

# WGISS-52 Executive summary – Provenance using KSI Blockchain Pilot project

- ESA and Guardtime are executing BC4SA-FO technology assessment project to demonstrate how KSI Blockchain will enhance security of data archives and deliver provenance.
- KSI Blockchain technology enables functionality, that provides **integrity and provenance** of satellite mission data (archiving and dissemination).
- Technology demonstration is provided on the **ESA Space data preservation archive**. New EO data security process is applied. Input EO-SIPs are signed and verified to provide long term validation.
- Archive system operator receives **overwatch capability** of stored data products via dashboard. **Evidence of integrity and provenance** when distributing data products to **3<sup>rd</sup> parties**.

[More info: https://guardtime.com/eoguard](https://guardtime.com/eoguard)



**CEOS WGISS-52  
workshop**

# PROVENANCE USING KSI BLOCKCHAIN PILOT PROJECT

**GUARDTIME  
/EOGUARD**

**Priit Anton  
2021**



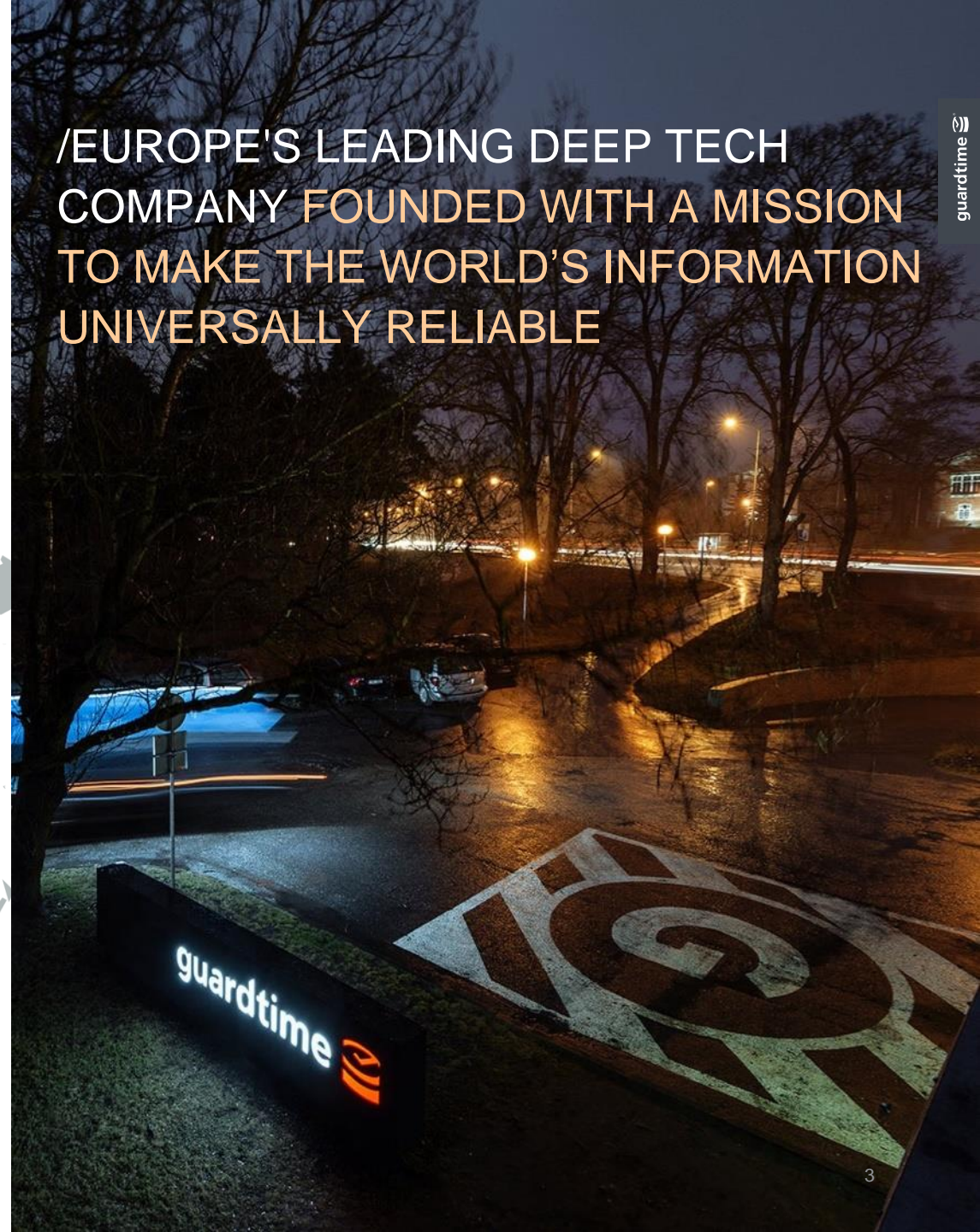
# /GUARDTIME AT A GLANCE

- + **FOUNDED:** 2007 in Tallinn, Estonia
- + **2020 REVENUE:** 36M USD
- + **PERSONNEL:** 150

