MTT CropInfra

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Abstract. CropInfra is a development and testing platform for future agricultural production, information and knowledge management infrastructure.

1   History and Motivation of MTT CropInfra

Farmers around the world and especially in the western world have for decades faced growing pressure to increase the efficiency of their production, because of rising prices in production inputs and environmental requirements. Administrative tasks have also increased the work load of the farmer. Recently also the food processing and retail industry and consumers are imposing new and continuous requirements for producers to produce more sustainable products and to provide information about the products for the food production chain as well as to consumers.

To manage resources efficiently, the ideology of precision farming was formed. In precision farming each production unit, is treated individually according to its needs. Precision agriculture has not made a true breakthrough. A reason for this is the lack of efficient data management, equipment interoperability and knowledge models to take advantage of precision agriculture machinery.

A Nordic InfoXT project studied the infrastructure needs for agricultural production and precision farming. The project proposed a web based distributed and networked production infrastructure. [1] The description of this infrastructure laid the ground work for CropInfra platform.

2   Description of MTT CropInfra

CropInfra is constructed at MTT Vakola's farm, which is a research farm located in the Southern Finland. MTT Vakola's farm has 150 ha arable farm that produces cereals and silage grass. CropInfra infrastructure consists of MTT Vakola's research and testing infrastructure; MTT Vakola's fields and farming machinery, Soil weather sensor network and the local monitoring sensor networks.

Research outputs produced in MTT are implemented into CropInfra platform to be tested in, and used in actual farming operations. These implementations include outputs from the machine automation research as well as results of information and knowledge management research.

CropInfra platform is used to gather and store information about field operations and environment, like the fertility of the land, the state of the land, meteorological information, water flows, and nutrients in leaching waters. CropInfra platform is also used to plan farming operations. Specific services are created to merge, aggregate and utilize the collected farm data, an example is the plant decease forecast and alarm service. CropInfra platform also assists in execution of farming operations. CropInfra platform stores and distributes work tasks to farm machinery, monitors and documents the execution of given tasks, creating data to be used in planning of the future farming operations. The massive work-data collection makes it possible to simulate, test and develop different data modeling, proofing, refining, filtering and aggregation methods and systems. Also, the level of information and performance accuracy can be studied.

Principles of networked systems in farm management information systems were further studied in European FutureFarm project. The Project concluded that the future system will be distributed system of services and repositories. [2]

CropInfra's information management is built according to SOA-principles as a distributed networked system, as suggested by research views. In CropInfra data is collected into databases and a web service layer is built on top of these databases. Web services are tailored and used to create assisting services for planning, development and execution of farming operations, which are required for enabling precision agriculture practices. Figure 1 illustrates structure and functionalities of MTT CropInfra information infrastructure.
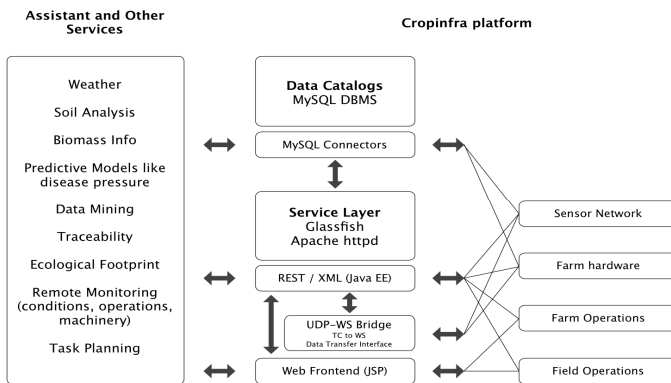

Fig. 1. MTT CropInfra platform information infrastructure and services

References

1. Pesonen, et al.: InfoXT - User-centric mobile information management in automated plant production. Nordic Innovation Centre (2008)
2. Pesonen, et. al.: Final report and documentation specifications of FMIS, FutureFarm Deliverable (2011), http://www.futurefarm.eu/system/files/ FFD3.7_Final_Rep_Doc_Spec_Final_0.pdf