

living planet symposium

BONN
23–27 May
2022

E1.05.1 New Space
missions in InCubed

TAKING THE PULSE
OF OUR PLANET FROM SPACE



Incubed SAT4EOCE and the SAT4EO+ Smallsat Programme

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27/05/2022

Deimos, technology company of Elecnor



SPACE
60% of activity



SPACE SCIENCE & EXPLORATION

Flight segment
Ground segment



SATELLITE NAVIGATION

EGNOS V3
GALILEO 2nd



GNSS receivers



EARTH OBSERVATION

Platforms



Antenna

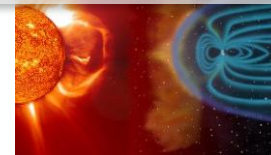


Software suite

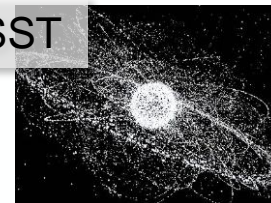


SPACE SITUATIONAL AWARENESS

Space weather

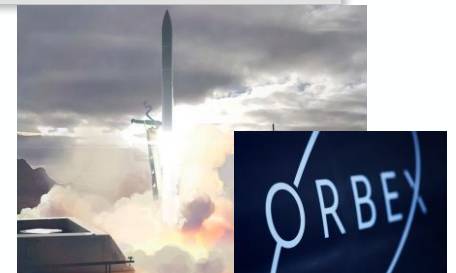


SST



LAUNCHERS

Small launchers

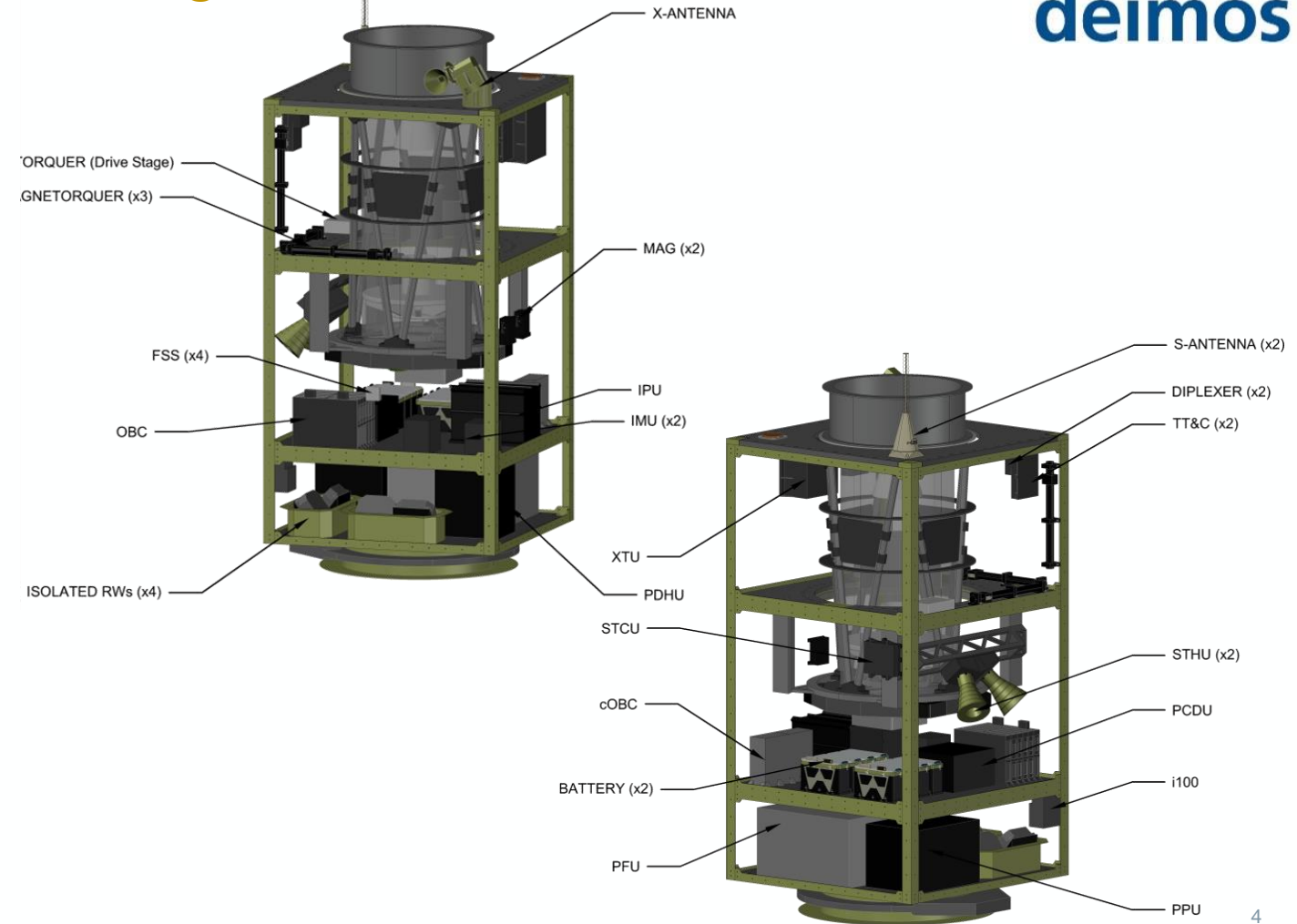


SAT4EO+ Programme: DEIMOS “intelligent” small satellite for responsive VHR optical services

Key performance parameters & innovative features

