EUROPEAN UNION
SATELLITE CENTRE
Analysis for decision making

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Cloud Computing Case Studies & Applications for the Space and Security Domain

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Agenda

1. Introduction
2. European Context
3. GEOINT Workflow
4. Benefits of Cloud Computing
5. Use Cases

SatCen

EU SatCen

Who we are

A unique operational GEOINT instrument to support EU External Action

EU Agency based in Spain

GEOINT Service Provider

24/7 Availability

EO Data Analysis for Security

Our Mission

Analysis for decision making and actions in the field of CFSP/CSDP, including EU missions and operations, by providing products and services resulting from the exploitation of relevant space assets and collateral data

Our Current Engagements

Operations

Regional Conflicts

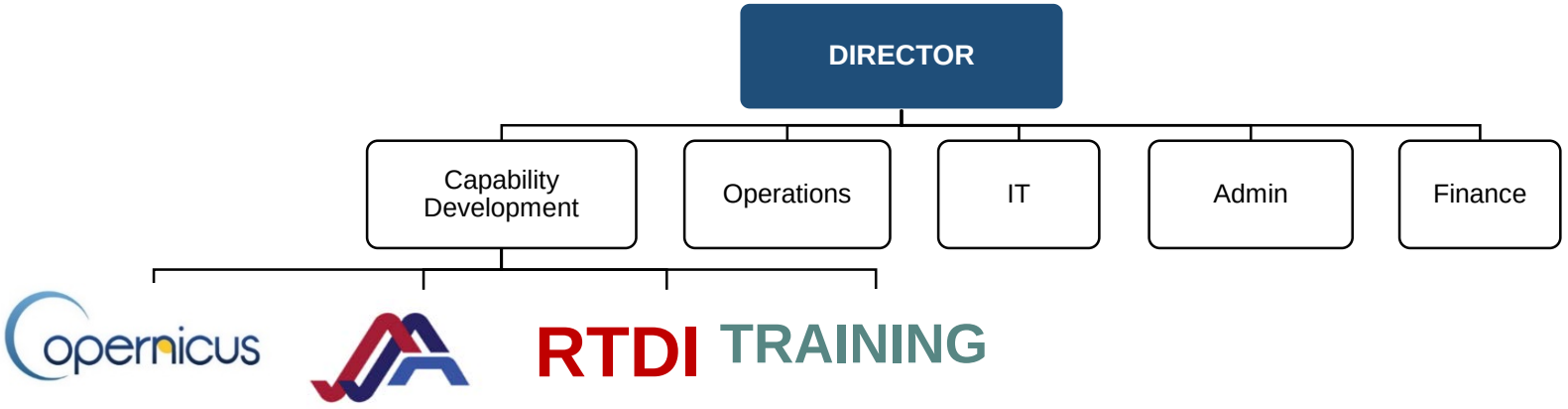
Piracy

Migration

Proliferation WMD

Humanitarian Aid

Research, Technology Development and Innovation

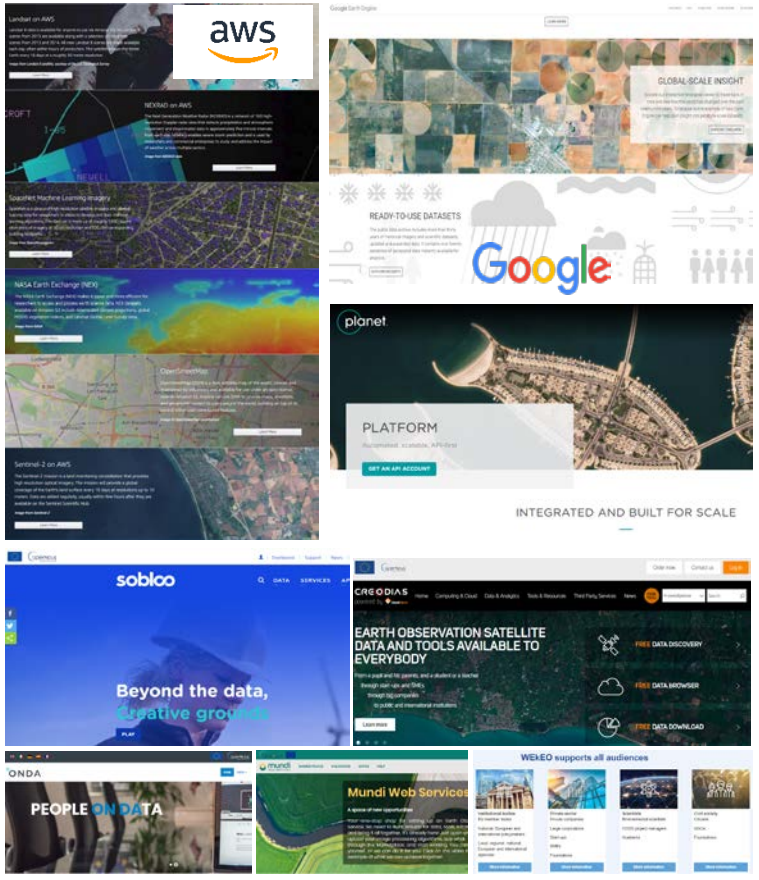


The ***Research, Technology Development and Innovation*** Unit is implementing new operational solutions looking at the whole EO and collateral data lifecycle:

