Smart Agri-Food Logistics: Requirements for the Future Internet

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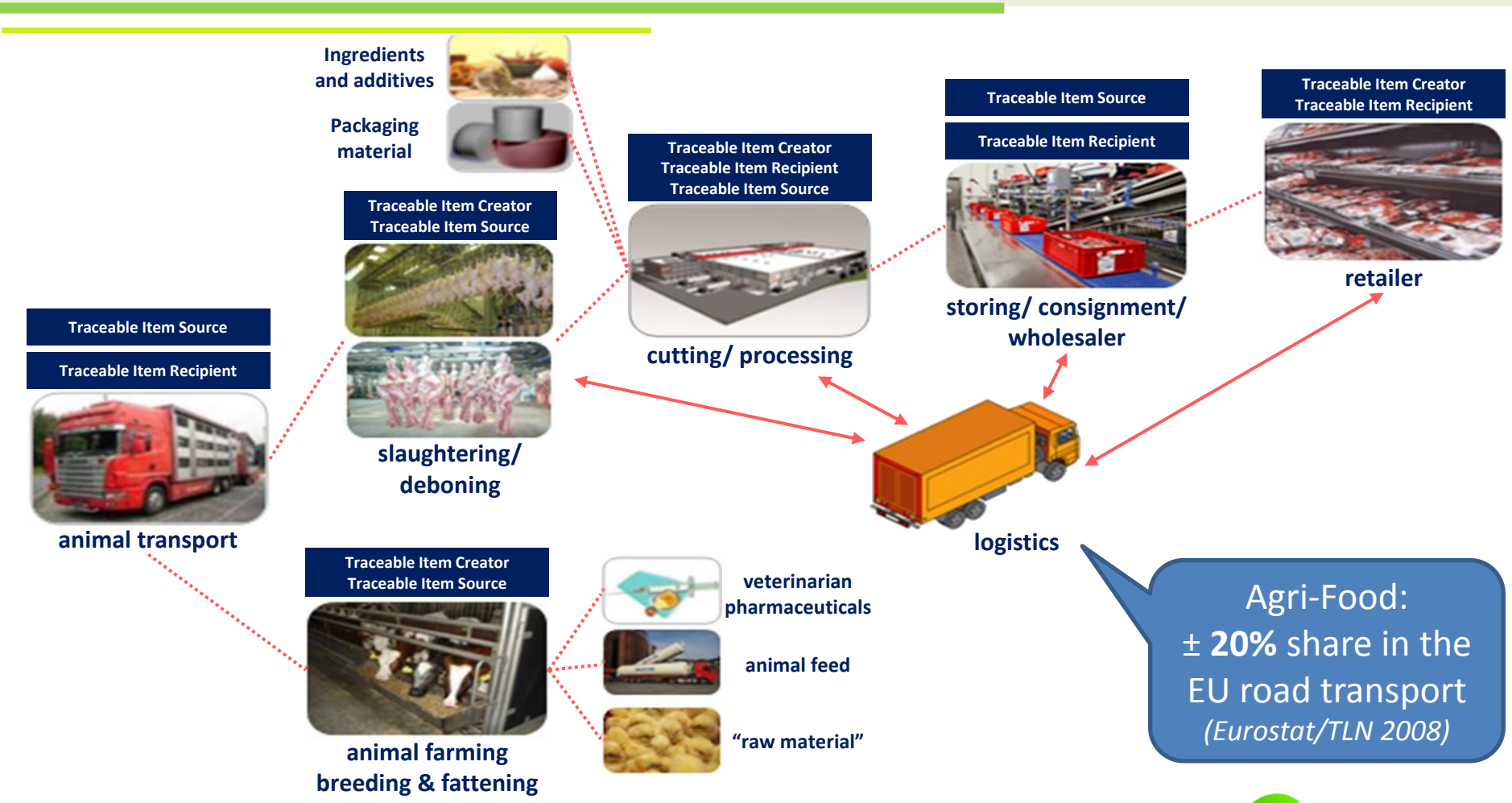
Smart Agri-Logistics: Diverse and Dynamic Supply Chains