- ❑ ~200kg smallsat
- ❑ Optical VIS (RGB, PAN) and NIR payload
 - ❑ VHR @0.55m native; ~0.3m with SRR
- ❑ Agile (stereo, multi-pointing)
- ❑ Low cost
- ❑ Highly responsive (< 10 min) globally
 - ❑ Global product latency <5 min
 - ❑ Global tasking < 5 min
 - ❑ Direct product delivery
- ❑ Intelligent, Insight4EO used as Intelligence & Payload processing unit
 - ❑ On-board re-planning
 - ❑ On-board payload processing
 - ❑ On-board EO products (alerts)

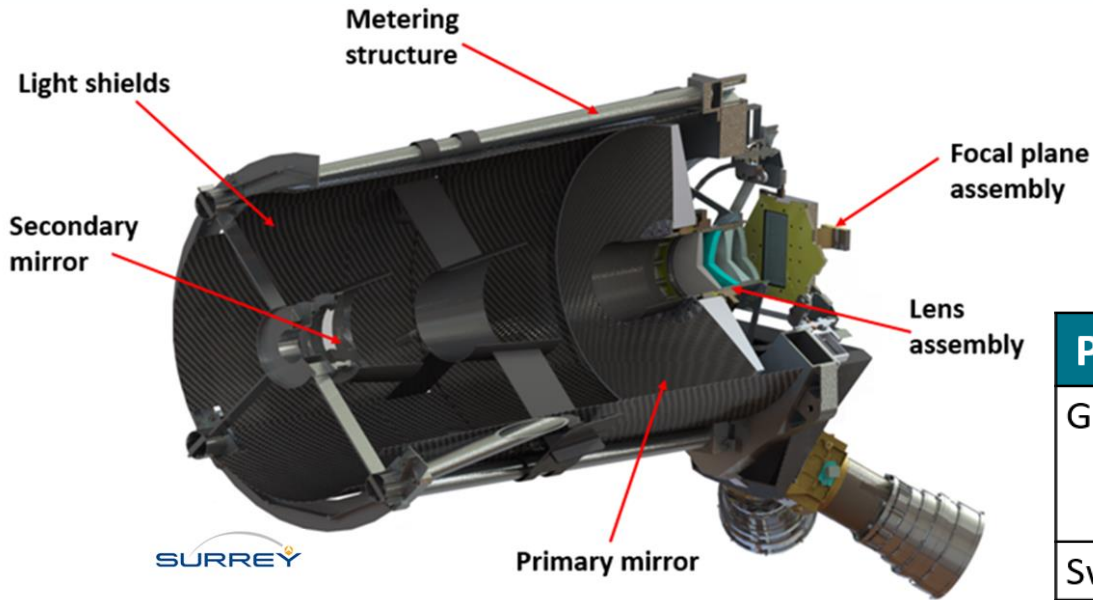
Payload and units accommodation @PDR



SAT4EOCE Products – Optical Payload (I)



□ Precision is a very high resolution multispectral imager which utilizes a novel CCD-in-CMOS time delay and integration (TDI) line scan detector and innovative opto-mechanical techniques to achieve cutting edge performance at a market-leading size, weight and power.



