

GEOHUB SERVER

FROM DAILY UPDATED SATELLITE DATA TO USER-FRIENDLY APPLICATIONS

<https://www.geohub.net>

<https://app.geohub.net/compute/>

1. [General Description](#)
2. [Capabilities](#)
3. [Why use Geohub server?](#)
4. [Architecture](#)
 1. [Description](#)
 2. [Scheme](#)
5. [Automated Data & AI-Driven Insights](#)
6. [Licensing](#)
7. [User experience](#)
8. [Interoperability and data integration](#)
9. [Service Levels](#)
10. [Usage example](#)
 1. [Scenarios](#)
 2. [Video](#)
11. [Storage:](#)
 1. [Description](#)
 2. [Structure](#)
12. [Tools & Functionalities](#)
13. [User and regional impact](#)
14. [Integrated open apps](#)
15. [Use Instructions](#)
16. [Collaboration opportunities](#)

1. GeoHub Server - General description

An enterprise geographical data platform developed from scratch by BSS

Unified and Scalable

- Efficient decision-making
- Operational excellence
- Sharing data between users
- Can be run on GNU/Linux, MacOS and Windows

Secure and reliable data infrastructure

- Enterprise-level privacy and security
- Fully versioned with edit history
- Automated processing and web publishing of geographical data
- Encrypted & backed up daily

Serving a wide range of users:

- Forestry, agriculture, and utilities
- Municipalities and government agencies
- Private companies
- R&D institutions and universities

End-to-End EO Service Platform

Dataset

Discover and select data, services, and applications

Upload

Upload, validate, and deploy custom applications

Process

Process, analyze, and visualize geospatial data

Publish

Publish results and products for reuse by other users

3. Why use GeoHub Server?

- ✓ Always up to date (5+ years history + the most actual data)
- ✓ Ready for integration into public and private sector workflows
- ✓ Secure and cost-efficient operations
- ✓ Simple, user-friendly interface
- ✓ From data to ready-to-use apps
- ✓ Superior user support
- ✓ Uses local licensing
- ✓ Full data sovereignty

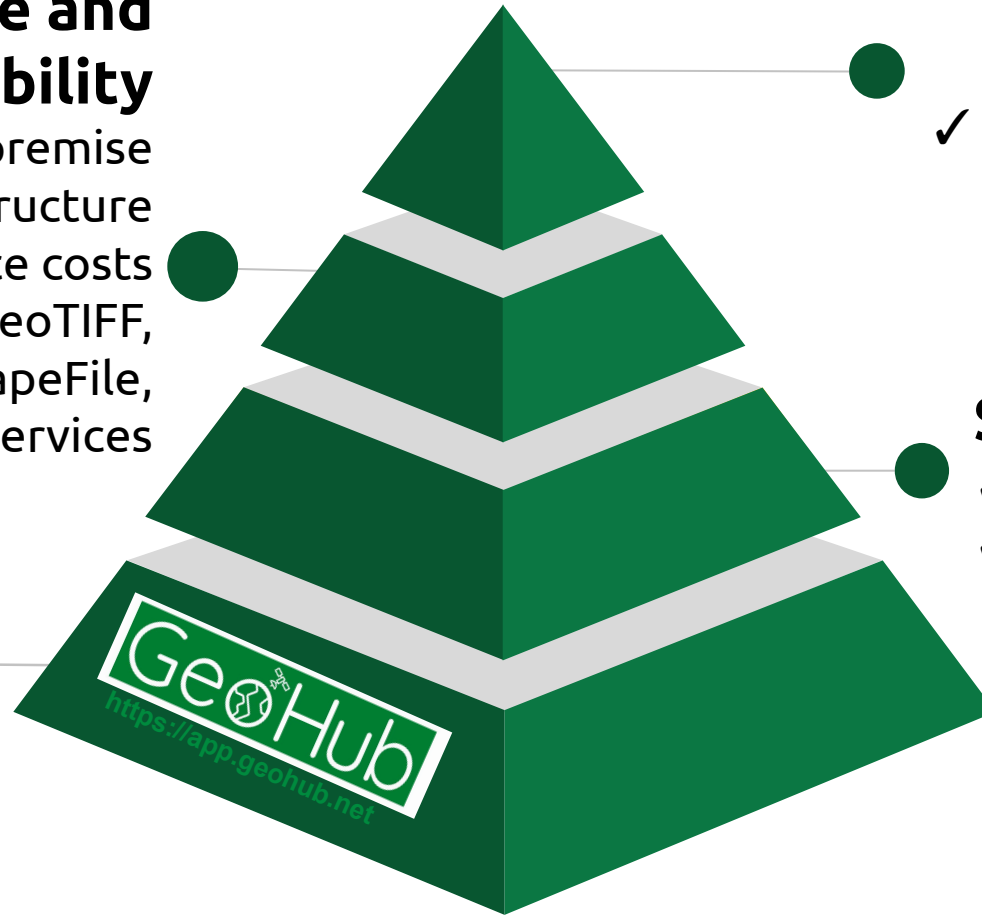
4.1. Geohub Server - Architecture Description

