Contributors' names and short CVs:

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Karel Charvat is graduated in theoretical cybernetics. Expertise in project management of research project. Key qualification: strategic studies and management of projects in ICT and SDI. Participation in projects: Wirelessinfo, Premathmod, EMIRES, REGEO, Rural Wins, Armonia, a Bard, EPRI Start, Ami@netfood, AMI4For, Voice, Naturnet Redime, Mobildat, SpravaDat, Navlog, c@r, Humboldt, WINSOC, Study for DG AGRI Broadband in Rural Development, Plan4all, Plan4business, Habitats, Apps4Europe, SmartOPenData.

Dr. Antonio Campos is the Director for Technology and Innovation of SERESCO since Nov. 2012 and part time professor of the University of Oviedo since 2005. He has a PhD in Informatics and a MSc. in Industrial Engineering by the University of Oviedo (Spain). Since 1996 Dr. Campos has participated in diverse international R&D initiatives at research or management levels, first as full-time associate professor of the University of Oviedo and from 2005 to 2011 as the Director for Research and innovation of CTIC Technological Center.

Dr Raul Palma is a researcher at Poznan Supercomputing and Networking Center. His interests include provenance and evolution, preservation of data and methods, ontology engineering, semantic and distributed technologies. He received his PhD in Artificial Intelligence from Universidad Politécnica de Madrid (UPM) with honors. He has participated in several EU projects, such as the Network of Excellence Knowledge Web (IST-2004-507482), NeOn project (IST-2005-027595), e-Lico (ICT-231519) and has coordinated PSNC participation in WF4Ever project (ICT-2007-6 270192). He has published over 25 papers and book chapters and has authored or co-authored several vocabularies and ontologies.

Walter Mayer has a university degree at the University for Applied Life Science and Natural Resources Vienna (1975) for forestry, avalanches and torrents and a college degree of agriculture (Matura) (1968). His job history led him from his activities with the Forstverwaltung Schwarzenberg and the foundation of the company ZEMA GmbH, Austria-Sales of Apple u. Acer Computer (1978 – 1985) to the foundation of his civil-engineer office (1984). Since 1988, Mr. Mayer has been dealing with the development of software for the management of forest and agricultural enterprises and founded PROGIS (1995).

Type of the presentation proposed: **In-use contribution**

Title of the presentation: **FOODIE: Farm-Oriented Open Data in Europe**

Summary of the presentation

The agriculture sector is a unique sector due to its strategic importance for both European citizens (consumers) and European economy (regional and global) which, ideally, should make the whole sector a network of interacting organizations. Rural areas are of particular importance with respect to the agro-food sector and should be specifically addressed within this scope. The different groups of stakeholders involved in the agricultural activities have to

manage many different and heterogeneous sources of information that need to be combined in order to make economically and environmentally sound decisions, which include (among others) the definition of policies (subsidies, standardisation and regulation, national strategies for rural development, climate change), valuation of ecological performances, development of sustainable agriculture, crop recollection timing and pricing, plagues detection, etc. Such processes are very labour intensive because most parts have to be executed manually and the necessary information is not always available or easily accessible. In this context, future agriculture knowledge management systems have to support not only direct profitability of agriculture or environment protection, but also activities of individuals and groups allowing effective collaboration among groups in agri-food industry, consumers, public administrations and wider stakeholders communities, especially in rural domain.

To that end FOODIE project aims at building an **open and interoperable** agricultural specialized **platform hub** on the cloud for the **management of spatial and non-spatial data** relevant for farming production; for **discovery of spatial and non-spatial** agriculture related data from heterogeneous sources; **integration of existing and valuable European open datasets related to agriculture; data publication and data linking** of **external agriculture data sources contributed by different public and private stakeholders** allowing to **provide specific and high-value applications and services** for the support in the planning and decision-making processes of different stakeholders groups related to the agricultural and environmental domains.

Extended Abstract:

1. Introduction

The agriculture sector is a unique sector due to its strategic importance for both European citizens (consumers) and European economy (regional and global) which, ideally, should make the whole sector a network of interacting organizations. Rural areas are of particular importance with respect to the agro-food sector and should be specifically addressed within this scope.

There is an increasing tension, the like of which is not experienced in any other sector, between the requirements to assure full safety and keep costs under control, but also assure the long-term strategic interests of Europe and worldwide. In that sense, agricultural production influences, and is influenced by water quality and quantity, ecosystems, biodiversity, the economy, and energy use and supply. The seasonality and ubiquity of agriculture make agricultural practices and production amenable to efficient synoptic monitoring. Besides, food supplies depend on trends in the natural environment, including weather and climate, freshwater supplies, soil moisture and other variables. At the same time, modern agriculture has a major impact on the environment while damaging biodiversity. Unless they are sustainably managed, farms and pastures can cause erosion, desertification, chemical pollution and water shortages. These risks need to be monitored and managed by devising in effect. Therefore, from this it can be concluded that the balance between food safety and food security will be important task for future farming worldwide, but also for farming knowledge management.

