

Selected Components

Part 2

FIspace
Business Collaboration

Presenters:

Front-End: René Fleischhauer (SAP)
Business Entities: Benjamin Heilbrunn (SAP)
Events: Fabiana Fournier (IBM)
System & Data Integration: Carlos Maestre Terol (ATOS)

The FIspace Processes

1. **Manage Users & Business Partners**
   - User Management (Registration, Companies & Affiliation, Access & Permissions)
   - Configuration & Administration (Personalization & Customization)
   - Find & manage business partners

   Front-End + SPT

2. **Develop FIspace Apps**
   - Implementation using the FIspace SDK, incl.
     - Usage of FIspace technologies (UI Libraries, BEs & Events, Syst. Integration)
     - Re-using existing Apps (Baseline & other)
     - Integrated Security Assurance (SPT as integrated part of SDK)
   - Provision in FIspace Store, incl.:
     - Create descriptions (USDL description, pricing model, user guide & technical spec.)
     - Upload & Marketing via FIspace Store

   Dev. Env. + integrated tools

   Store

3. **Find & buy FIspace Apps**
   - Find Apps (for both Users and App Developers): search, find, inspect
   - Buy Apps: select, accept term & conditions, payment

   Store + Business Model (WP500)

4. **Install & use FIspace Apps**
   - Configure & Instantiate for User, incl.:
     - Connection to own system landscape (incl. necessary adapters)
     - Define information to be shared
   - Personalization for End-Users (notification settings, etc.)

   Dev. Env.

   Front-End

Business Network Collaboration with the FIspace

- *Enable 'efficient collaboration in business network' via FIspace & Apps*
- *Enable several Apps for the same / similar 'Collaborative Business Process'*

Overall Design

FIspace Business Collaboration

The FIspace Processes

1. Manage Users & Business Partners

End-User

- User Management (Registration, Companies & Affiliation, Access & Permissions)
- Configuration & Administration (Personalization & Customization)
- Find & manage business partners

Front-End
+ SPT

2. Develop FIspace Apps

App Developer

- Implementation using the FIspace SDK, incl.
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Dev. Env.
+ integrated tools

Store

3. Find & buy FIspace Apps

End-User / App Devel.

- Find Apps (for both Users and App Developers): search, find, inspect
- Buy Apps: select, accept term & conditions, payment

Store
+ Business Model (WP500)

4. Install & use FIspace Apps

Business IT Expert

- Configure & Instantiate for User, incl.:
  - Connection to own system landscape (incl. necessary adapters)
  - Define information to be shared

End-User

- Personalization for End-Users (notification settings, etc.)

Dev. Env.

