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Future Internet Business Collaboration Networks in Agri-Food, Transport and Logistics



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Fispace will deliver a novel, innovative and open Business Collaboration Space that, based on Future Internet technologies, enables seamless collaboration in open, cross-domain business networks and allows for establishing an ecosystem of users from various industrial sectors as well as IT solution providers. Leveraging concepts established in the B2C world, such as social networking and app stores, the aim is to overcome the problems that plague modern businesses when working in unfamiliar geographies or with unfamiliar partners. In addition, the integrated app store concept shall allow domain ICT vendors to develop useful applications that can be combined and "mashed up" using Fispace services to create innovative, integrated services for activities such as machinery control, environmental management, tracking and tracing, contract development, planning and resource management.

The two domains that are the application focus of this project – Transport and Logistics and Agri-Food – are two of the largest business domains in the European Union. The food and beverage industry experienced an annual turnover in 2010 of more than €955 billion, and the Transport and Logistics industry had an annual turnover of approximately €525 billion in the same year (all statistics from Eurostat). While exhibiting a large aggregated turnover, both domains are highly fragmented: over 99% of the producers in the food and beverage industry are classified as SMEs, and approximately 67% of T&L service providers fall into the same category. Hence, these industries are highly attractive initial target application domains for novel B2B collaboration solutions such as the Fispace. Numerous studies and anecdotal evidence indicates that improved collaboration, planning and execution through advanced ICT could yield savings of between 10% and 15%. Just as importantly, CO₂ emissions from agricultural operations (12.5% of total emissions) and transport activities (14.0% of total emissions) amount to the largest combined source of greenhouse gas emissions. Better farm and transport management could significantly reduce these emissions.



1. Motivation

Modern business networks tend to be highly distributed inter-organizational entities, spanning country boundaries composed of business partners who have limited insights into the overall network and who are only focused on optimizing their own small part of the value chain. Current ICT services generally support this limited network focus, and thus provide only basic support for inter-organizational data and process integration. This means that complex inter-organizational collaboration activities today must be accomplished through manual efforts.

Technology advancements are also placing increasing strains on existing ICT systems. New technologies for gathering data on field activities, such as new sensor technologies, scanners, and RFID, are creating data collection, distribution and management problems for existing Internet technology. Sharing of these data is also problematic as the requirements for privacy and security of these types of data are poorly supported by existing Internet services.

The lack of robust inter-organizational integration and collaboration systems hampers business efficiency and optimization for all parties involved in the planning and execution of multi-organization value chain activities: customer requirements for end-to-end tracking and tracing must be satisfied through combinations of human inputs and interventions, heterogeneous information from incompatible ICT systems create barriers to interoperability between network partner systems, and the end-to-end coordination of operational planning and execution activities requires extensive manual effort making network operations costly, non-transparent, error-prone, inefficient and environmentally non-sustainable.

Fispace will develop a multi-domain collaboration and integration service, based on FI-WARE core platform and Future-Internet technologies, enabling new business models that overcome these deficiencies. The central features of the Fispace collaboration service will be:

- Provisioning of the Fispace service will follow the Software-as-a-Service delivery model, which means that Fispace services can be accessed anywhere at any time via any device;
- The Fispace service is an open service that can be extended and customized for specific stakeholder demands by integrating domain apps (similar to the iPhone and Android business models);
- A domain app store facilitates the marketing of targeted applications that take advantage of the collaboration and mash up services of the Fispace and its underlying FI-WARE generic enablers;
- A collaboration manager for business-to-business networks that supports the planning and execution of business operations from a global perspective with message-based coordination among the involved business partners;
- Integrated techniques for monitoring and tracking on the basis of data integration from the Internet of Things, including sensor systems and smart item technologies accessible via FI-WARE generic enablers;
- Information integration from legacy and third party systems enabled through a service-based integration layer that is enabled and supported by FI-WARE generic enablers;
- Role-based views for the individual participants in the business networks along with integrated security and privacy management for fine-grained access control to confidential information;

2. Fispace Approach

A high level schematic of the Fispace collaboration platform showing its relationship to domain users and its foundation based on FI-WARE generic enablers (GEs) is shown in Figure 1.

