ICT infrastructure of ADDFerti

- A Data-Driven Platform for Site-Specific Fertigation –

One of the challenges in precision farming is the heterogeneity of the data and the sensors including both proximal and remote sensing tools. Particularly for this project the geographic distance between the project partners needs also to be taken into consideration. To mitigate this, ICT systems need to be developed, which can work with different data sources and are also easy and intuitively to operate. The goal of the intended fully automated web-based spatial data infrastructure (SDI) to be developed under ADDFerti is that sensor data can be retrieved and processed online, feed into web processing services and get real-time recommendations for precision farming applications.

ICT infrastructure

Precision farming relies to a high extent on spatially related information of crops and soil attributes in addition to other auxiliary data. These spatial information needs to be collected, processed and provided to modern machinery as recommendation maps in form of compatible shape files. The proposed software architecture for this project is SDI to host sensor data, to support automatic decision-making processes and to send recommendation maps to precision farming applications (see Figure 1). Sensor data can be uploaded through a user-friendly web UI or REST API. A decision support system (DSS) can be integrated as WPS to calculate the fertigation recommendations of the different management zones in a field to be sent to the hose reel irrigation system (HIS) control unit. Layers and maps hosted on the SDI can be used in Desktop GIS and Browser applications through OGC (Open Geospatial Consortium)-Services.
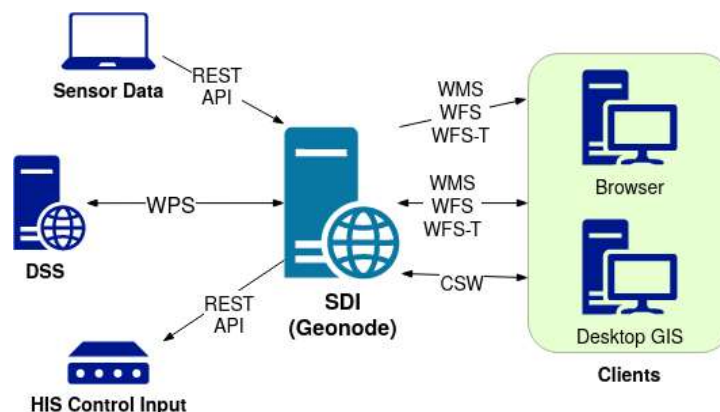

Figure 1: Prototypical ICT-Infrastructure of ADDFerti.

Geodata portal

The central building block of the ICT infrastructure is the geodata portal. For the ADDFerti project it fulfils multiple functions, which are a structured (geo)data storage (Database), a metadata catalogue, open APIs to upload, download and edit data, hosting of OGC-Services (WMS, WFS, WCS, WPS) and WebGIS functions.

The geodata portal was built with GeoNode [1] as a framework. GeoNode is an open source project [2] for building spatial data infrastructures. Figure 2 shows its core components. GeoNode is written in JavaScript and Python, uses Django as a web framework and nginx as a webserver. It can handle different database management systems; for this project PostgreSQL, with the PostGIS extender for spatial database support is used. A on OGC and ISO standards based metadata and catalogue service is provided by pyCSW. To enhance performance the web application GeoWebCache is integrated to cache map imagery.
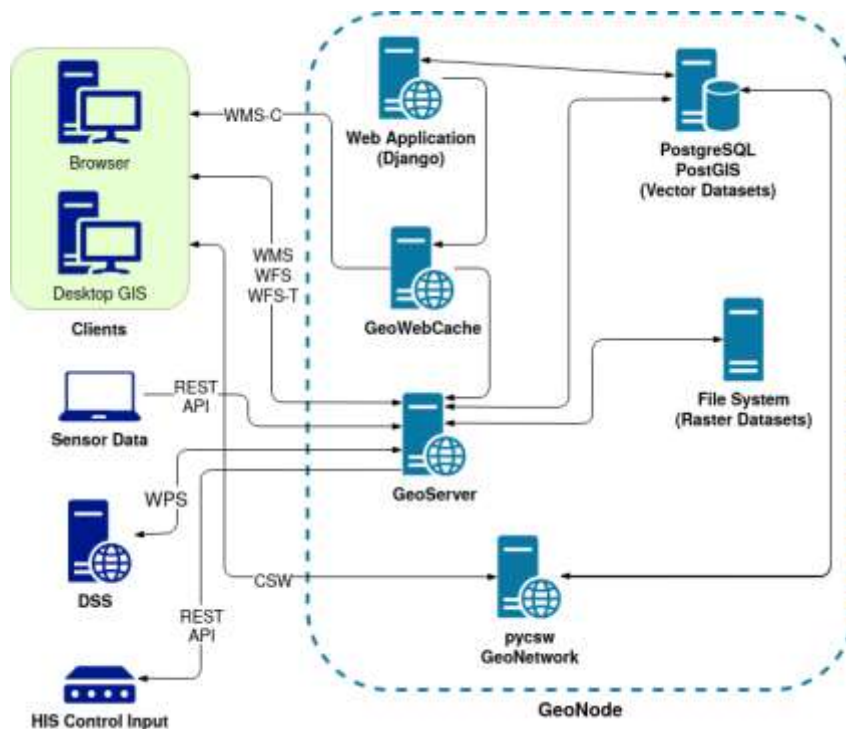

Figure 2: Internal architecture of GeoNode in context to the prototypical ICT-infrastructure of ADDFerti.

Relevant Links:

[1] GeoNode. https://geonode.org

[2] GeoNode Github repository. https://github.com/GeoNode