Illustrative example of a meat supply chain (source: GS1)

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Current Challenges:
Sector-specific characteristics heavily impact logistics





- High supply uncertainty due to natural production
  - Unpredictable variations in quality and quantity of supply
  - Flexibility in logistic processes and planning expected
  - Early warning and pro-active control is required
- High perishability
  - Cold chains: temperature-conditioned transportation and storage
  - Very short order-to-delivery lead-times
- Seasonable growing requires global sourcing to ensure year-round availab**il**ity
- High demands on food safety, quality and (environmental) legislation
  - Ability to trace production information of products in transit
- High tracking and tracing and logistic planning complexities
  - Continuous and discrete product flows
  - Diverging and converging processes and by-products
- Additional phytosanitary and veterinary import inspections
- Many SMEs – importance of collection and allocation mechanisms

Future Internet

- Aims to overcome limitations of the current internet, including:
  - a lack of data integrity, reliability, provenance and trust
  - a lack of data integration and federated storage solutions
  - lack of flexibility and adaptive control
  - segmentation of data and control
- “Developing the Future Internet” to combine several trends in internet development into an integrated approach
  - the on-going industrialization of IT
    - cloud computing
    - open service delivery platforms
  - new wireless networking technologies and the deployment of fibre
  - the breakthrough of the Internet of Things

This presentation

Central Research Question:

How can the Future Internet help to accomplish the specific demands of agri-food logistics?

More specific objective:

to define the requirements on the Future Internet (FI) technologies of the food and agribusiness domain