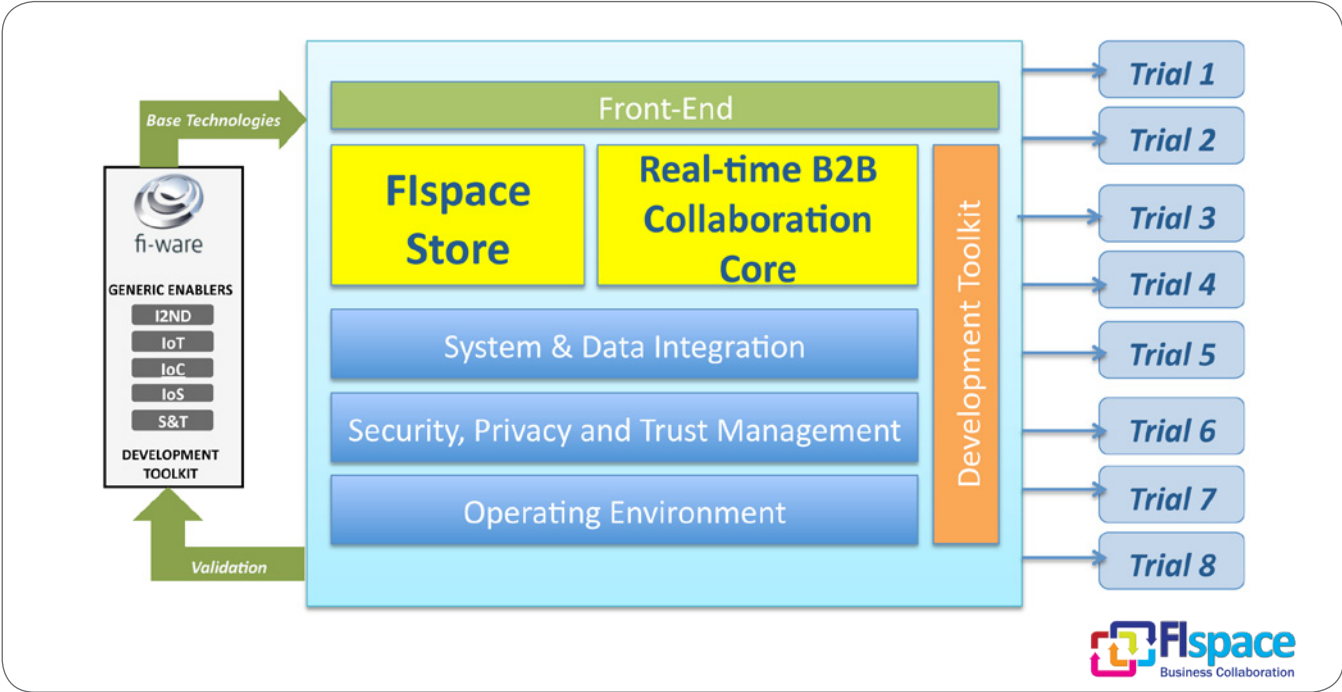


Figure 1 The Fispace concept based on the FI-WARE Core Platform

3. Future Internet as Enabler

The Fispace project will leverage and extend the domain-solutions and stakeholder communities for international transport and logistics and agri-food developed during the Phase I use case

projects Finest and SmartAgriFood. This extension of capabilities will allow for cross domain usage of the Fispace service to address multi-domain business challenges (see Figure 2). Such cross-domain usage will demonstrate to other FI PPP use case projects the value of the Fispace collaboration model and, hopefully, encourage them to utilize its services in their projects. Fispace will also actively seek out applications and enablers from other Phase II projects to encourage their development and deployment in the Fispace ecosystem. The enabling technologies will be taken from the Finest and SmartAgriFood Phase I projects, as well as the work done in the FI-WARE core platform project, and integrated into the Fispace service itself as generic services, or developed as domain applications implementable from the Fispace application store.