- Cooperation (e.g. H2020 Projects, ESA, GEO)
- New Data Acquisition Systems (e.g. HAPS, Small Satellites)
- Alternative Data Sources (e.g. Mobile Networks)
- EO Based Applications (e.g. SAR Change Detection)
- Innovative Technologies (e.g. Big Data, Artificial Intelligence)

Space and Security – the European Context

- Open EO data as a driver for innovation
  - Fast discovery and access
  - Processing close to the data
  - New application domains
  - New user profiles
- EO downstream application landscape. A plethora of solutions, in a growing ecosystem
- Space and Security domain is heavily relying on effective processing of big geospatial data



Space and Security – the European Context

- European Policies on Space and Digitalisation
  - EU Cloud Initiative
  - Digital Single Market
  - EOSC
  - EU Comm(2012) 529
  - EU Space Strategy 2016

"common service working models"

"marketplace of efficient and effective services"

"independent, interoperable and exchangeable building blocks"

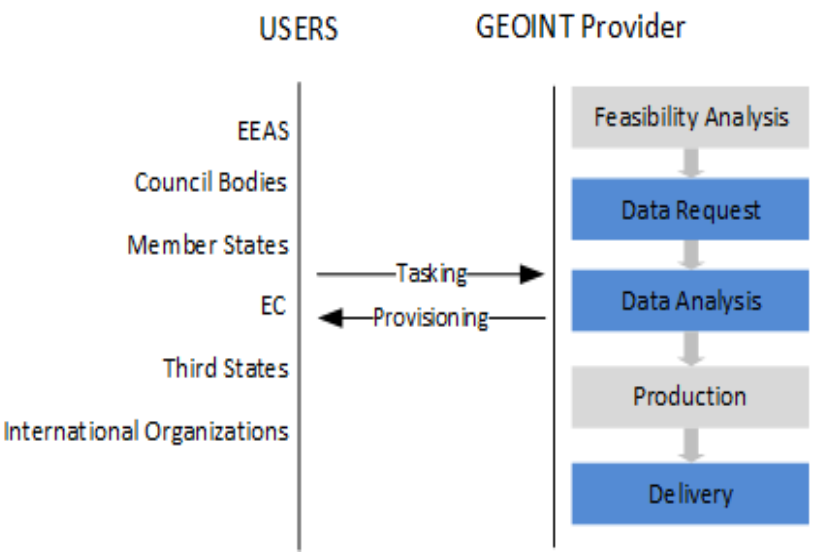
"FAIR digital objects"

"facilitate automatic processing"