Front-End

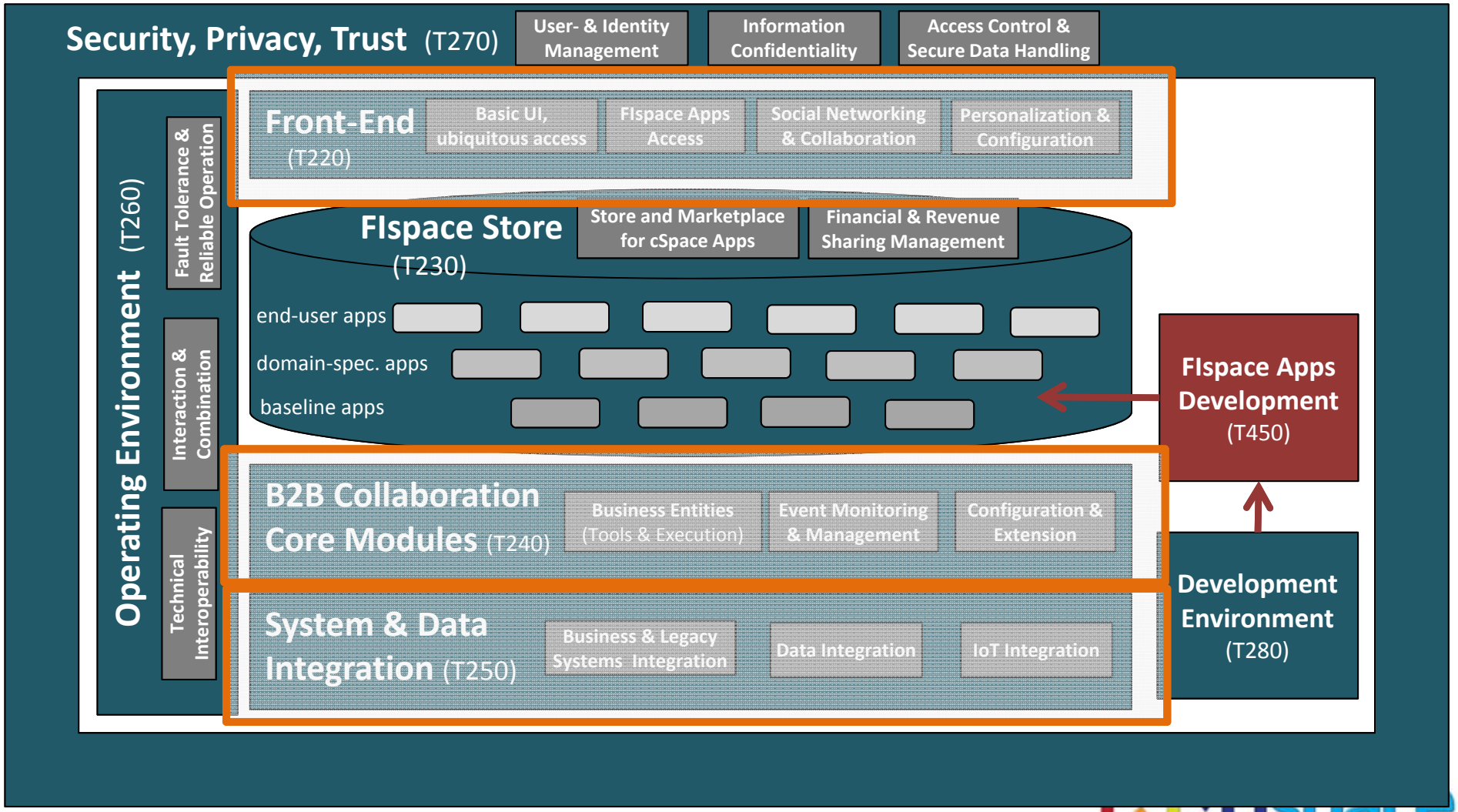
Business Network Collaboration with the FIspace

- *Enable 'efficient collaboration in business network' via FIspace & Apps*
- *Enable several Apps for the same / similar 'Collaborative Business Process'*

Overall Design

FIspace Business Collaboration

FIspace High-Level Architecture



FIspace Business Collaboration

Front-End Core: Features

- **Purpose**
  - Main Access Point
  - Customizable to individual preferences
  - Access to all FIspace Features
  - Access to purchased FIspace Apps
- **Main Features**
  - Homepage & Main Navigation Bar *(called Front-End Core, Sub-Task 222 - SAP)*
  - Access to purchased FIspace Apps *(Sub-Task 223 – ATB)*
  - Notification Bar *(Sub-Task 222 – SAP)*
  - Business Networking & Business Network Analytics *(Sub-Task 225 – SAP)*
  - Personalization & Configuration *(Sub-Task 224 – ATB)*
  - Ubiquitous Access via any Device *(Sub-Task 226 - NKUA)*

FIspace Business Collaboration

Architectural Issues???

ISSUES open:

1. **Data Ownership**
   - ‘Partitioned’ Object Data (different owners).
   - Different locations (for security and ownership). Disconnect when necessary..
   - **History data.**
   - **Decentralization /integration. No central system on SC level. Legacy integration.**
   - **Tracking and tracing tree when allowed and necessary**
2. **Apps.. Own and public.**
3. **Etc. Many..**

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Business Collaboration

Event Management Module (EPM)

Many times we react to situations that are combination of events within a context

The house sensor detects that the child did not arrive home within 2 hours from the scheduled end of classes for the day

I want to be notified when my own investment portfolio is down 5% since the start of the trading Day; have an agent call me when I am available, send SMS when I am in a meeting, and Email when I am out of office.