Built for Performance and Adaptability

- ✓ Deployment in cloud and/or on-premise infrastructure
 - ✓ Low maintenance costs
- ✓ Multi-format publishing : GeoTIFF, SpatiaLite, GeoJSON, ShapeFile, XYZ/TMS, WMS, MVT services

Licensing

- ✓ Uses local licensing
- ✓ Full data sovereignty
- ✓ No data leaves customer infrastructure
- ✓ Only open data standards used



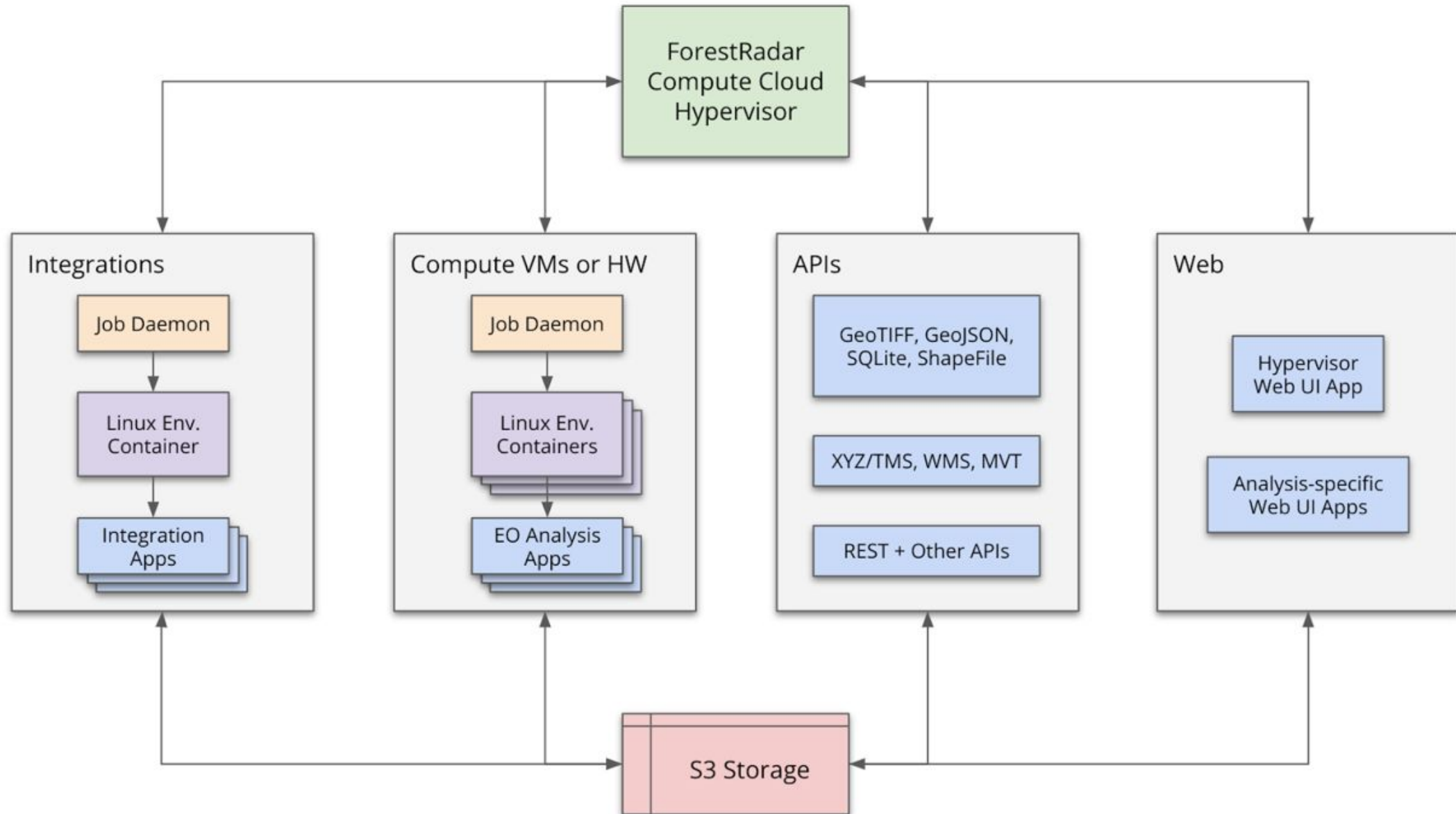
Flexible

- ✓ Flexible architecture tailored to different operational needs
- ✓ Data source flexibility - Sentinel (1/2/3/5/6) + Lidar, orthophoto, custom integrations

Scalable