Traditional GEOINT Workflows

- Space and Security

To support the decision making and actions of the EU in the field of the CFSP/CSDP, including operations, by providing products and services resulting from the exploitation of relevant space assets and collateral data



Message written by refugees during a crisis. It reads *help us*

Cloud impact on GEOINT Workflows

Data Request:

- Centralized data access avoiding the generation of isolated siloes
- Minimize Response Time
- Fostering FAIR principles
  - Findable
  - Accessible
  - Interoperable
  - Re-usable

Data Analysis and Production:

- Scalability , flexibility and elastic ICT infrastructure
- Cost-effective
- Processing close to the data
- More focus on added-value tasks for specialized staff
- Systematic analysis, recurrent processing, proactive processing

Product Delivery:

- Faster delivery and enhanced interoperability
- Easier management of geographically distributed users
- Need to ensure secure transfer of information (through controlled access protocols)

Opportunities from Cloud Adoption in Security

- Stronger security management
- More frequent updates and security patches
- Lower risk of local errors in isolated siloes

Cybersecurity

- Easier to meet demand – dynamically scale-up
- Better economies of scale – cost effective
- Potential for Standardisation

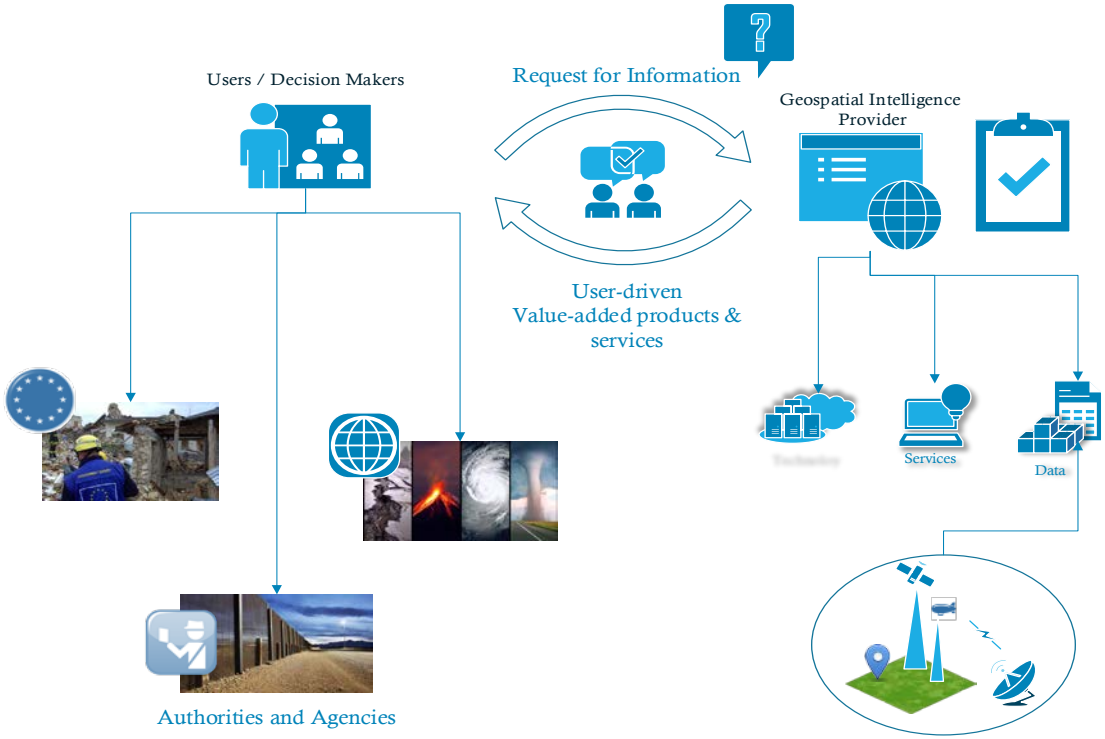
Flexibility and Scalability

- Less downtime, increased productivity, revenue and brand health
- Fast response in emergency situations