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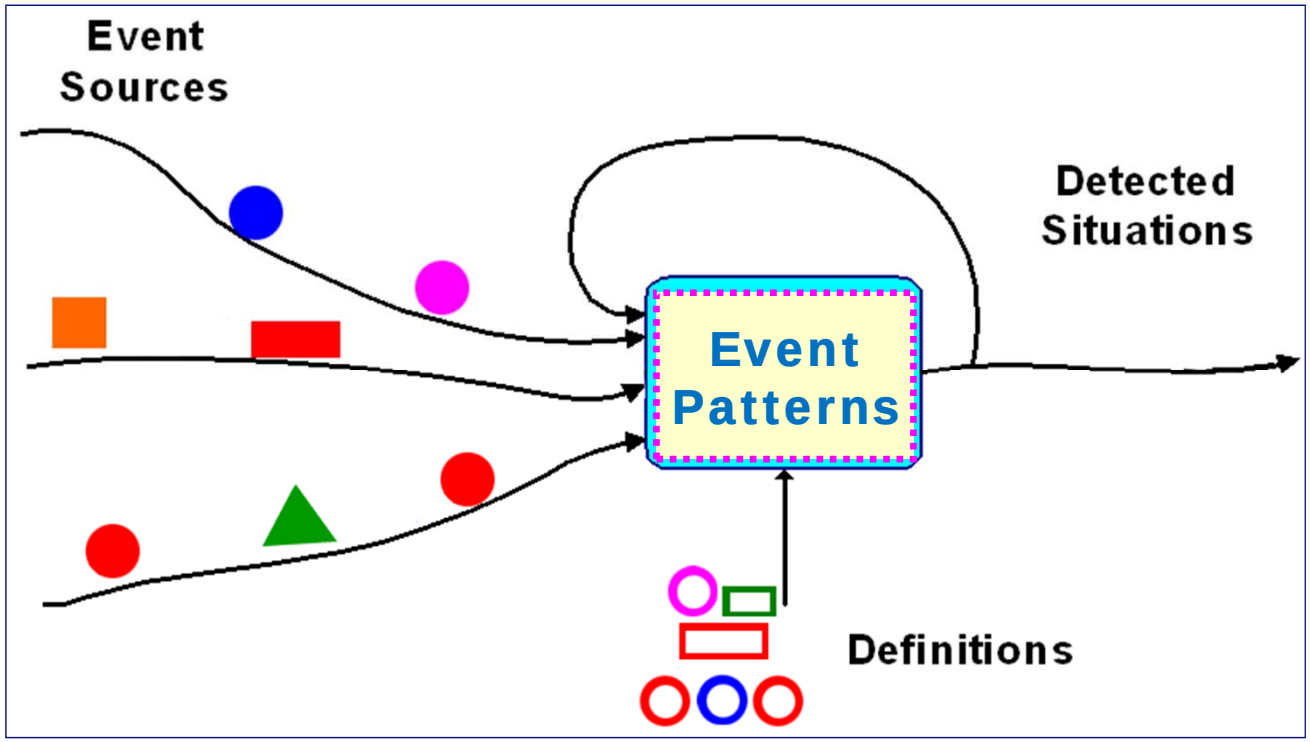
Event Management Module (EPM)

Pattern detection is one of the notable functions of Event Processing (EP)



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Event Management Module (EPM)