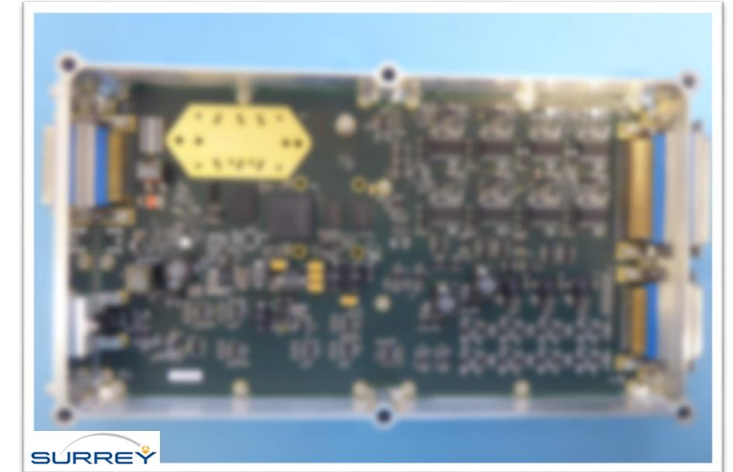
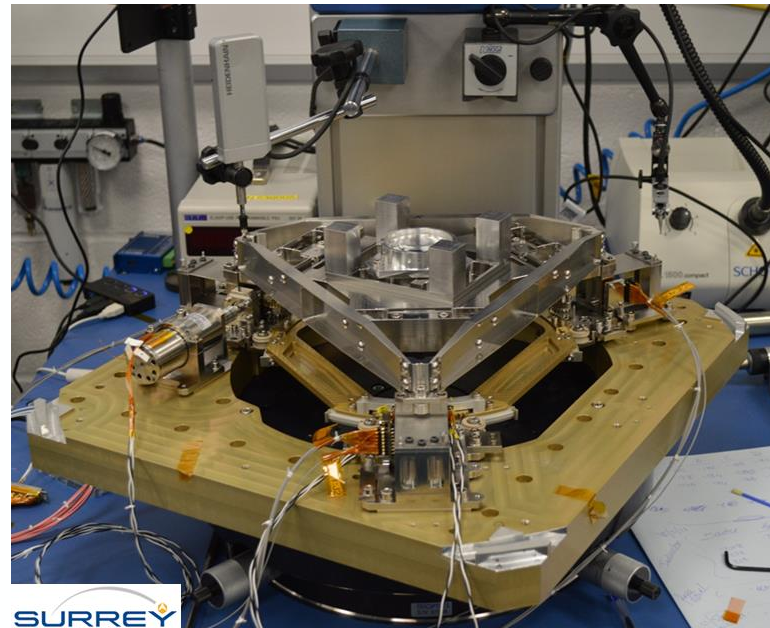
Parameter	Specification
GSD	0.6 m PAN (< 0.5 m with $\frac{1}{2}$ pixel shift) 1.2 m multispectral
Swath	9.5 km
Bands	PAN, R, G, B, NIR
Sensor Type	CCD-in-CMOS TDI detector
SNR	>100



SAT4EOCE Products – Optical Payload (II)

Development Status

- ❑ Commencement of AIV for the flight imager is starting now with delivery in 2022
 - ❑ EM Front End Electronics / Detector under test
 - ❑ EQM Focus mechanism built and tested
 - ❑ PFM service module delivered
 - ❑ Mechanical parts
 - ❑ Optical components
 - ❑ OGSE complete