Figure 2: Collaborative Business Networks in The Future Internet

The focus of the project will be to implement and test the Fispace solution and its underlying technologies, specifically the FI-WARE GEs, using multi-domain trial experiments. In addition, the project will utilize the trials to empirically support the business benefits identified during Phase I of each project, and thus ultimately will demonstrate the benefits of real life utilization of FI enabled technologies. In total, 8 trials that use common Fispace elements and FI-WARE enablers are selected, that are grouped into 3 use case scenarios:

1. **Farming in the Cloud** addresses food production issues at the farm level and covers two use case trials:
 - i. Crop Protection Information Sharing – use of field sensor and satellite data to intelligently manage the application of pesticides for maximum crop protection
 - ii. 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

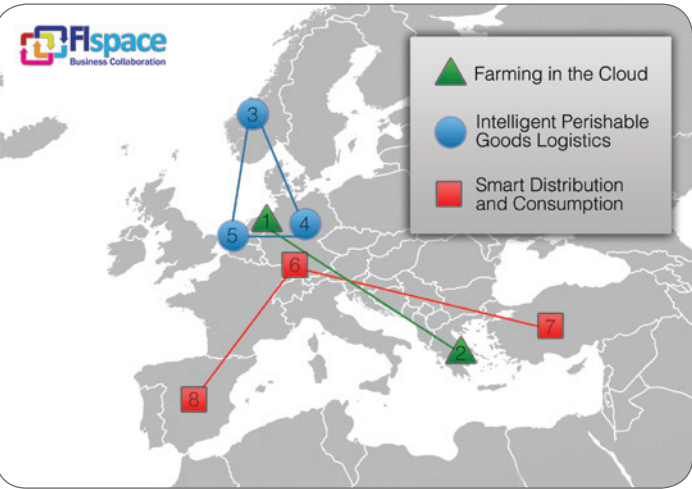


Figure 3 The eight Fispace use case trial experimentation sites in Europe divided in three themes.

2. **Intelligent Perishable Goods Logistics** 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:

iii. 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

iv. 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.

v. 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.

3. **Smart Distribution and Consumption** 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:

vi. 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).

vii. 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.

viii. Tailored Information for Consumers – the provisioning of accurate information to individual consumer’s needs and feedback of this information to the producers.

Most of the trials are related to global supply chains that are therefore difficult to pinpoint on a map. Nevertheless, Figure 3 provides a map of the physical trial locations that are most directly involved.

4. Business Relevance and Impact

Modern international business is a highly competitive endeavor where resource constraints require organizations to partner with one another to efficiently and effectively address customer needs. In this dynamic market new challenges continually arise, particularly due to increasing customer expectations for personalization and cost reduction. Current ICT technologies are either too limited or not capable of properly supporting this evolution of customer requirements. The envisioned integrated collaboration platform will facilitate the following business benefits:

- Better satisfy customer requirements, such as:
 - » End-to-end visibility and event management,
 - » Enhanced monitoring and tracking of goods as they move along the value chain,
 - » Less costly and better tailored offers goods and services,

- » Significantly reduced waste of perishable products,
- » Immediate notification of deviations and the occurrence of hazardous events,
- » Lower environmental impacts through increased network efficiencies, and
- » More transparent operations.

- Substantially increase business efficiency and optimization throughout the entire value chain by:

- » Significantly reducing manual efforts for planning and re-planning,
- » Enhancing interoperability among heterogeneous systems based on business standards,
- » Automating support for coordination of operational activity execution,
- » Providing accessibility anywhere and anytime via any device, and
- » Facilitating the rapid identification and contracting of capable business partners.

- Facilitate new business opportunities by:

- » Providing more efficient and transparent service offer management,
- » Optimizing partner contract negotiations,
- » Facilitating new business partner interactions and collaboration opportunities, and
- » Providing access to true end-to-end business and consumer performance metrics.