Disaster recovery

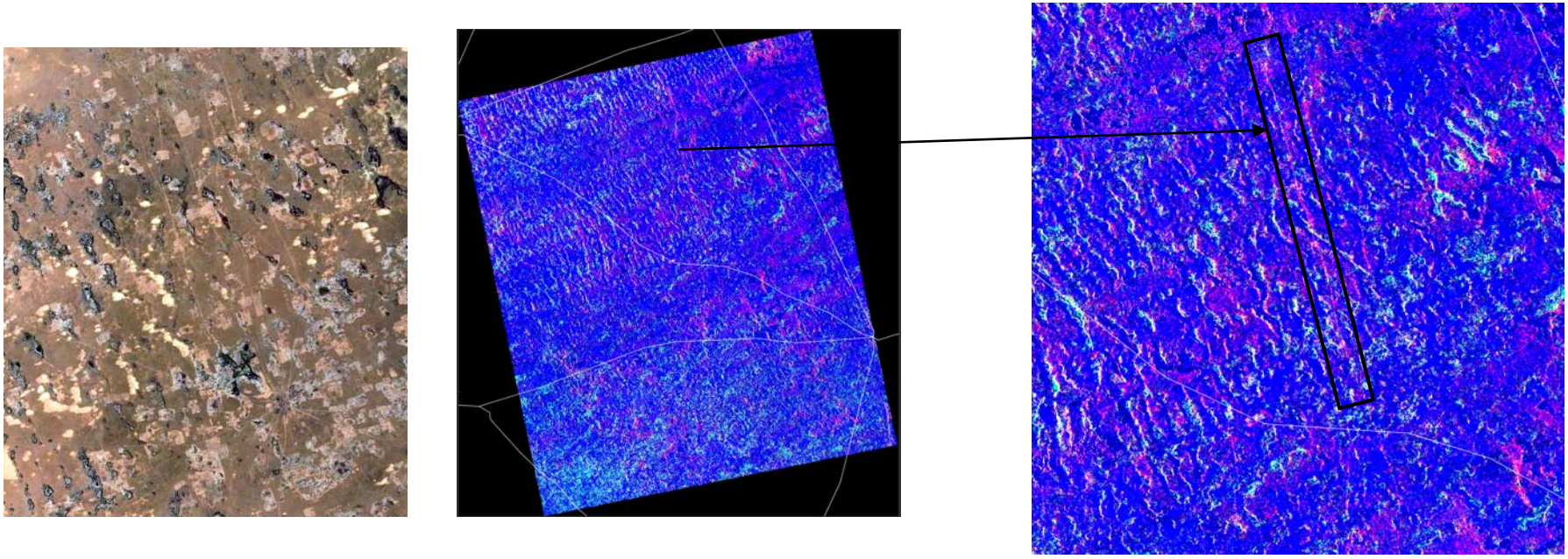
- High degree of replication-redundancy
- Increased resilience
- Wide-spread availability