Main characteristics of an event-driven application

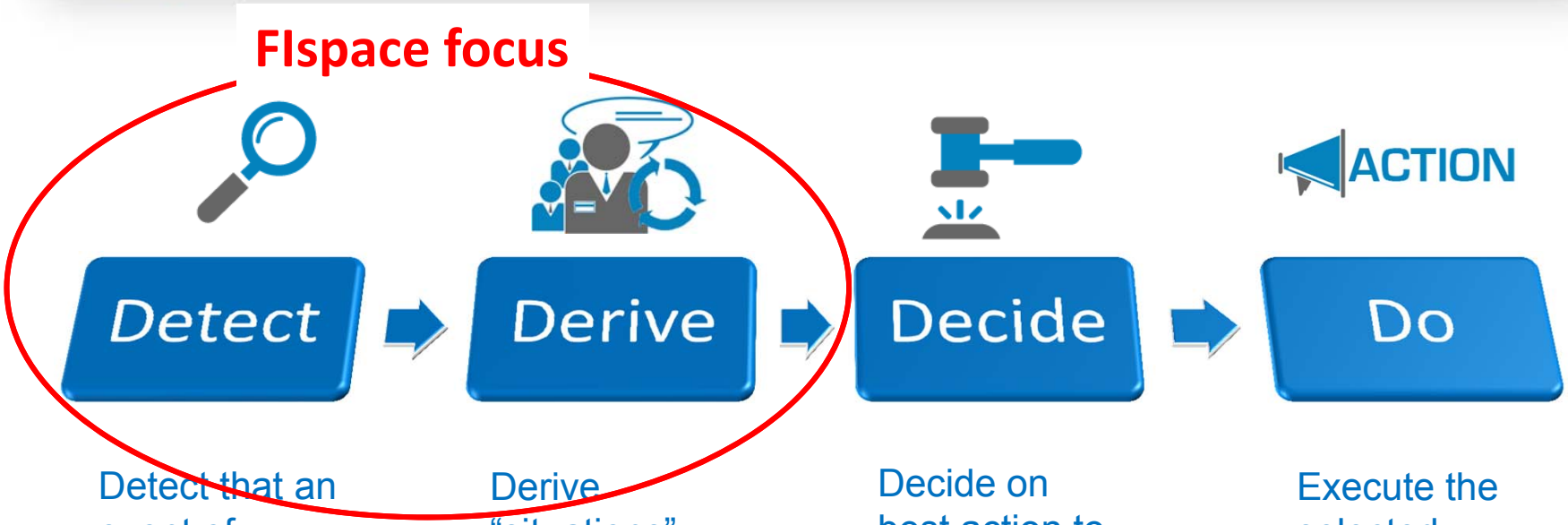
- Asynchronous behavior of events - Events just happen!
  - We don’t know if any specific event will happen
  - We don’t know when any specific event will happen
- Hidden situations to be deduced
  - E.g., anomaly in IoT sensor readings
- Window of opportunity to react to these situations
  - E.g., if we don’t replace a bad sensor in 15 min then the perishable shipment can be ruined

Event Management Module (EPM)

- **Purpose**
  - Detect & analyze various types of events
  - Derive situations of interest, e.g., delays in due dates, missing documentation, anomalies in IoT sensors.
  - Enable real-time alerts on the derived situations to the different stakeholders in the process
  - Enable proactive alerts on situations that may happen (with a certain probability) in the future (*Advanced feature*)
- **Main Features** developed in FIspace / T240
  - The EPM is based on the CEP-GE provided by FI-WARE and extended to meet FIspace specific requirements
  - The EPM is composed of an authoring tool (design-time) and a run-time engine (run-time)
  - Both tools will be extended in FIspace to cope with proactive scenarios
  - Both tools will be extended in FIspace to ease the creation of new scenarios and the on-boarding of new collaborations

The Event Processing Pattern

FIspace focus



Detect that an event of interest has occurred

Derive "situations" which are actionable conclusions from watching multiple events

Decide on best action to take

Execute the selected action

Watch the traffic → *Traffic jam is coming* → *Determine traffic lights policies* → *Reset Traffic lights*

FIspace Business Collaboration

Event Management Module (EPM)

What events are we monitoring and tracing in FIspace scenarios?