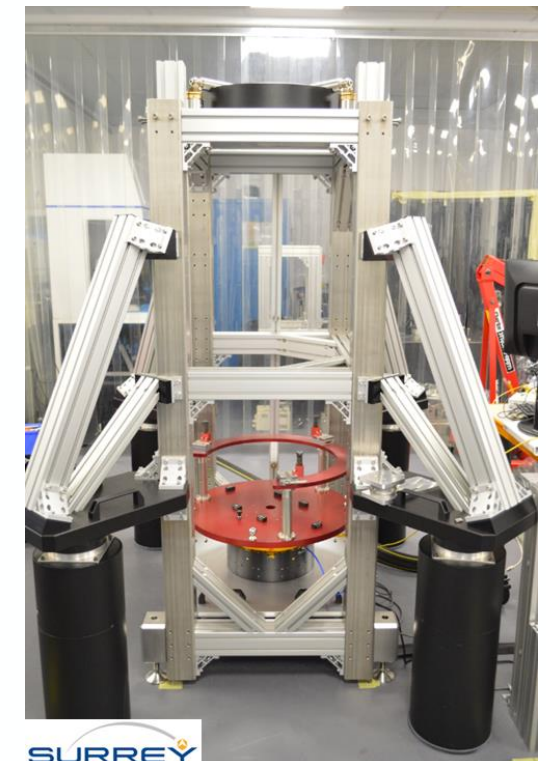
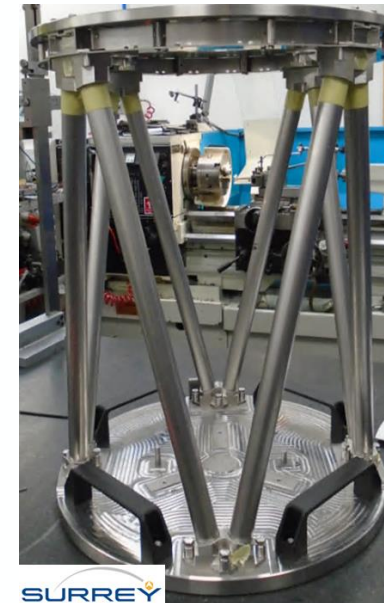
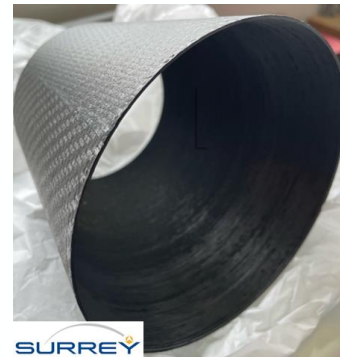
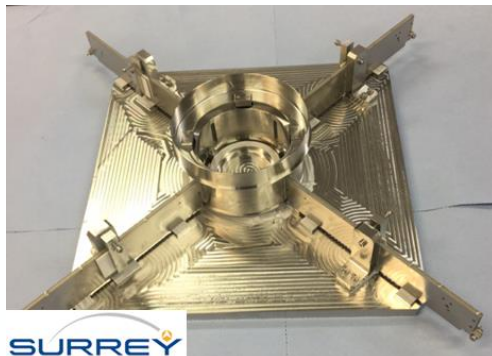
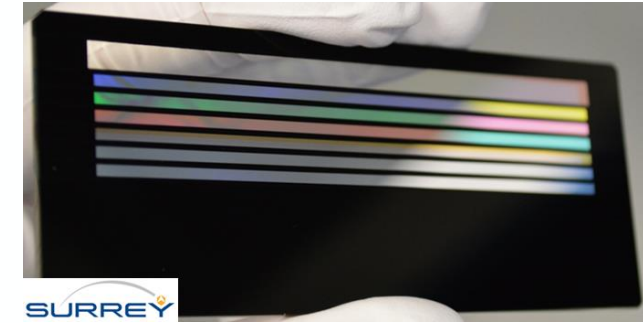


SAT4EOCE Products – Optical Payload (II)



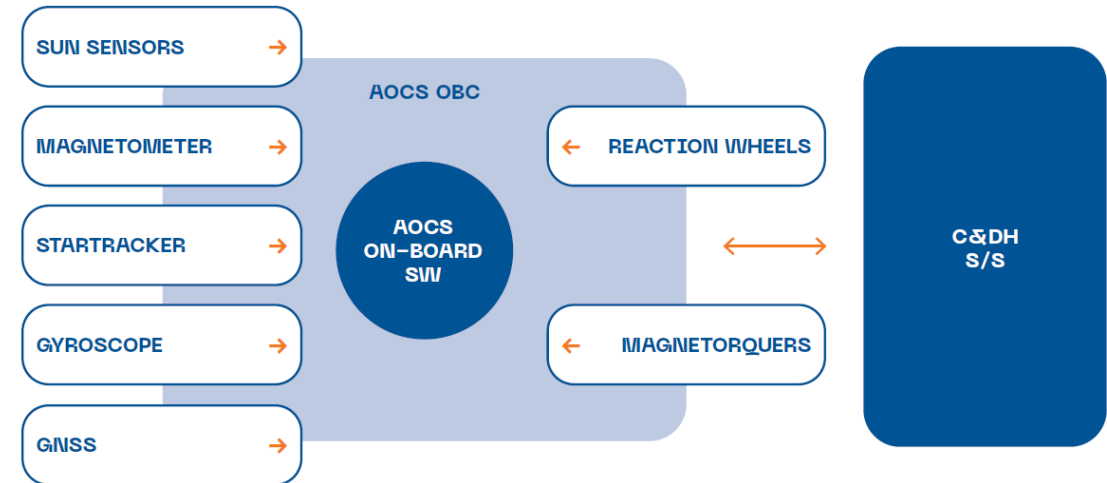
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 - ❑ **OGSE complete**