- ✓ Virtually unlimited scalability
- ✓ Large processing capacity : 80k+ CPU hours/month, 30-170k jobs/month, 16vCPU+120GB per job

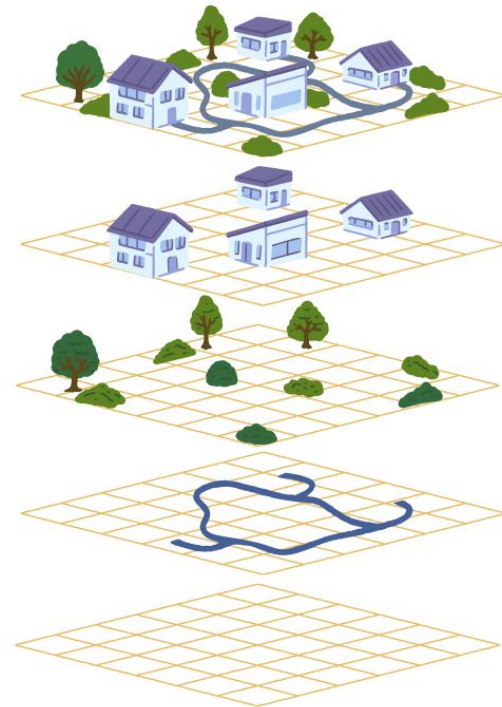
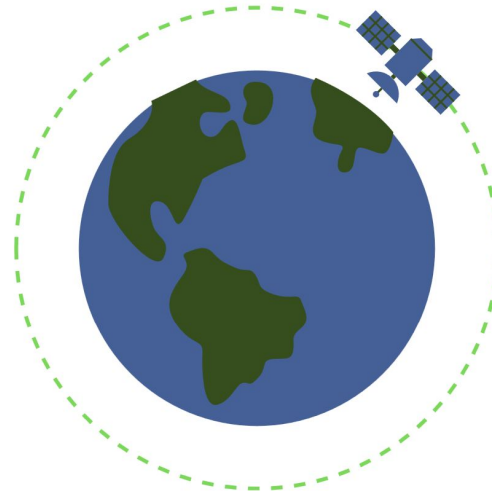
4.2. Geohub Server - Architecture Scheme



5. Automated Data & AI-Driven Insights

From Data to Actionable Intelligence

- ✓ Automated data pipelines (satellite, orthophoto, drone, sensor, harvester, and other geospatial data)
- ✓ End-to-end automated processing workflows
- ✓ AI-powered analytics for fast, reliable, and up-to-date insights
- ✓ Real-time access to critical information