Loss prevention



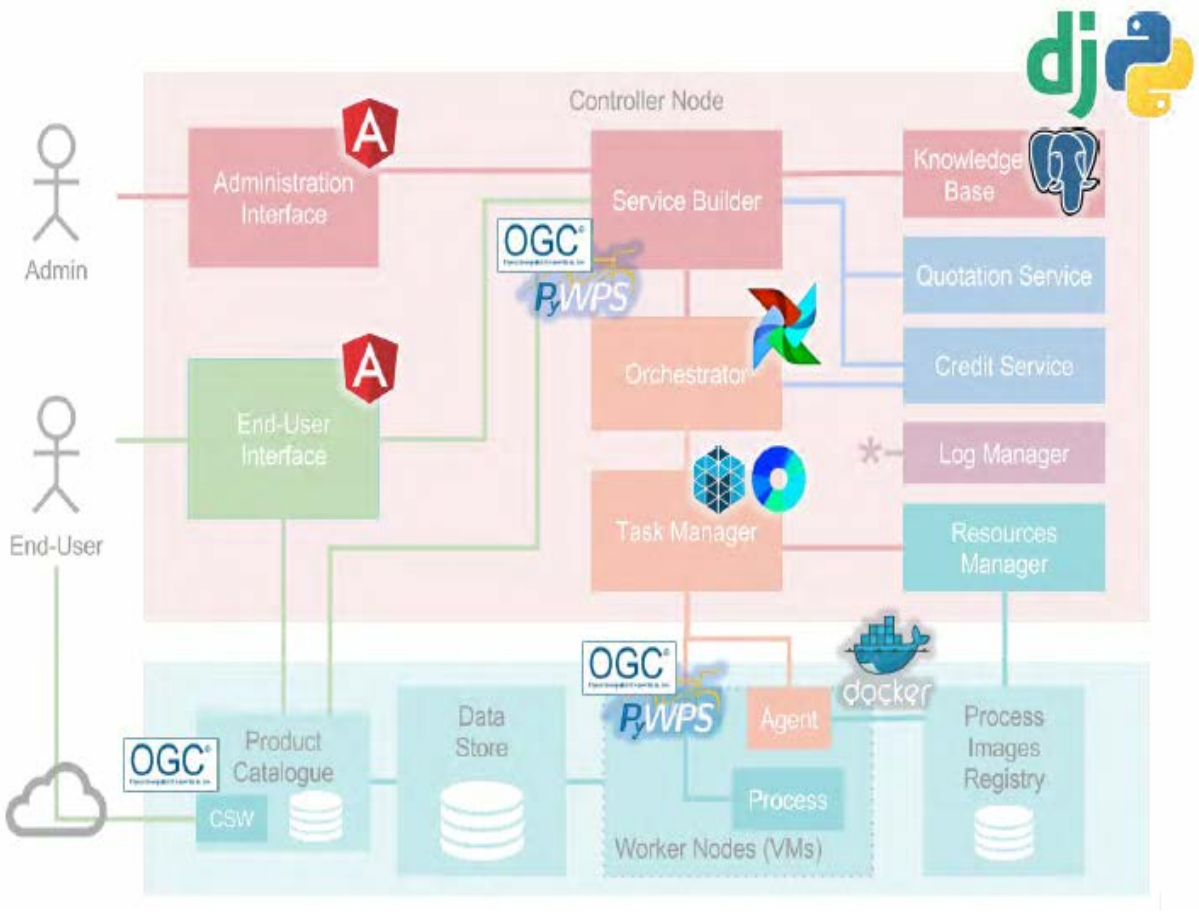
Use Case 1. PaaS for High Complexity Processing

- Identify Migration Routes
  - SAR images are a valid support to optical imagery analysis
  - Need to employ measurements sensitive to movement/change: phase variation in multiple SAR acquisitions
    - Multi-temporal coherence – support to visual interpretation



Use Case 1. PaaS for High Complexity Processing

Cloud based workflow orchestration framework for SatCen Multi-temporal Change Detection Service