Product: Standalone AOCS

- ❑ Configurable miniSat AOCS product
- ❑ Targets 80 to ~400kg LEO missions (OPT and SAR)
- ❑ Configurable across a range of EO missions
- ❑ Rapid procurement, missionisation and re-configuration of software and hardware is built into the product design
- ❑ **Low cost** (versions <1M€)
- ❑ Two variants pre-qualified (ground HIL)
 - ❑ Core baseline
 - ❑ High performance



SAT4EOCE Products – AOCS (II)

Development Status

- Design verified
- CDR within 2022
- AIV and pre-qualification early 2023

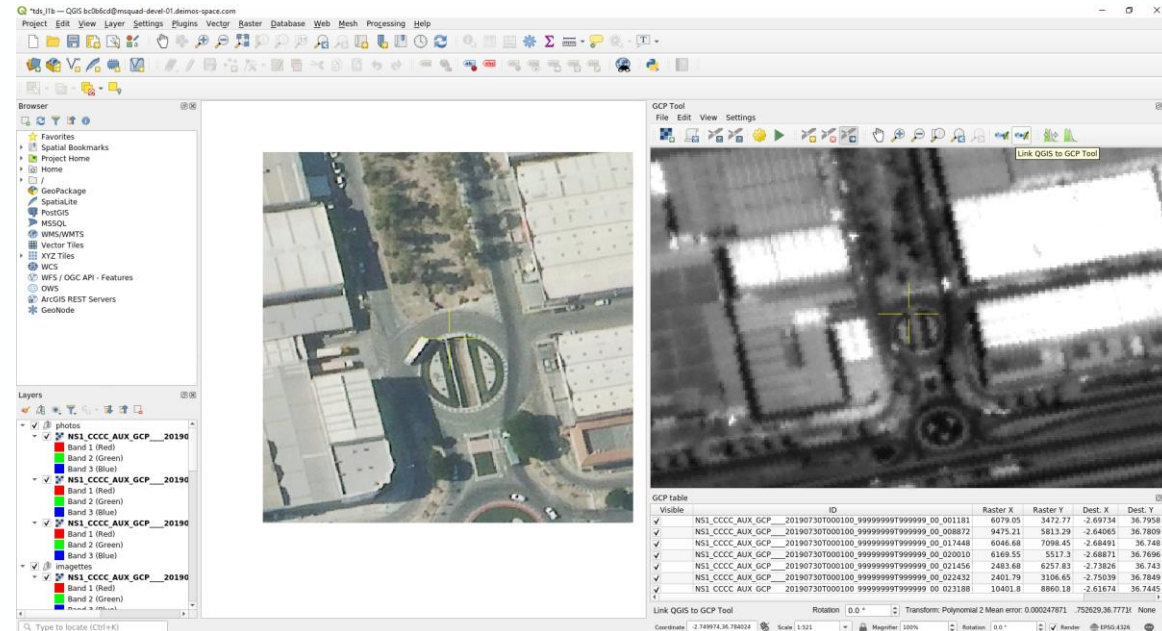
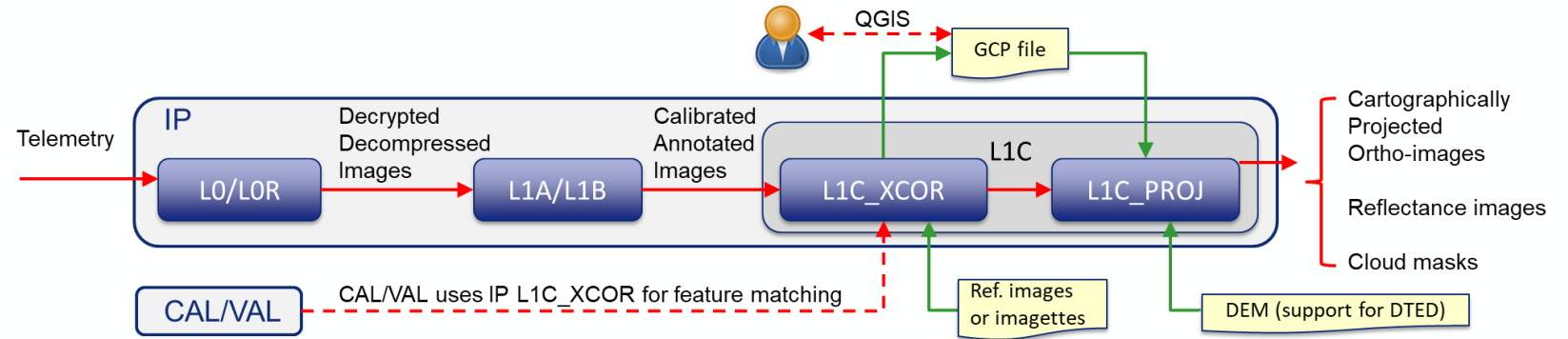
KPP on Pointing:

- Very fine pointing: <0.005 deg
- Very high knowledge: <0.003 deg
- Pointing stability: <2 arcsec/s
- High agility: up to 4 deg/s



Product: Process4EO

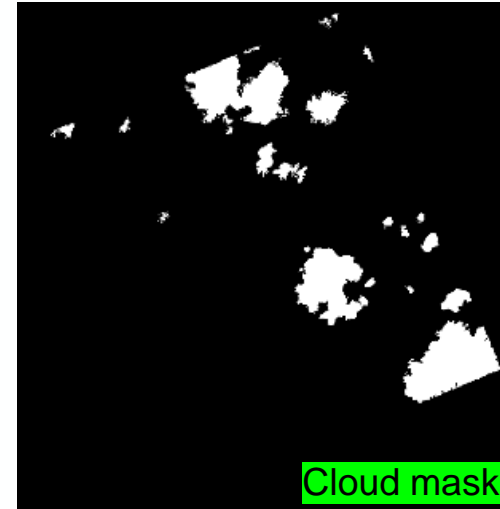
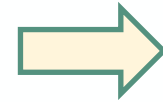
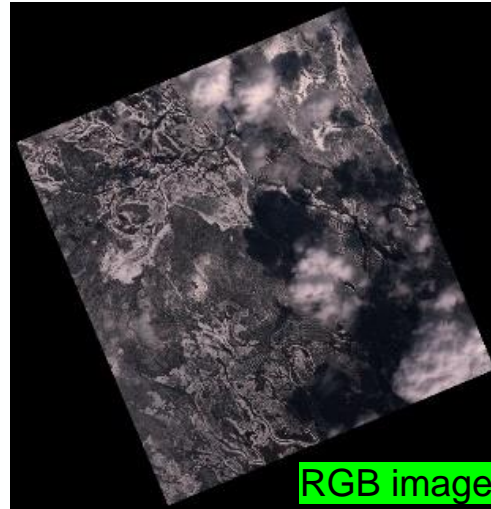
- ❑ Conversion of raw data into ortho-rectified L1C images
- ❑ Automatic or manual (QGIS-assisted) GCP extraction from ortho-images or chips
- ❑ Flexibility to configure custom processing levels
- ❑ Modularity to reuse basic functions in your CAL/VAL
- ❑ Support for a wide collection of DEMs
- ❑ Ready to be deployed in the cloud



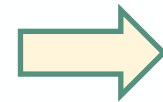
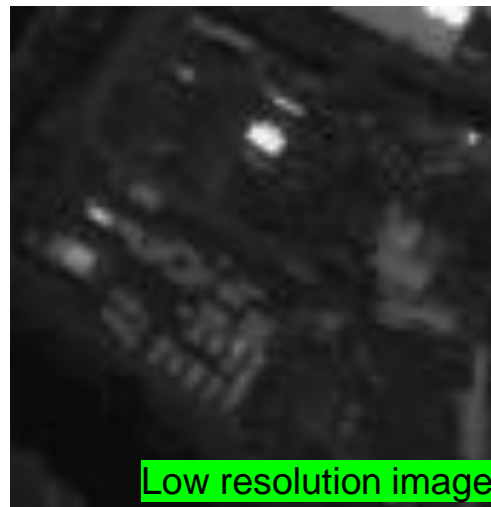
SAT4EOCE Products – Instrument Processor (II)