6. GeoHub Server – Licensing

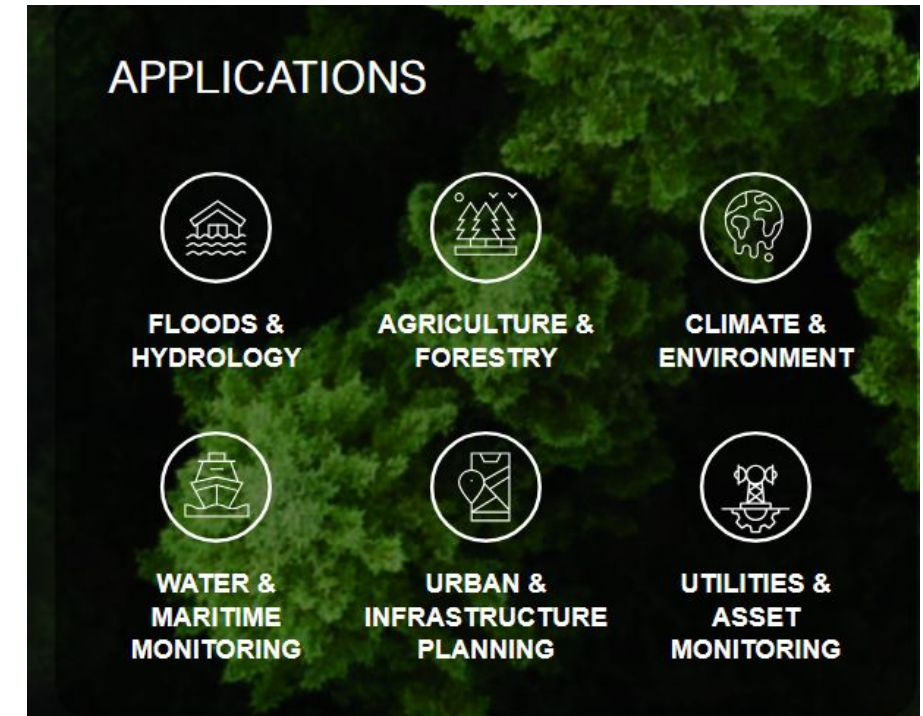
Enables local work processing

- ✓ Uses local licensing – no internet/cloud access needed
- ✓ Full data sovereignty:
 - ◆ Organisation fully owns and always has access to its data, even after software license has expired
 - ◆ BSS or any third parties can't access it if it hasn't been explicitly published
 - ◆ Organisation can use any other software to integrate with the system

7. Geohub Server - User Experience

Powerful Yet Easy to Use

- ✓ User-friendly interface – **no coding required**
- ✓ Built-in AI capabilities for change detection:
 - ◆ Fires, floods, temporary structures, and more
 - ◆ Urban environments
 - ◆ Infrastructure risk zones
 - ◆ Forest and land-use monitoring
- ✓ Fast deployment and onboarding
- ✓ Virtual assistant