Use Case 2. Systematic Change Detection

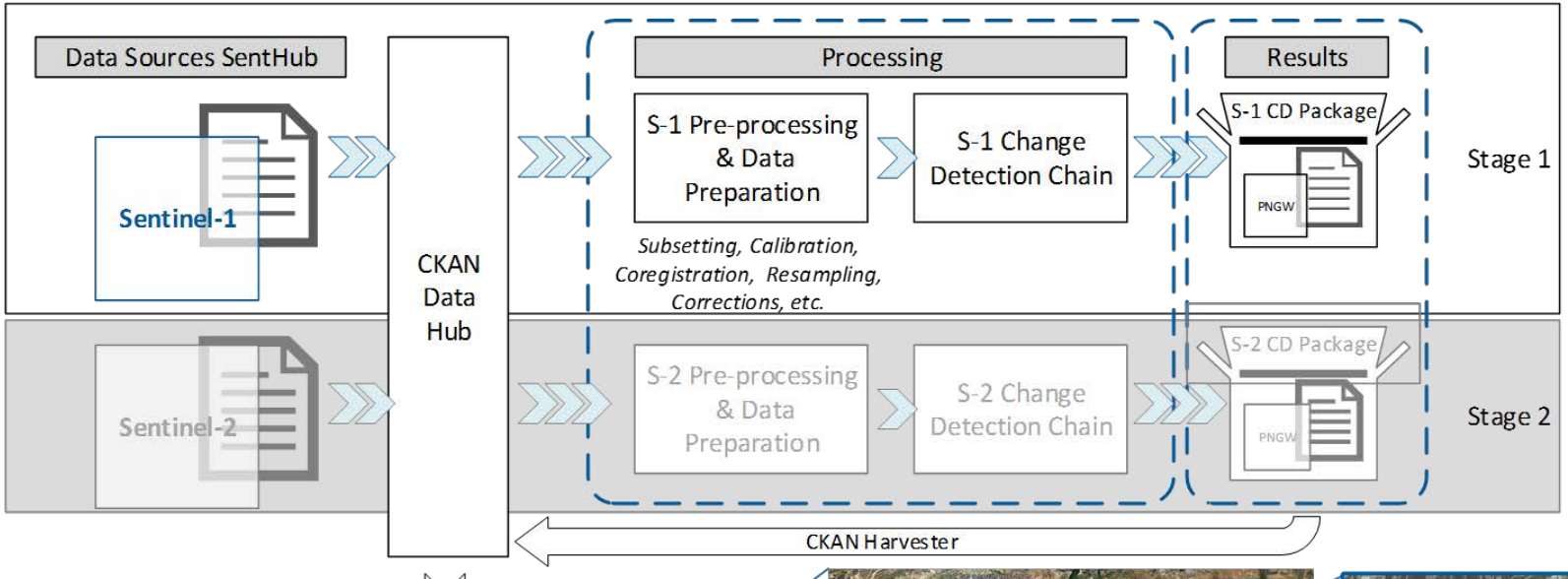
- Next Generation GEOSS for Innovation & Business
- NextGEOSS main activities
  - Engaging EO and related communities
  - Delivering an EO Data and Applications Hub
- SatCen is:
  - Liaising with GEO communities/activities
  - Implementing a Space and Security pilot
- Current Status
  - NextGEOSS 1.0 release platform launched (31st Jan 2019)
  - Space and Security Pilot phase1 is integrated
- Results
  - Sentinel-1 CD chain V2
  - *Sentinel-2 CD chain*
  - Complete data exploitation chain on the cloud (discovery, access, processing, delivery)

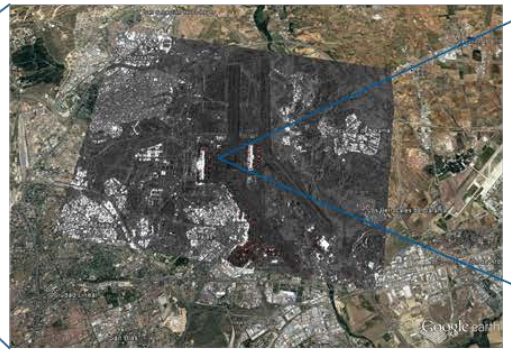
NEXTGEOSS
Contributing to the Vision of GEO

https://nextgeoss.eu/

Use Case 2. Systematic Change Detection

Space and Security Pilot: Systematic Change Detection applications exploiting Copernicus Sentinel imagery



