EO data hosting and processing – core capabilities and emerging solutions

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An introduction to Airbus Defence and Space

EO data hosting and processing – core capabilities and emerging solutions

Space Systems  I  Military Aircraft  I  Communication, Intelligence & Security  I  Electronics

- Geo-Intelligence
- SatComms
- Integrated Systems
- Secure Land Communications
EO data hosting and processing – core capabilities and emerging solutions

A closer look at the Geo-Intelligence business

- **1982**: SPOT image
- **2001**: Creation of Infoterra
- **2010**: Full integration into Astrium Services
- **2014**: Re-branding to Airbus Defence and Space

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- **1986**: SPOT 1
  - Launch of SPOT 1
- **2002**: SPOT 5
  - Launch of SPOT 5
- **2007**: TerraSAR-X & TanDEM-X
  - 2007: launch of TerraSAR-X radar satellite
  - 2010: launch of TanDEM-X, for WorldDEM™
- **2011 & 2012**: Pléiades 1A & 1B
  - 2011 & 2012: launch of Pléiades very-high-resolution satellites
- **2012 & 2014**: SPOT 6 & 7
  - 2012 & 2014: launch of SPOT 6 and SPOT 7
The UK part of Geo-Intelligence

- Core competences include:
  - Data management and data hosting
  - Geospatial solutions
  - EO-based services and value adding activities

- UK Geo-Intelligence has been involved in Copernicus since its inception

- Primarily through activities in the land, security and emergency response domains
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Elements of the C3S ‘vision’

- Key extracts from the C3S introduction presentation:
  - To be an authoritative source of climate information for Europe
  - To build upon national investments and complement national climate service providers
  - To support the market for climate services in Europe

- The implications of these key elements of the C3S ‘vision’ for the CDS:
  - Robust, secure, scalable with sound ongoing operations and maintenance
  - Cost-efficient, taking advantage of investments already made and lessons already learned
  - Accessible, promoting easy access and information exchange
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Elements of the C3S ‘vision’

C3S Service elements: Climate Data Store

Series of ECV datasets and climate indicators

- Observed, reanalysed and simulated
- Relevant to support adaptation/mitigation policies at European level and wider

Reanlyses

Multi model seasonal forecast products

Other ECV datasets

Data collection and data rescue

Data reprocessing

Climate projections

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Processing and archiving – Sentinel-1 and Sentinel-2 PACs

- Geo-Intelligence UK have been operating PAC facilities as part of the ESA ground segment network for over 25 years
  - UK PAF for ERS-1 and ERS-2
  - UK PAC for Envisat
  - ESA PAC for the SWARM mission

- In 2012, Geo-Intelligence UK was awarded contracts for setting up, operating and maintaining PAC facilities for both the Sentinel-1A and Sentinel-2A satellites. For S1A, the Farnborough PAC was selected as the Commissioning PAC

- Recently both contracts have been extended to include the B units for both S1 and S2

- As a result, Geo-Intelligence UK operates on behalf of ESA/EC the largest archiving facility for Sentinel data in the world

- Installation, integration, operations and maintenance of large EO data storage facilities is thus a core capability for Airbus Defence and Space, Geo-Intelligence UK
Processing and archiving – Sentinel-1 and Sentinel-2 PACs

- With both the Sentinel-1 and Sentinel-2 PACs located in Airbus DS’s Farnborough facility, the site is a critical component of the overall PDGS, disseminating data directly to the Copernicus Services.

- Sentinel-1A launched in April 2014
  - Routine Operations Phase
    - Approximately 300TB of data have been stored in the LTA since the satellite launch.
    - Approximately 1.8TB of data will be processed, stored and made available to Copernicus users per day, when S1A reaches full operational capacity.
    - The operations team are currently performing monitoring, reporting, production and reprocessing activities.

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Connecting the CDS to the user community - GeoStore

- Airbus DS operates the largest commercial geospatial hosting facility in Europe – GeoStore

- Key characteristics include:
  - 24/7 access to catalogue
  - Tasking and archive ordering with direct delivery
  - Automated alert system to keep customers informed

- These concepts would translate directly to effective dissemination of ECV datasets, reprocessed datasets, seasonal forecast products etc
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Bulk processing and hosted processing

- The **AIRBUS Processing Cloud** provides a Sentinel Exploitation Platform for ‘Big Data’ processing and hosted processing

- Examples of successful processing and reprocessing campaigns already completed include:
  - MERIS processing:
    - 1 day to implement IPF and test
    - 3.5 days to process 2 years of MER_RR
  - AATSR, ATSR-2, ATSR-1 reprocessing:
    - L2P/L3U processing for entire missions
    - Estimated processing time for AATSR mission using ESA provided infrastructure >700d
    - Processing times using the **AIRBUS Processing Cloud**:
      - AATSR: 2 weeks
      - ATSR-1: 5 days
      - ATSR-2: 10 days

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Bulk processing and hosted processing

- The AIRBUS Processing Cloud also enables the development of new products and services in a partnership approach.

- The APC is also intended to support SMEs, research organisations, universities etc to operationalise their algorithm capabilities:
  - Supports the commercialisation of EO products and services by reducing the requirement for upfront infrastructure investments.
  - Provides a ready-made route to market to support business case development.

- Examples include real-world examples, potential Copernicus Service examples and could be extended to include C3S examples:
  - Sentinel-1 REDD+ service with the University of Edinburgh.
  - Sentinel-2 data to support the Copernicus Land Services.
  - Sentinel-1/Sentinel-2 data to support ECV preparation.
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Bulk processing and hosted processing

Copernicus Service User  
Airbus DS Service User  
3rd Party Application Provider/User

Copernicus Service  
Airbus DS Service  
3rd Party Application

Copernicus Climate Service User

C3S Service

AIRBUS Processing Cloud

Sentinel-1 data  
Sentinel-2 data  
EO applications

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More efficient use of data through Linked Data models

- When data first emerges from a new EO mission, typically there is an intense period of analysis, calibration, error characterisation and algorithm development.
- This activity then continues at reduced intensity as the mission matures, but is supplemented by publications, presentations and application development.
- Much of this analysis is carried out by 3rd parties, across the user community, with the outputs constituting ‘commentary’ on the new mission.
- This ‘commentary’ is a form of metadata and is typically scattered across a wide variety of locations, literature, conference proceedings, reports, websites, etc.
- This reduces efficiency in terms of knowledge transfer and the ability of different users to properly assess the fitness-for-purpose of the data for their particular requirements.
- A similar process would be expected for the new CDS.
- Linked Data models enable generic ‘bodies’ of information to be associated with ‘generic targets’.
Linked Data models

- Linked Data models may be used to connect users, and prospective users, of data to knowledge and expertise that would otherwise be difficult to extract from the user community.

- Further, Linked Data models enable these users, or prospective users, to also contribute commentaries of their own.

- Linked Data is therefore about using the Web to connect data/products that weren’t previously linked.

- Airbus DS are using their experience of Linked Data models to implement a solution supporting Coordinated Quality Control in the context of the ESA Copernicus Space Component e.g. synthesis reports are linked to datasets and to data providers.

- This enhanced exploitation of both mission and dataset perspectives supports improved identification of patterns in quality issues and harmonisation across missions.

- A similar concept is considered relevant within the context of the CDS considering ECVs, reanalyses, forecasts, modelling capabilities, climate projections etc.
Thanks very much.