8. Interoperability and data integration

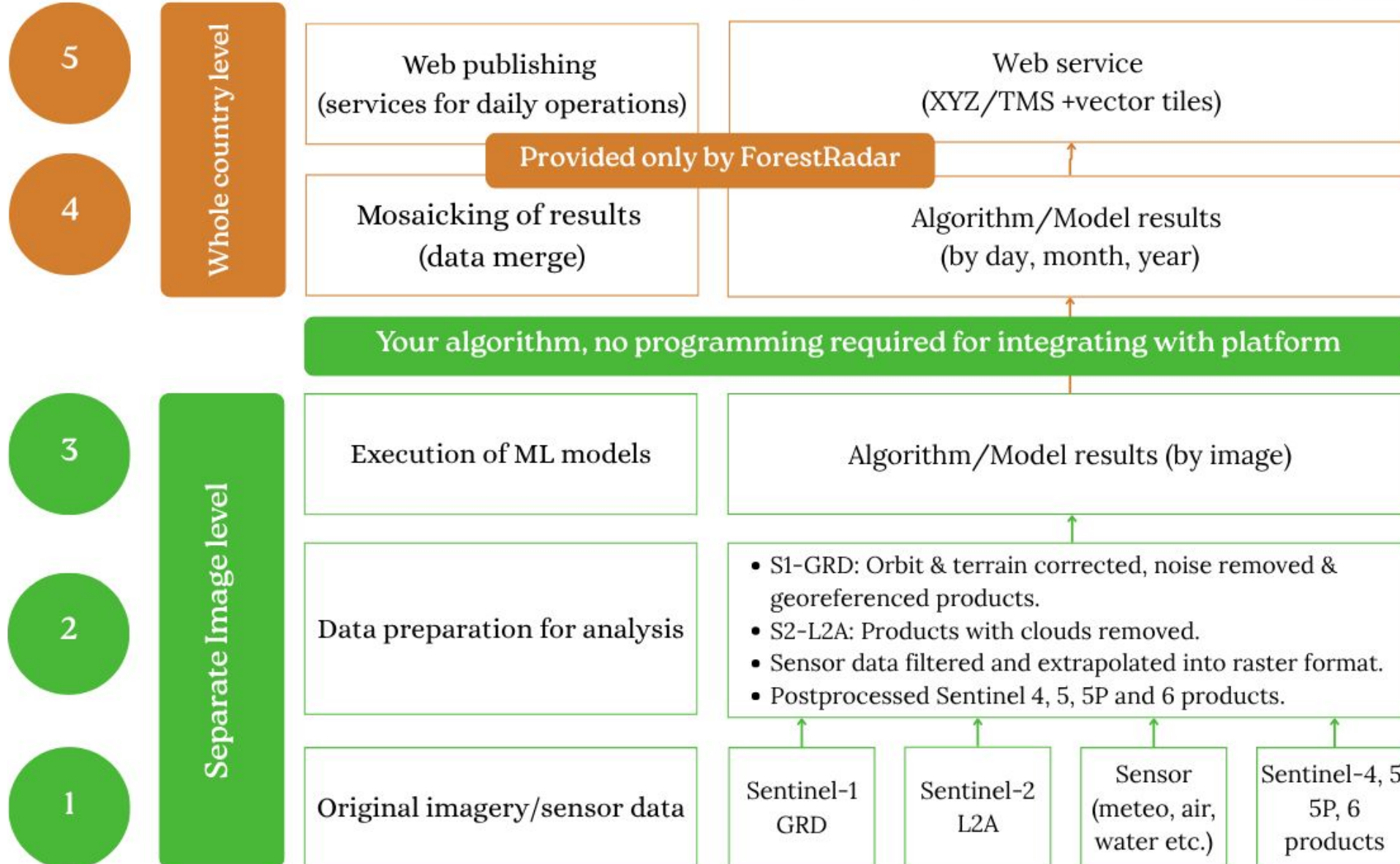
Seamless Integration with Existing Systems

- ✓ Interoperable with e-government platforms
- ✓ Integration of public and private geospatial data sources
- ✓ Support for standard web services:
 - ◆ XYZ / TMS
 - ◆ WMS
 - ◆ JSON / GeoJSON
- ✓ Easy data sharing with external systems (e.g., QGIS, ArcGIS)
- ✓ S3-compatible storage for seamless cloud integration

9. GeoHub Server - Service Levels

Service level

Earth Observation Data Platform *provided by Baltic Satellite Service*



10.1. GeoHub Server - Usage example scenarios

The screenshot displays the GeoHub web application interface. On the left is a dark sidebar with the 'GeoHub' logo, a 'Files' button, a language dropdown set to 'English', and buttons for 'Help', 'Apps', and 'Log out'. The main area is split into two panels. The left panel, titled 'Files', shows a file browser for the user '/bss/andrei' with a list of files: 'data', 'env', 'log', 'proj', 'tool', and 'Containerfile'. The 'Containerfile' is selected. The right panel, titled 'Containerfile', shows the content of the selected file, which is a Dockerfile script. At the bottom of the interface are buttons for 'Upload', 'Create new', 'Open', 'Revert', 'Save', and 'Save as'.

Files /bss/andrei

Back Forward Up Home

data
env
log
proj
tool
Containerfile

Containerfile

```
FROM docker.io/library/debian:latest

RUN apt-get update && \
  apt-get install -y curl git gnupg jq parallel rclone rsync sqlite3 time wget zip && \
  apt-get install -y gdal-bin g++ libgdal-dev pipx python3 python3-dev python3-gdal python3-pip \
  python3-venv && \
  apt-get clean

RUN pipx install pypyp && \
  pipx ensurepath

RUN python3 -m venv /root/venv && \
  /root/venv/bin/pip install --upgrade pip setuptools wheel

RUN /root/venv/bin/pip install --upgrade numpy

RUN /root/venv/bin/pip install --upgrade gdal==$(gdal-config --version)
```