- Events related to the flow of the process or collaboration process
  - E.g., process delays
- Events related to the IoT sensors and/or backend systems
  - E.g., exceptions in the sensors network

Real-time alerts regarding detected situations

Handling Process Delays

Apply the EPM component to monitor the process correct flow and alert on delays and exceptions

RULE NAME AND DESCRIPTION
Advice request is not serviced within X hours – A new request is issued by the farmer but is not being serviced within X hours. i.e a *Create advice request* event is detected but no *Expert accepted request* event is detected within *X hours*. (X is a parameter for example X=12 hours)
Advice approval is delayed – The expert's advice was sent for authority approval Y days ago and has not been approved yet. i.e. *Advice is sent to authorities* event is detected but no *Authorities approval* event is detected within *Y days*. (Y is a parameter for example Y=3 days)

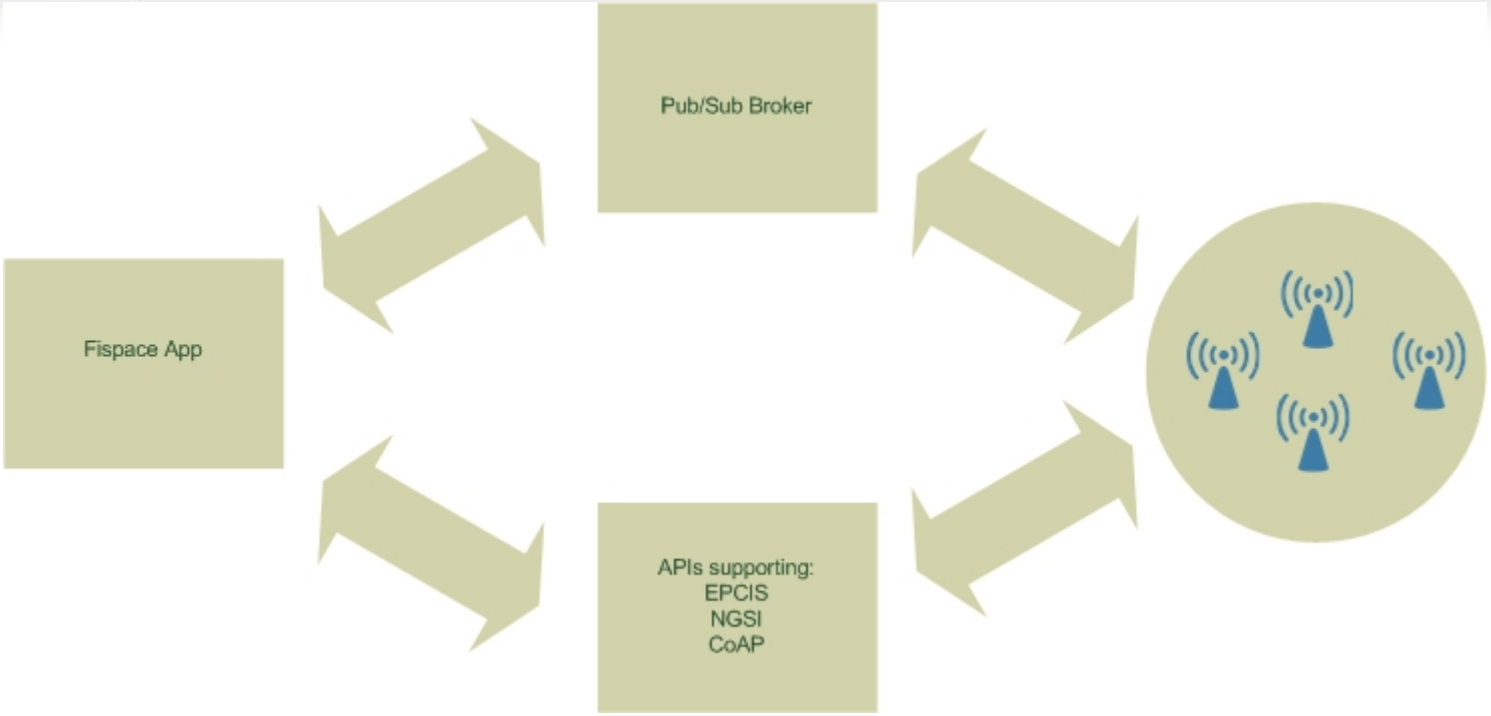
Event Management Module (EPM)
The spraying advice use case - Event rules examples (2/2)