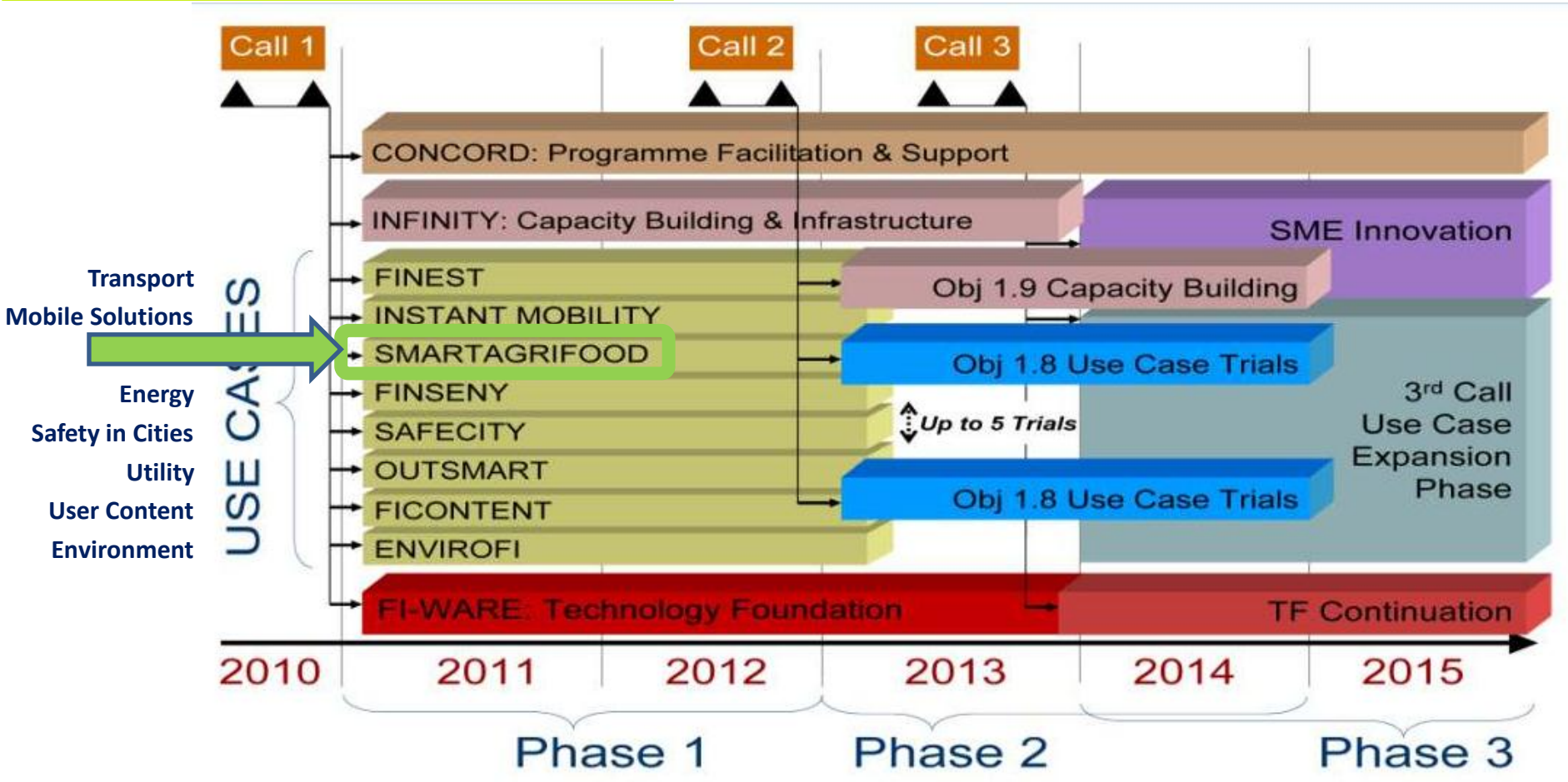
Structure of the prestention

- Future Internet Public Private Partnership Programme (FI-PPP)
- SmartAgriFood project
- Smart Agri-Food Logistics

FI-PPP programme approach

- Industry-led
- Creating internet innovation
- User-driven
- Integrated programme notion
- Overall FI-PPP budget:
  - 300 Million Euro EC contribution

Use Case within Future Internet PPP



Currently some 150 Organisations in the FI-PPP Programme

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Objectives of SmartAgriFood

Boost the application & use of future internet ICTs in the agri-food sector by:

- identifying and describing the technical, functional and non-functional **FI-specifications**
  - for experimentation in smart agri-food production as a whole system and
  - in particular for smart farming, smart agri-logistics and smart food awareness
- identifying and developing smart agri-food-specific **capabilities and conceptual prototypes**:
  - demonstrating critical technological solutions including feasibility,
  - to further develop them in large scale experimentation and validation
- identifying and describing existing **experimentation structures** and start **user community building**,
- resulting in an implementation plan for the next phase.

Consortium

- **21** beneficiaries from **7** countries
- Balanced consortium
- Connected to
  - European Technology Platforms
  - Future Internet Assembly
  - IERC cluster
  - Industry/ Government

	Research		Industry/ end-users	
	Agri-food	ICT	Agri-food	ICT
DLO-WUR	++	+		
ATB	+	++		
TNO	+	++		
CENTMA	++	+		
ATOS				++
ASI				++
HWDU				++
MTT	++	+		
KTBL	++	+		
NKUA		++		
UPM		++		
Campden BHU			++	
Aston Uni.		++		
VTT	+	++		
OPEKEPE			++	
John Deere			++	+
Wageningen Uni.	++	+		
EHI Retail			++	
GS1			++	+
SGS			++	+
BonPreu			++	