- ❑ Accurate cloud detection with just VNIR bands

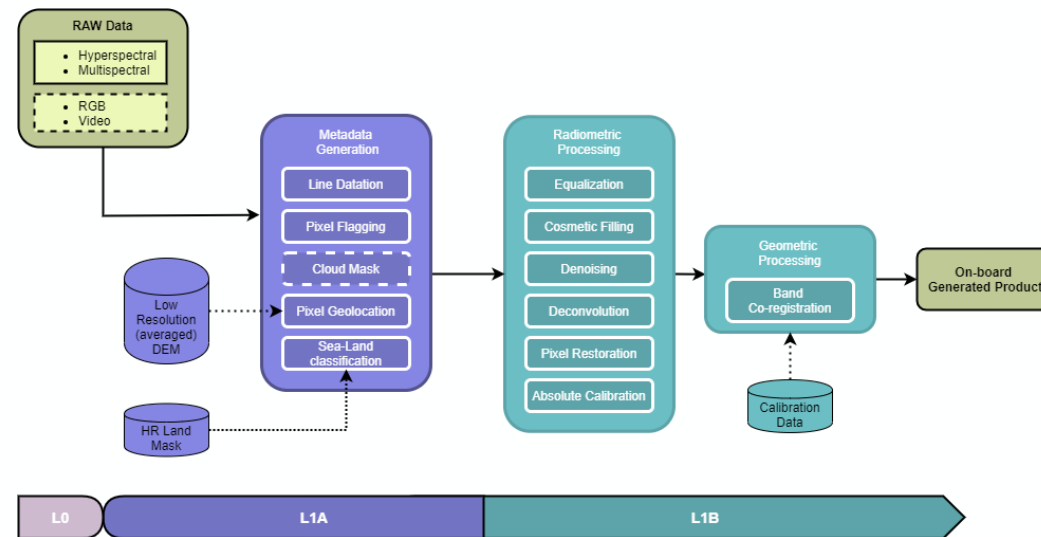


- ❑ Supports super-resolution-ready CMOS sensors



Product: **OBIP**

- ❑ On-board L1B/C generation
 - ❑ Latency below 30 seconds (parallelised processing)
- ❑ On-board high-level products via AI/ML processing (e.g. ISR, Maritime products)
 - ❑ Latency below 20 seconds
- ❑ Supports
 - ❑ On-board data prioritisation
 - ❑ On-board re-planning
 - ❑ Real-time EO products (alerts) via direct product delivery



EMSA Vessel Detection Like-Product



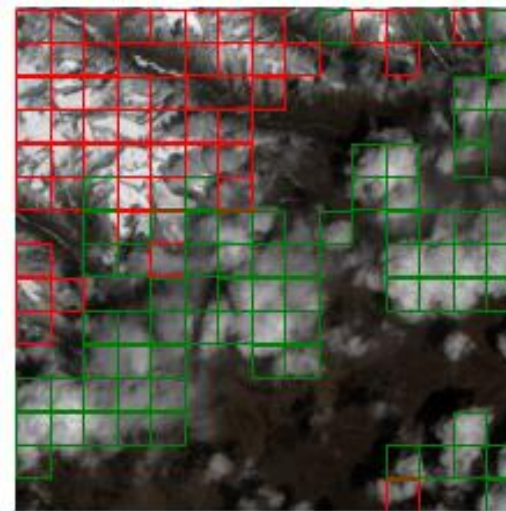
OBIP Development status

- OBSW implemented
- HW testing started

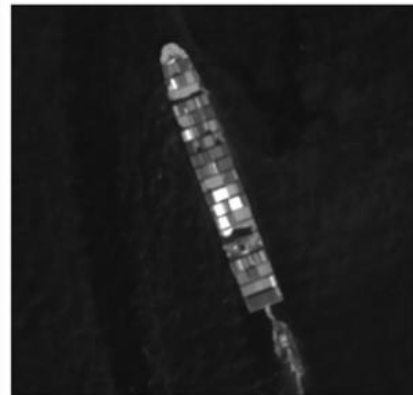
Highlights

- L1B quality similar to ground product
- ML/AI product generation provides good performance with adequate training set
- On-board processing latency below 1 minute
- Product provided commercially through DEIMOS' Insight4EO product line