Upload Create new Open Revert Save Save as

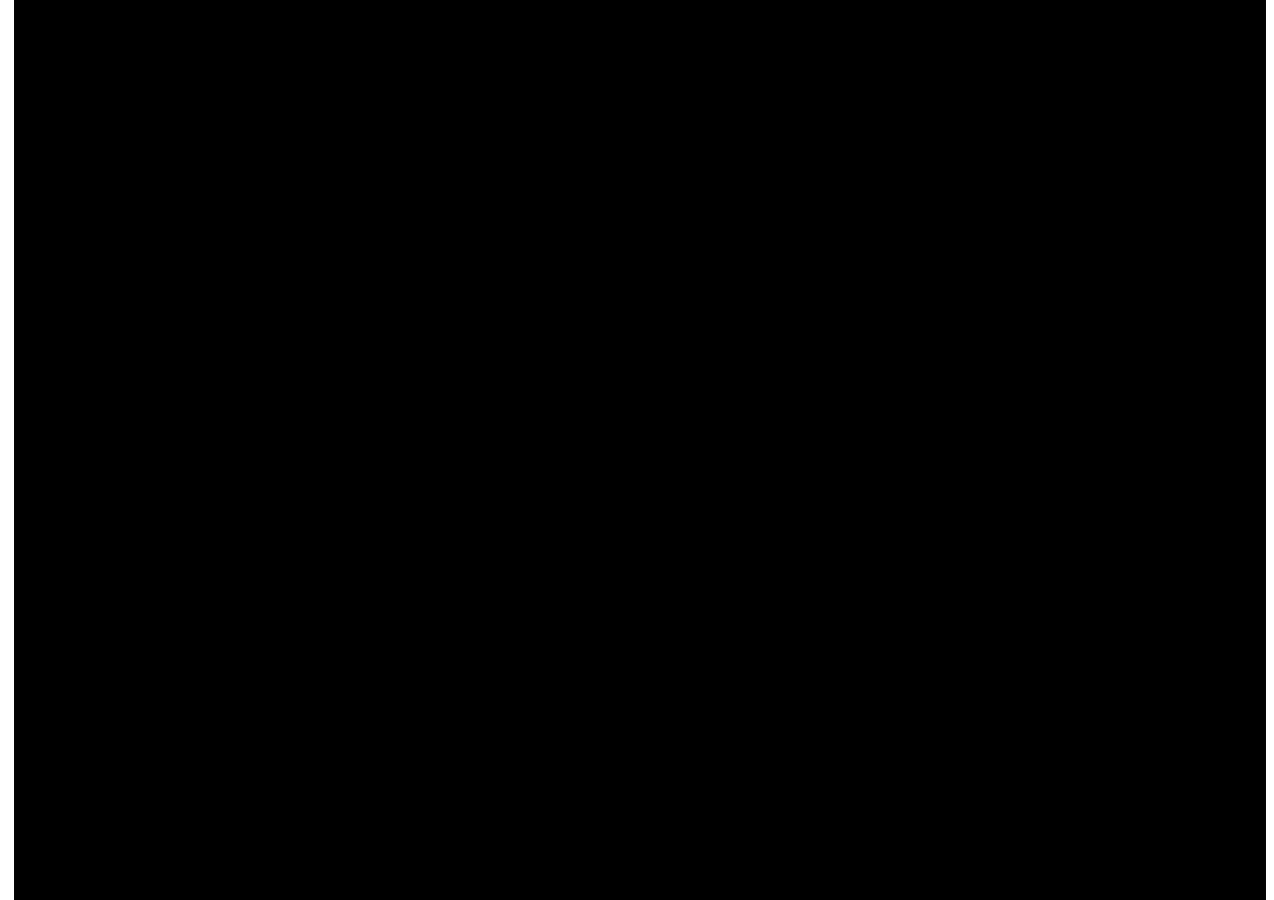
SCENARIOS:

1. Exploring existing platform data.
2. Uploading and downloading data to/from the platform.
3. Running data conversion and web publishing tasks.
4. Sharing data with other users.
5. Setting rules and triggering users tools.
6. Creating environments to use for users tools.

10.2. GeoHub Server - Usage example video

Example video:

1. Creating new directory inside *.data/*
2. Deleting an object;
3. Uploading a file from local device;
4. Creating a .txt file from Geohub;
5. Opening, updating and saving the example text file.