The different groups of stakeholders involved in the agricultural activities have to manage many different and heterogeneous sources of information that need to be combined in order to make economically and environmentally sound decisions, which include (among others) the definition of policies (subsidies, standardisation and regulation, national strategies for rural development, climate change), valuation of ecological performances, development of sustainable agriculture, crop recollection timing and pricing, plagues detection, etc.

Such processes are very labour intensive because most parts have to be executed manually and the necessary information is not always available or easily accessible. Thus, for instance, typical farm activities carried out by farmers include the monitoring field operations, managing the finances and applying for subsidies, depending on different software applications. Farmers need to use different tools to manage monitoring and data acquisition on-line in the field. They need to analyse information related to subsidies, and to communicate with tax offices, product resellers etc.

In this context, future agriculture knowledge management systems have to support not only direct profitability of agriculture or environment protection, but also activities of individuals and groups allowing effective collaboration among groups in agri-food industry, consumers, public administrations and wider stakeholders communities, especially in rural domain.

Besides, knowledge management on the agriculture domain is usually divided into three interrelated levels:

- **Macro level**, which includes management of external information (for example about market, subsidies system, weather prediction, global market and traceability systems);
- **Farm level**, which includes for example economical systems, crop rotation, decision supporting system;
- **Field (micro) level** including precision farming, collection of information about traceability and in the future also robotics.

But to exploit all these data, converted into information and finally distilled as knowledge, it is necessary to contextualize and manage this knowledge with adequate software services that assists the flow of information and synchronizes all resources and activities within a farm, making them part of farm business processes. Inventory, manufacturing, distribution, logistic, shipping, construction, and accounting processes must benefit from agriculture knowledge management to realize a new generation of ERP Software Services for modern farms, rather than using any standalone software application or any combination of them.

To that end FOODIE project aims at building an **open and interoperable** agricultural specialized **platform hub** on the cloud (which is conceptualized in Figure 1) for the **management of spatial and non-spatial data** relevant for farming production; for **discovery of spatial and non-spatial** agriculture related data from heterogeneous sources; **integration of existing and valuable European open datasets related to agriculture; data publication and data linking** of **external agriculture data sources contributed by different public and private stakeholders** allowing to **provide specific and high-value applications and services** for the support in the planning and decision-making processes of different stakeholders groups related to the agricultural and environmental domains.

2. FOODIE project approach

In order to realize FOODIE concept and the associated service platform hub (Figure 1), the project will aim at accomplishing the following technological objectives:

- To make use of existing spatial information resources and services for various domains – coming from different initiatives like INSPIRE,SISE, GMES/Copernicus, GNSS, GALILEO, GEOSS , GBIF, EUNIS, EEA, EUROSTAT, etc. - where the EC and the member states have invested heavily over the past decade,
- To design and provide an open and interoperable geospatial platform hub on the cloud based on existing software components from research results and available solutions in the market (mostly open-source) that includes:
- integration of external agriculture production and food market data using principles of Open Linked Data
- an open and flexible lightweight Application Programming Interface (API), that allows private and public stakeholders in the agricultural and environmental area to publish their own datasets (e.g., datasets provided by local sensor networks deployed in situ in farms, knowledge from farm communities, agricultural services companies, etc.) and make it available in the platform hub as open linked data (and enabling it to further processing and reasoning over it)
- specific and high-value applications and services for the support in the planning and decision-making processes of the different stakeholders groups

- provision of security mechanisms to prevent the unauthorised access and use of the platform users' personal information as well as the data published by them
- a marketplace where data can be discovered and exchanged but also external companies can publish their own agricultural applications based on the data, services and applications provided by FOODIE.