Project approach Smart Agri-Food

Phase 1

Realising conceptual prototypes in different agri-food environments

Phase 2

Large Scale Experimentation

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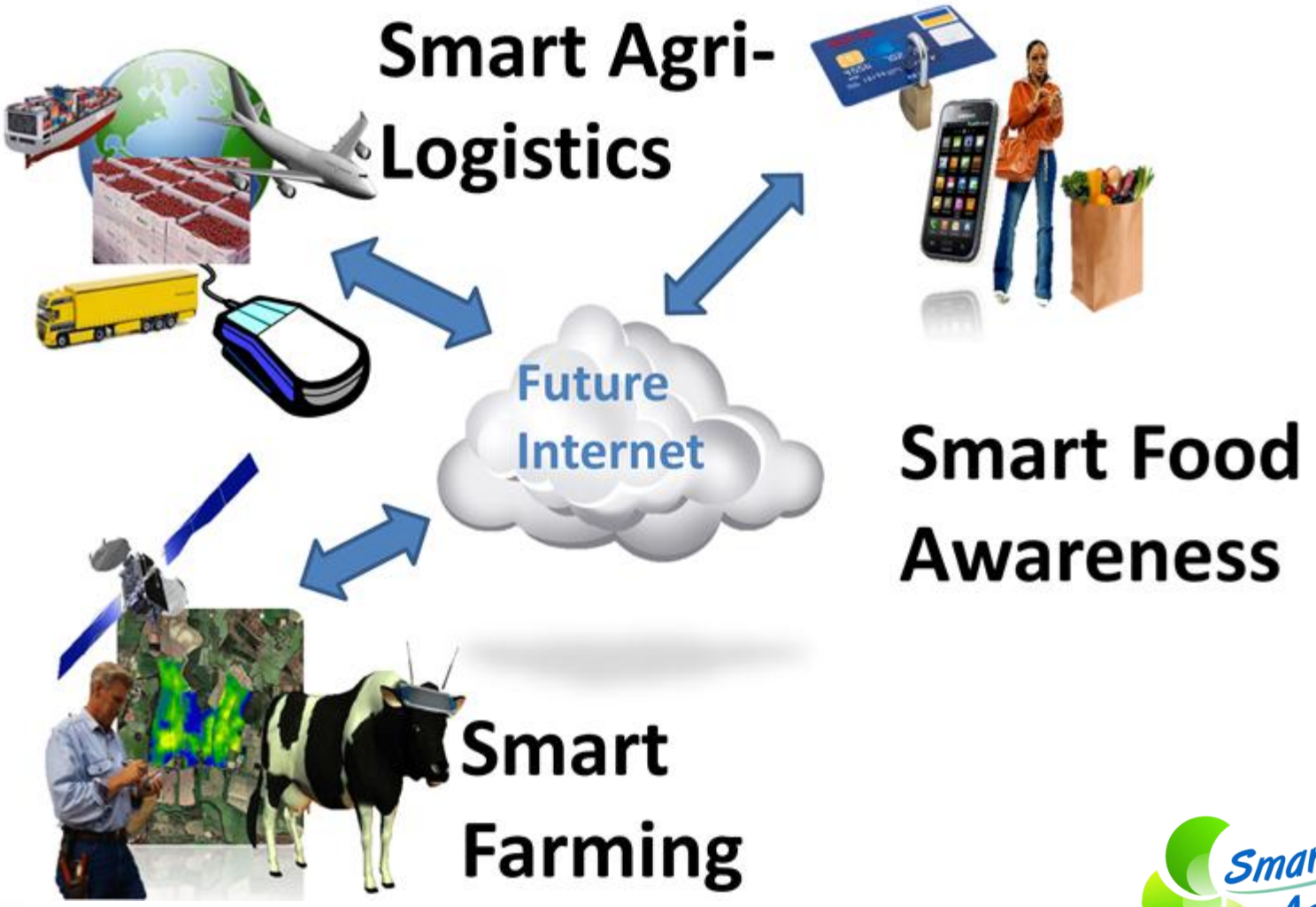
3 Use Case Scenario's: from Farm to Fork



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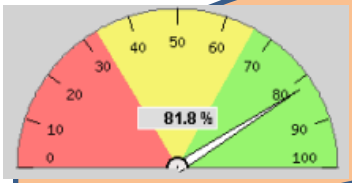
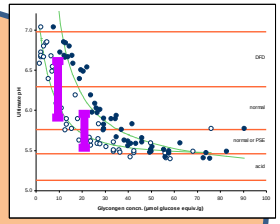
Vision for FI Application Potentials: Critical Features