Monitoring the sensors network in the farm

Apply the EPM component to monitor the farm's sensors and alert on exceptions

RULE NAME AND DESCRIPTION
Humidity and Moisture is too low– when *Humidity sensor's read <=70%* AND *Soil moisture sensor's read <=75%* are detected within *one hour*, then generate Alert1: "Close the windows and start the water spraying"
Humidity and Moisture are back to normal– when *Humidity sensor's read >70%* AND *Soil moisture sensor's read >75%* are detected AFTER Alert1 occurred, then generate Alert2: "Open the windows and stop the water spraying"

How to connect IoT systems



- Publish/Subscribe mechanism (FIware GE)
- Client/Server Part need to be deployed to the IoT System so data can be imported/exported.
- APIs supporting several standards will be implemented

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How to support data integration

- Different systems have different data models. Therefore, it is needed to match them to be able to exchange data between them.
- There will be available some functionality to make this possible for the Business IT Engineer, when connecting a FIspace app with an external system.
- We are still working to choose the more suitable technology to be applied.

SDI and Trials

Definition of services + data model

Definitions of interfaces to connect to the systems

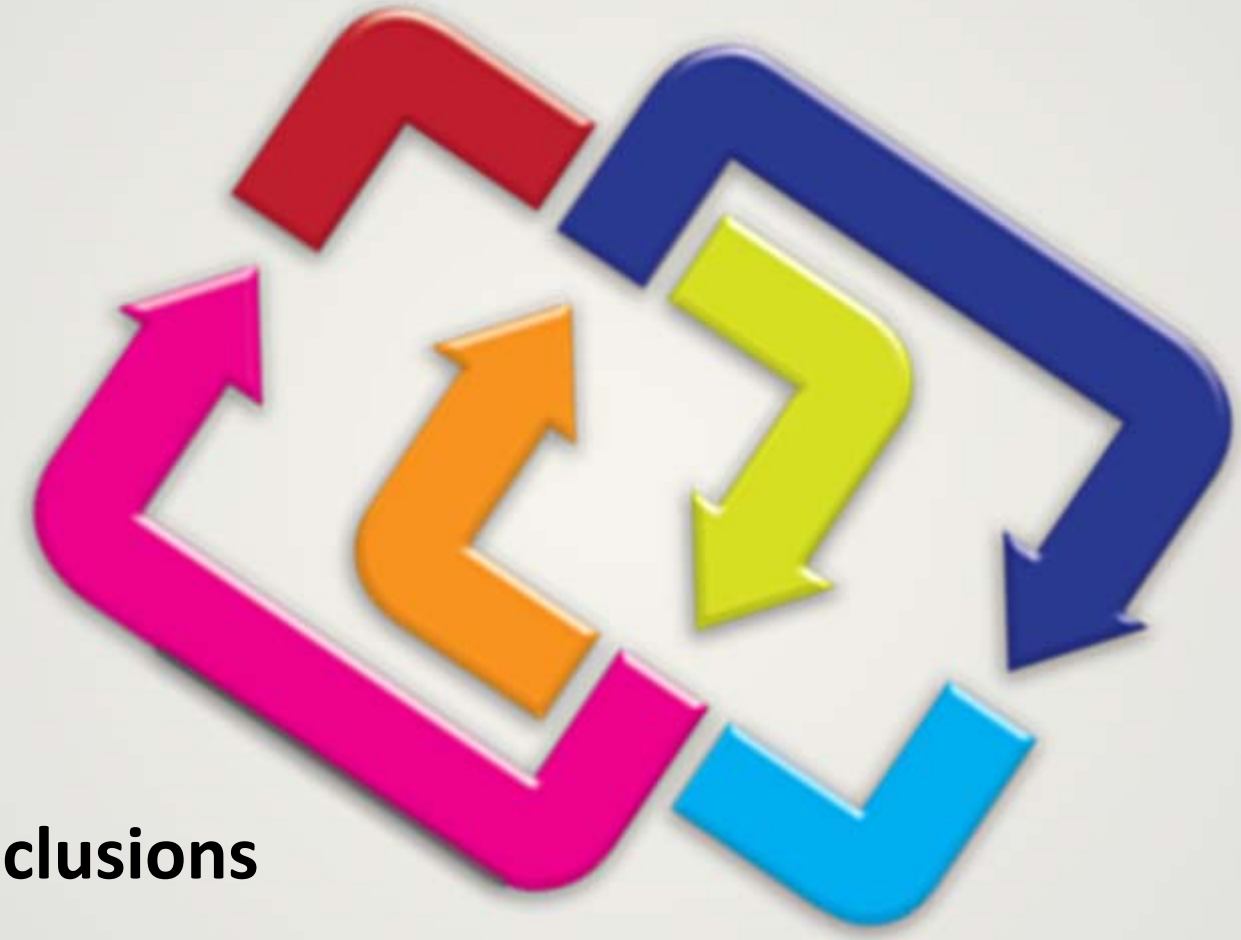
1. Crop Protection Information Sharing
2. Greenhouse Management & Control