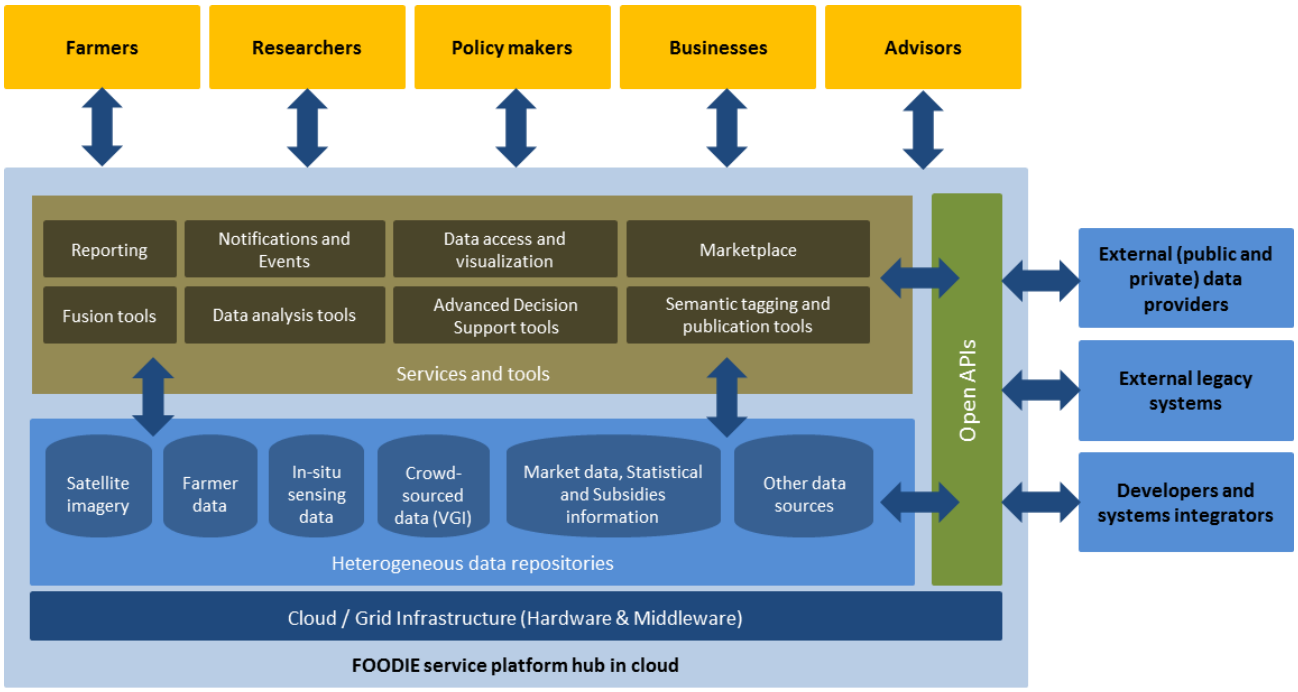

Figure 1: FOODIE service platform hub in cloud

Besides, to facilitate integrating and deploying services over FOODIE, and trying to assure FOODIE success in the mid-term, it will be taken into account state of the art and expected evolution of management services and data marketplaces for the next years. In that sense, FOODIE will seek and provide the following innovative aspects:

- **Cloud deploying of basic and standardized services**, which will decrease not only deploying costs but also production and maintenance costs. Cloud deployment will also make easier integration and realize the vision of a "network of data-hubs", sharing data and services to provide a new data exploitation ecosystem where data is enriched by composition. Collaboration among hubs will enable a market for *data brokerage*, kind of data hub which do not store data but locates, summarizes, enrich and disaggregate data to provide vertical services of high added value.
- **Easily discoverability and composability of services**. Not only data and services published and deployed by FOODIE will follow (de facto) standards as far as possible, but guides to build and deploy services over FOODIE will be publicly available so any service can not only be easily found by end users or third party companies but also can, with the adequate access management, be reused alone or by composition with other services to provide a richer or a particular solution. This approach will also enable a personalization market realized by third-party, specialized companies in vertical markets.
- **"Pay as you go" paradigm**. Services or data published by FOODIE can be free or non-free. For instance, FOODIE will provide for free a global agriculture sector balanced scorecard

and a non-free repository where key indicators for the agriculture sector may be obtained and combined by all stakeholders to make their own balanced scorecard. FOODIE may also go a step further providing analysis based on free indicators to provide free, white papers or sample reports and non-free, only for subscription members, reports. This paradigm will enable third parties as for instance consultancy companies to sell consultancy services (reports, etc.) on top of FOODIE information.

- **Reward mechanisms for data sharing**. Open data are the key value of FOODIE, but also volunteered data and knowledge shared among user's communities. FOODIE will promote participation of stakeholders and end users (high value data owners) in terms of "the more information you provide to the hub, the more data and services for free you will enjoy". Also, this approach will help to build virtual communities and exploit social knowledge.
- **Clear Return of Investment (ROI) for the end user**. The current economic situation makes reduction of costs a strategic pillar of a large number of companies. FOODIE must develop a business model which, during the marketing process, clearly demonstrate the value of services in ROI terms (i.e. FOODIE may include a simulator which calculates, asking a few questions about a crop, reduction of costs by rationalizing the use of fertilizers, water… thus quickly amortizing the cost of the service)
- **Multi-device/multiplatform/multipurpose front-ends**. FOODIE will include mechanisms allowing users to exploit information and services by means of graphical and intuitive interfaces. Standards as HTML5 widgets for visualization will be preferred to assure compliance with mobility devices, as they provide automatic means to perform interface adaptation according to specific hardware and software capabilities.

3. Pilot scenarios

FOODIE concepts and objectives will be realized by means of the resulting service platform hub, which will be demonstrated in three different pilot scenarios across Europe (Spain, Czech Republic and Germany), providing each of them thus a set of common and specific requirements (from their stakeholders) in terms of data and services that will be fulfilled by the platform.

More concretely,

- Pilot 1: Precision Viticulture (Spain) will focus on the appropriate management of the inherent variability of crops, an increase in economic benefits and a reduction of environmental impact.
- Pilot 2: Open Data for Strategic and Tactical planning (Czech Republic) will focus on improving future management of agricultural companies (farms), introducing new tools and management methods, which will follow the cost optimization path, reduction of environmental burden, improving the energy balance while maintaining production level.
- Pilot 3: Technology allows integration of logistics via service providers and farm management including traceability (Germany). This pilot will focus on integrating the German Machine Cooperatives systems with existing farm management systems and logistic systems as well as to develop and enlarge existing org-cooperation models and business models with the different chain partners to create win-win situations for all of them with the help of IT solutions.