Selective Download



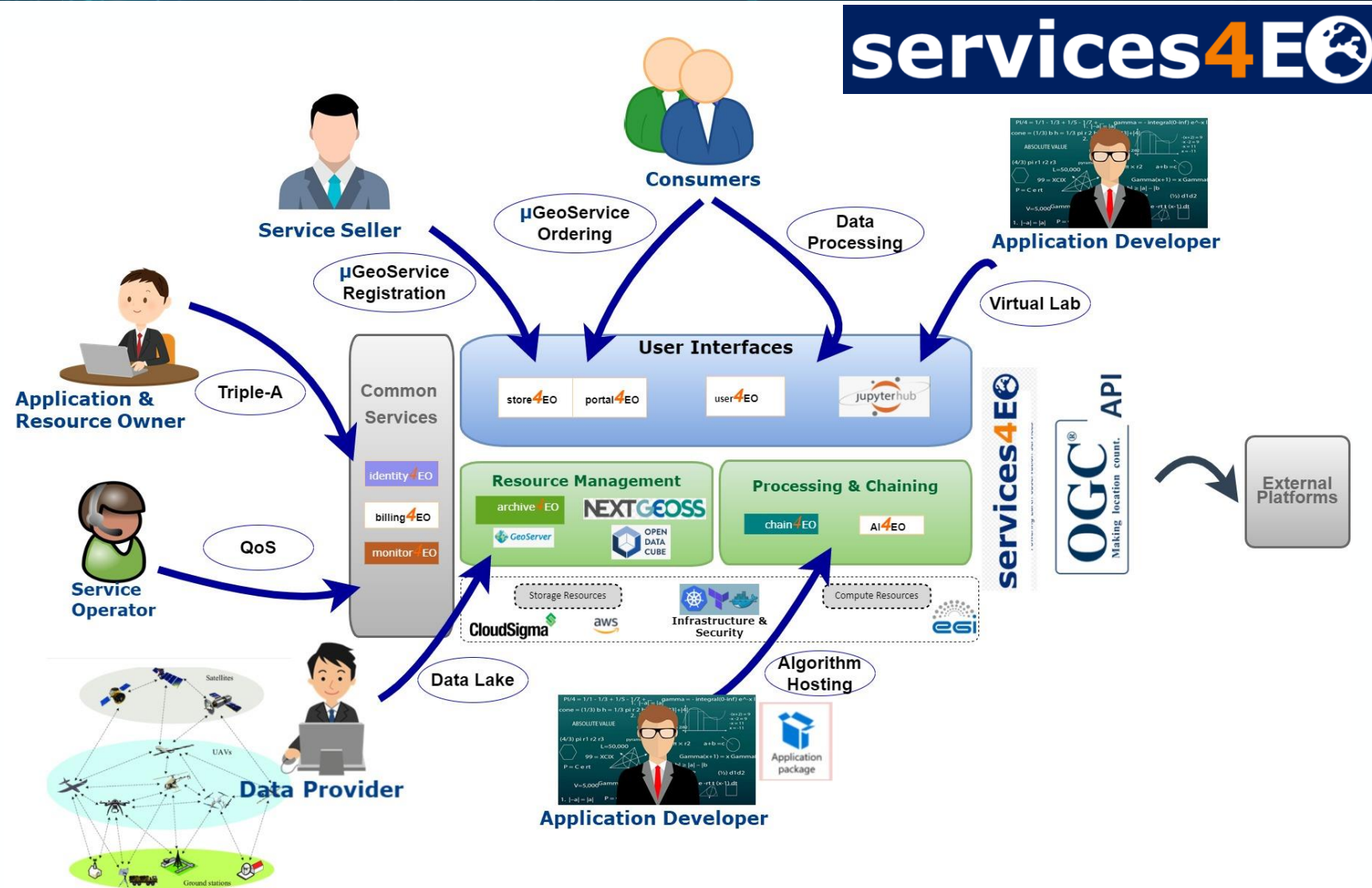
Real time Alerts

Thumbnail Image

Ship Information
Alert ID
Detection Time
Ship Position
Position Accuracy Error
Detection Confidence
Ship Heading
Ship Length
Length Estimation Error
Ship Beam
Beam Estimation Error

SAT4EOCE – Exploitation Platform

Product: Services4EO

- Generic cloud exploitation platform for satellite imagery, can be connected to several **Ground Segments** (free and commercial providers)
- Includes **B2B Marketplace**, to build automated (AI) applications in agriculture, forestry, maritime, energy...
- Catalogue 100s of EO** (micro-) **services** available for **subscription**, including from third parties organisation



- ❑ SAT4EOCE provides a set of sustainable EO products
- ❑ Supporting DEIMOS' sat4EO VVHR small sat programme and the commercial market
- ❑ Commercialisation started, with all products offered by 2023
- ❑ Big thanks to ESA EO, InCubed and PhiLab
 - ❑ InCubed experience shows an effective and efficient collaboration approach for EO



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