3. Fish Distribution and (Re-) Planning
4. Fresh Fruit and Vegetables Quality Assurance
5. Flowers and Plants Supply Chain Monitoring

6. Meat Information Provenance
7. Import and Export of Consumer Goods
8. Tailored Information for Consumers

Pool of interfaces

- Service Interface A
- Service Interface B
- Service Interface C
- Service Interface D



Summary & Conclusions

Part 3

FIspace
Business Collaboration

Presenter: Michael Stollberg (SAP)

FIspace Main Characteristics

- **Overall Aim**
  - **Quick & easy development of an extensible set of apps** for specific business purposes (**NOT** 'all-in-one' stand-alone business applications that are completely provided by 1 IT vendor)
  - **Focus on 'collaboration across organizational boundaries'** with build-in support in the FIspace Platform, technologies, and Apps (**NOT** focus on in-house operations)
  - **Facilitate & foster new business models on the cloud**, for both Application & User Industry (**NOT** yet-another-BusinessSystem using FI technologies)

- **Basic Principles**
  - There can be **several FIspace Apps for the same Collaborative Business Process**
  - The **main logic** of the Collaborative Business Process is **kept & managed in the Platform**
  - The **FIspace Apps shall be purchased & used by several companies**:

- **Analogies**: the FIspace is like …
  - Facebook: users see status & actions when logged on
  - LinkedIn: manage your business partners and personal contacts
  - Mobile Apps: FIspace Apps are rather small & simple, primarily supporting B2B collaboration; users purchase them can configure them for individual purposes
  - Next Generation Gaming Platforms (e.g. PS4, XBox One): everything online & collaborative

FIspace Business Collaboration

Expectations from Trials / Main WP results

- **The ‘Developers’ will …**
  - **Provide**:
    - The ‘Platform Features’ as outlined here
    - Development Environment for FIspace Apps
    - Store for FIspace Apps (provide, find, buy)
    - Help & support for project members and stakeholders
  - **Need**: feedback (critical & constructive) and collaboration on design

- **Expectations from Trials**
  - Define such trials (i.e.: cross-organizational scenario, TO BE with FIspace), incl.:
    - Such FIspace Apps (i.e.: focus on business collaboration, usage & exploitation of FIspace main features)
    - Definition of Business Entities and Events (close collaboration with T240)
    - Identify Systems to be integrated (close collaboration with T250)
  - Let Apps be implemented (mainly via Open Call)
  - Test & Evaluate wrt. KPIs using Experimentation Environment (cf. WP300)
  - Engage existing business network (cf. WP500)

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THANK YOU!

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