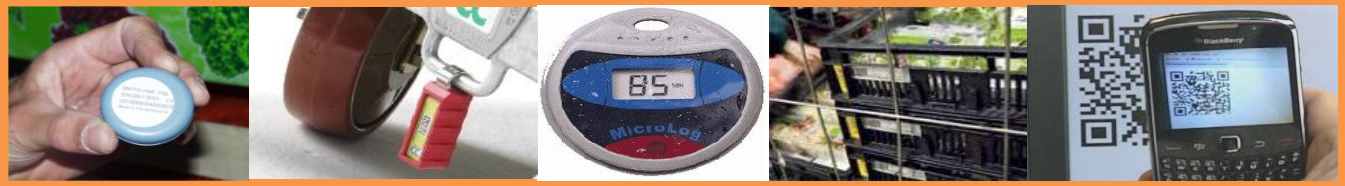


Logistics Intelligence



Logistics Connectivity

Real-time Virtualization



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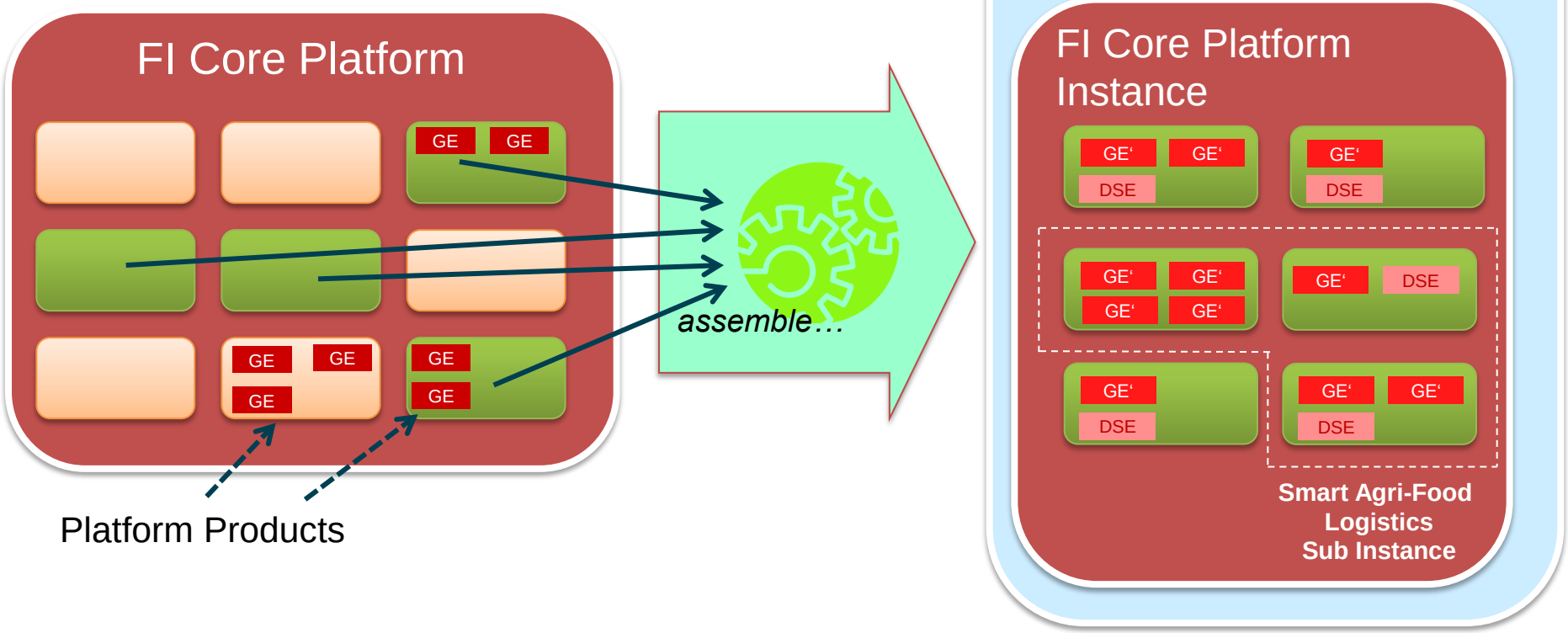
Instance of the Fi-Ware Core Platform