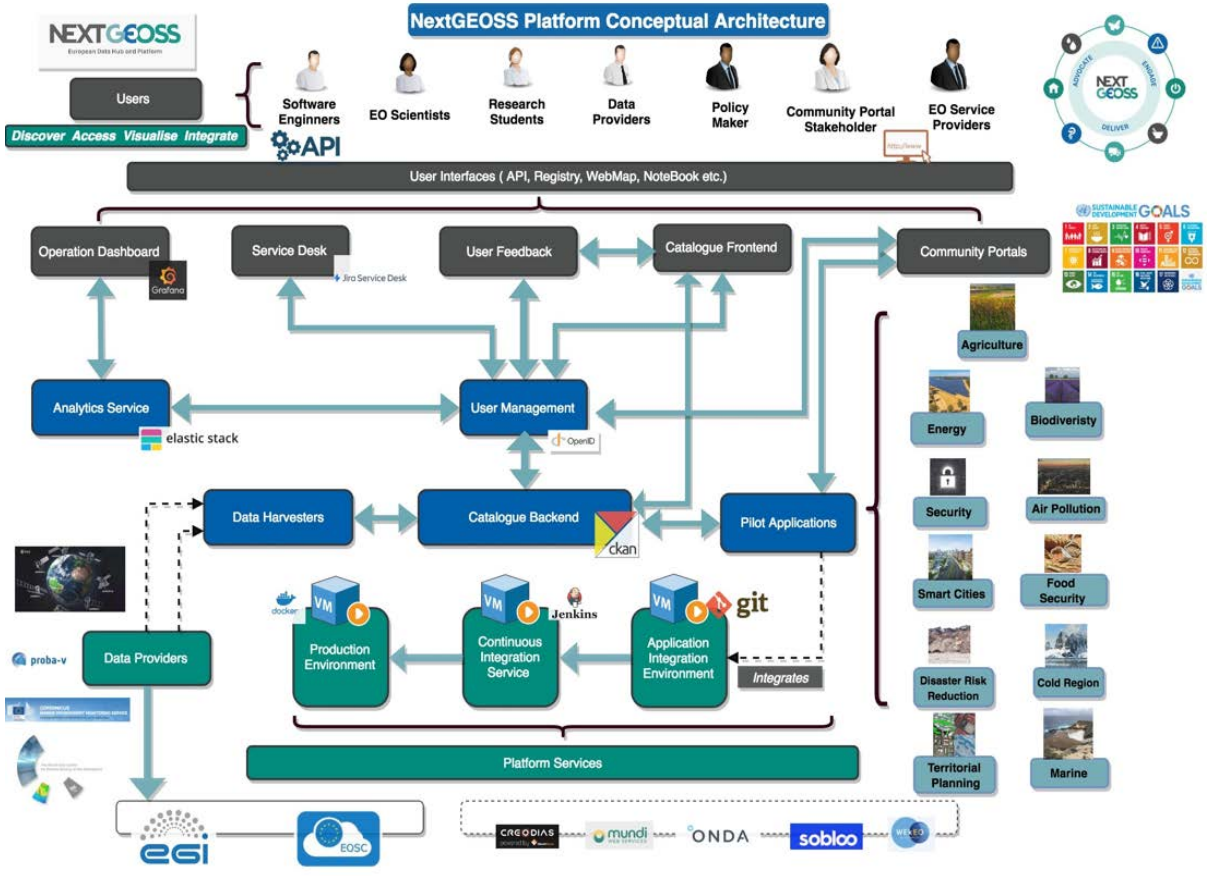


Result file usage example – Visualising changes over an Airport area

Use Case 2. Systematic Change Detection

Architectural view of the NextGEOSS services

The processing service is integrated autonomously by integrators, and a DevOps process deploys them on production servers



Conclusions and Future Work

- SatCen is implementing several scenarios to evaluate operational use of cloud for the provision of GEOINT products and services
- European context is favourable for EO applications on the cloud to reach operational maturity
- Geospatial intelligence is one key area that can directly benefit from a wider adoption of cloud (e.g. infrastructure scalability, data management and information delivery)
- Bigger challenges to be further investigated for Communication and Information Systems (CIS) required to handle EU Classified Information (EUCI)

Thank You!

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