11.1 Geohub Server - Storage Description

Standardised

- ✓ Follows UNIX's Everything is a File principle
 - ✓ Globally unique file paths
- ✓ All configuration lives as text files in storage
- ✓ Same data access served via web-accessible REST API and web UI
- ✓ Industry-standard S3 storage, accessible with FOSS and proprietary software clients



Versatile

- ✓ Ability to attach/mount locally on GNU/Linux, MacOS and Windows
- ✓ Bring your own storage:
 - ◆ Attach your local/network storage or S3-compatible storage
 - ◆ Use one of the cheap EU-based S3 cloud-based storage providers

Secure

- ✓ User access control – manage access for each user on a file/folder level
- ✓ Automatic file history and backups
- ✓ Complete data access logs
- ✓ Full data encryption at rest (AES-GCM or ChaCha20-Poly1305)
- ✓ Data sharing with external organisations

11.2 GeoHub Server - Storage Structure

Simple and categorized, the paths are always defined as ***geohub/[org]/[user]/**** and are classified as:

Path	Description	Storage structure
<i>./data</i>	user uploaded data files	user-defined structure
<i>./env/[name]/[version/[source]/container file</i>	user uploaded environments	system-defined structure
<i>./log/[tool]/[log_id].log</i>	log files created by executing tools	system-defined structure
<i>./rule/rule.toml</i>	user uploaded rules to trigger tools	system-defined structure
<i>./srcv</i>	web services	system-defined structure
<i>./tool/[name]/[version/[source]/run.sh</i>	user uploaded tools	system-defined structure
<i>./proj</i>	user uploaded data files for designated projects	user-defined structure

12. GeoHub Server - Automated processing

Tool and Environment Creation

- Prepares and packages users tool for testing
- Container image build from user source inputs
- Easy to follow instructions and help support
- Updates automatically upon change in tool source files

Rule Based Task System

- Built-in task queue and a hypervisor
- Distributed processing on GNU/Linux, MacOS and Windows
- Run containerised tasks (GDAL, Matlab, Python) and locally installed tools (ArcGIS)
- Data access managed automatically by using centralised S3 storage
- Interval-based automated processing, ex. for external integrations
- All tasks are accessible and can be manipulated as files
- Automated logging system for task output

Web Publishing

- Built-in static web app hosting
- XYZ/TMS and WMS web services for raster data
- GeoJSON and MVT+JSON web services for vector data
- Time/versioning support for web services
- On-the-fly server-side rendering for XYZ/TMS and WMS
- Unified authentication and authorisation

13. Geohub Server - User and regional impact

Accessible

Designed for both non-technical users and professionals.

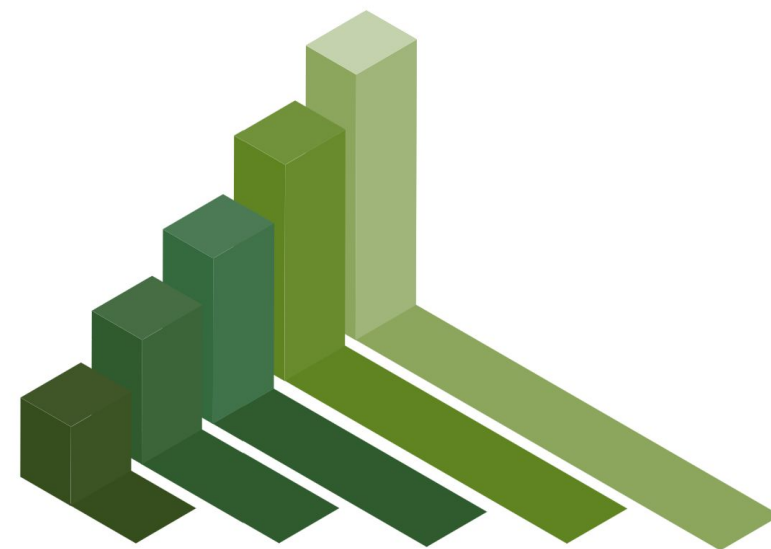


Collaborative

Facilitates collaboration between governments, institutions, and businesses.