Basic Future Internet challenges in Agri-Food Logistics

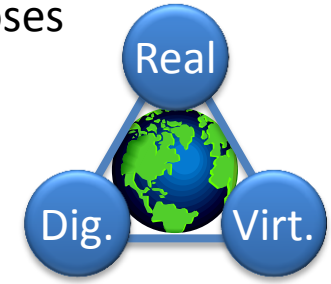
- Internet of Things (IoT)
  - Well developed devices and approaches available for specific parts in a chain.
  - Cost of devices to focus on the object.
  - Handle the change of ownership, addressing produce, packaging **and data.**
  - Decoupled generation of data from usage of info about exceptions/deviations.
  - A chain/network perspective is required.

- Telematics Systems
  - Combining status, context and location for generating knowledge.
  - Dynamic change of business partners interrelationships.
  - Need for an advanced decentralised management
    - Of authentication & authorisation
    - Of revocation of access rights
    - For assuring privacy of data.

Basic Future Internet challenges in Agri-Food Logistics

- Tracking and Tracing
  - Systems needs to trace across and through the companies in the chain.
  - Central service providers are not accepted

- Autonomous Systems
  - There need to be a virtual identity with “mobile software components”.
  - Autonomous decision making and communication of systems imposes critical questions towards security and governance, especially in dynamic business networks.
  - Challenge of managing the real, the digital and virtual world!



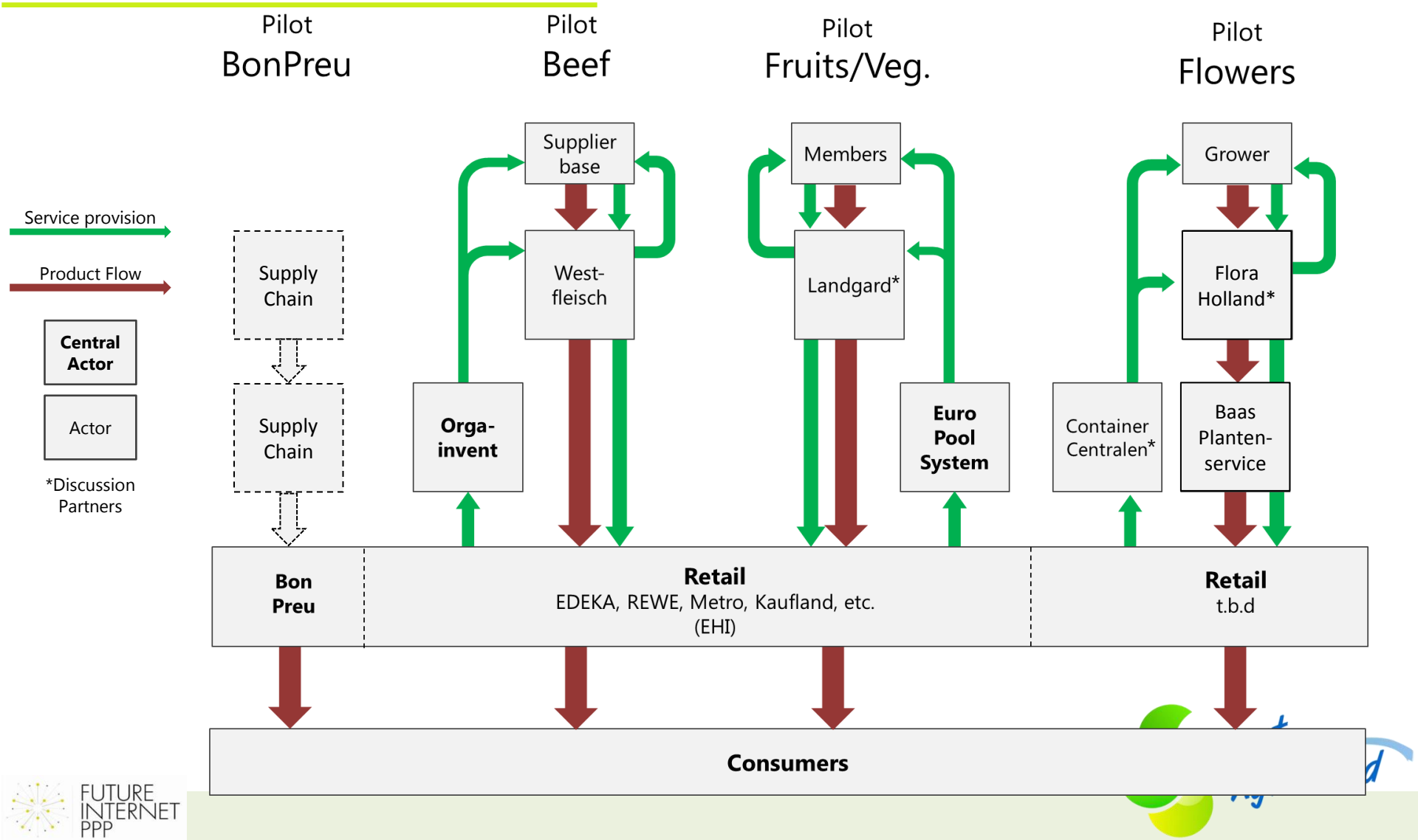
- Business Intelligence
  - Tremendous improvements seem possible – but for whom?
  - Can agri-food SMEs benefit from BI or only oligopoly type retailers?

However, ***organisational conditions are crucial success factors***!

Requirements Definition based on 7 Application Scenario's

No.	Name	Main focus
SL_1	Intelligent Supply Chain Event Management (SCEM) systems for the future food supply chain	• Detection and proactive management of critical events, e.g. a production delay in the mango supply chain
SL_2	Exception notification based on fruits/vegetables chain	• Usage of exception information (in particular laboratory info) to control the food products in transit in case of any food risk event
SL_3	Real-time and trusted information regarding product specifications and compliance	• Tracking and tracing of product data
SL_4	Legal compliance and quality control	• Assurance of product quality /safety, including security, energy and environmental information
SL_5	Quality Controlled Logistics (QCL) in the flower chain	• Dynamic monitoring of quality parameters (temperature, humidity, etc.)
SL_6	Intelligent retail store replenishment of fresh products	• Detecting decay of fresh products in the retail store and automate replenishment
SL_7	RFID implementation on pallets from warehouse to retail store	• Control the load from warehouse to improve delivery performance (decrease delays, damaged products, incorrect cooling, etc.)

Conceptual Prototypes – Focus of a Smart Agri-logistics



Required Future Internet Capabilities

- Peer to peer services for communication in the chain.
- Decoupled/asynchronous data transport, complying to rural areas
- Mobile services/agents as a kind of “app based” business interaction.
- Online profiles to cope with scarce ICT resources
- Updateable profile for objects
- Entity authentication/authorisation also without Internet connection
- Automatically add/revoke access rights in accordance to process demands
- Identify aggregations of objects and mapping of identification schemes
- Virtual identities in relation to context, location and ownership
- Decentralised trust – supporting certification schemes
- Mapping of interfaces by process experts

To conclude

- Future Internet is promising to accomplish specific demands of logistics for dynamic agri-food networks
- Requires specific capabilities concerning
  - Dynamic interaction of organisations with heterogeneous or no ICT
  - Required agreements of competing actors in a discount driven environment
  - Willingness to share critical data vs. need for privacy and secure systems
  - The usage of IoT related devices in open chains w.r.t. ownership & costs
  - A need to achieve a critical mass for wide adoption
- Main challenge:
  - how to configure dedicated logistic information systems, that provide the right functionality in the specific context of agri-food supply chains, based on a generic internet platform?
- Future activities:
  - Prototype implementation just started.
  - Usage of Generic Enablers and cross use case validation.

Smart Agri-Food

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Thank you!
Questions? Discussion...

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SEVENTH FRAMEWORK PROGRAMME