Scalable

- ✓ Enables stakeholders across the European countries and beyond
- ✓ Supports deployment and delivery of EO-based services



14. GeoHub Server - Open apps integrated

- ✓ GeoHub Platform <https://app.geohub.net/compute>
- ✓ Infrastructure and settlement monitoring <https://app.geohub.net/datel>
- ✓ Forest Monitoring <https://app.geohub.net/forest/>
- ✓ Water Quality Monitoring <https://app.geohub.net/ku-water/>
- ✓ Maritime Monitoring <https://app.geohub.net/ku-ship/>
- ✓ Agricultural Land Monitoring <https://app.geohub.net/lad-fire-flood/>
- ✓ Natural Resource Extraction Monitoring <https://app.geohub.net/edi-nrem/>
- ✓ Habitat Monitoring <https://app.geohub.net/dap>
- ✓ SmartAgro <https://app.smartagro.lv>
- ✓ Ecosystem Services for Lubuskie <https://app.geohub.net/lubuskie/>



Agricultural land monitoring service
The main purpose of the application is to improve the management of agricultural land by effectively addressing fire and flooding problems. Key objectives include increasing efficiency through automated mapping using satellite imagery, supporting regulatory compliance processes and rapid response, and centralizing operations for better resource optimization. The application allows users to identify, monitor, analyze, download and manage agricultural areas affected by fires and floods.



Forest monitoring service
The Forest Monitoring Service provides monitoring of forestry activities, such as clearcuts, and detects windfalls, along with annual monitoring for less visible forest damage, including excess water, insects, disease, and fire, across the Baltics. This service reduces the need for manual surveys, allowing human resources to focus on damage prevention and enabling timely updates to the State Forest Registry.



Infrastructure and settlement monitoring service
Infrastructure and settlement monitoring application allows to observe subsidence in cities with population more than 60 thousand. The service supports monitoring and analyzing how construction activities affect nearby buildings/infrastructure, identifying and preempting potential issues. InSAR analysis shows vertical displacement grids for the biggest 10 Baltic cities. The grids are derived from the persistent scattered interferometric analysis (PS-InSAR) of Sentinel-1 satellite radar images. Multitemporal InSAR analyzes for the time period of one year are calculated monthly. The precision of InSAR derived displacements is 2 mm on average.



Earth Observation for Ecosystem Services in Lubuskie
Earth Observation products map portal for the Lubuskie Voivodship in Poland, developed under the EO-BALP-CCN1 project. Provides interactive access to satellite-derived thematic geodatasets for selected ecosystem services with multilingual support and on-demand layer information.



Marine monitoring service
This service by using synthetic aperture radar (SAR) technology complements the monitoring of marine vessels in the waters of the exclusive economic zone of the Baltic States, and allows the detection of vessels not connected to the automatic identification system (AIS), especially under harsh weather conditions. Such data can assist in identification of illegal activities such as fishing in protected areas or during prohibited periods, illegal dumping and water pollution.



Natural resource extraction monitoring service
The Natural Resource Extraction Monitoring service is intended to produce classified maps of Natural Resource Extraction sites using Sentinel-2 imagery and available reference information. Monitoring of the licensed extraction sites is performed by observing the changes of their geographical extent and comparing the licence data with the classification results.



Water quality monitoring service
Satellite data based Water Quality monitoring application significantly expands water monitoring for surface waters in time (weekly observations) and in space (on the scale of almost the entire water body) enhancing the assessment of water quality, the number of problematic water bodies, their change in time and the locations of hot spots. Combining such data with agricultural land monitoring data makes it possible to identify possible sources of impact and develop environmental measures to improve water quality.

15. GeoHub Server - Use Instructions

- ✓ **Tutorial videos of GeoHub open applications** (ENG, LV, LT, EE) - 2 to 4 minutes each
- ✓ **Regular trainings and superior user support**
- ✓ More information about the GeoHub: www.geohub.net



16. Collaboration Opportunities

1) Looking for:

- new users (government, commercial, R&D)
- app & service providers
- EO data contributors and developers

2) R&D Collaborations – EO, environmental and disaster risk monitoring, climate resilience, utility infrastructure, municipal services, other projects

(Open to ESA, Horizon Europe, INTERREG, ERAF and other funding programs)

3) GeoHub Forest Monitoring service offering through the **ESA NoR program for integration to end-user operational GIS/IT systems**