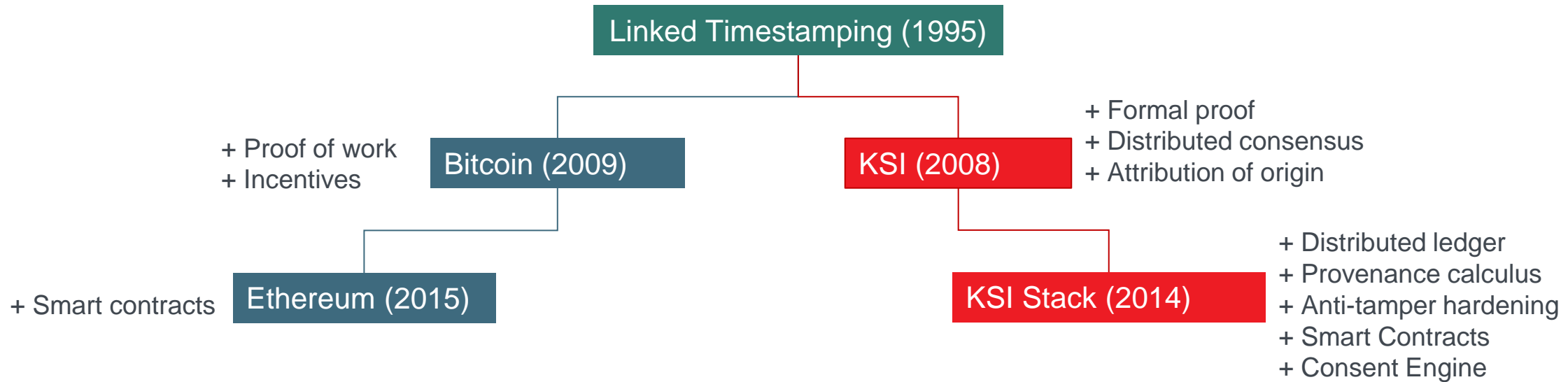


- + **REFERENCE CLIENTS:**
  - Telecom: Verizon
  - Government: Estonia
  - Health Care: WHO
  - Aerospace: Lockheed Martin
- + **PRODUCT:** Full stack infrastructure for building zero-trust systems and software applications. EU-EIDAS, NSA NIAP accreditation

/EUROPE'S LEADING DEEP TECH COMPANY FOUNDED WITH A MISSION TO MAKE THE WORLD'S INFORMATION UNIVERSALLY RELIABLE



# TECHNOLOGY FAMILY TREE



The cryptography behind the individual components of Bitcoin has been well known since the 1990s and Guardtime's cryptographers have been very active participants in that history.

See more: [guardtime.com/technology](https://guardtime.com/technology)

Buldas and Saarepera from Guardtime were the first cryptographers to give a formal security proof in 2003 of what properties do you need for hash-functions and data structures in order to build a formally verifiable security proof for hash-tree based time-stamping.

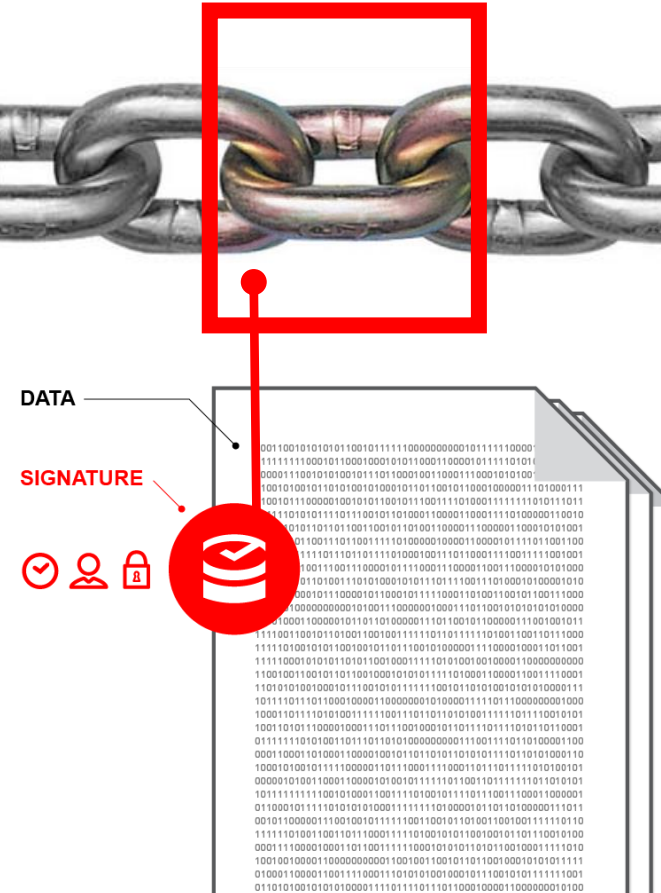
# KSI<sup>®</sup> Blockchain Service

KSI Blockchain provides a tagging system for electronic data: **KSI Signature**.

These signatures prove the time, integrity and provenance (human or machine) of the data without relying on trusted third parties, public/private keys or credentials that can be compromised or hacked.

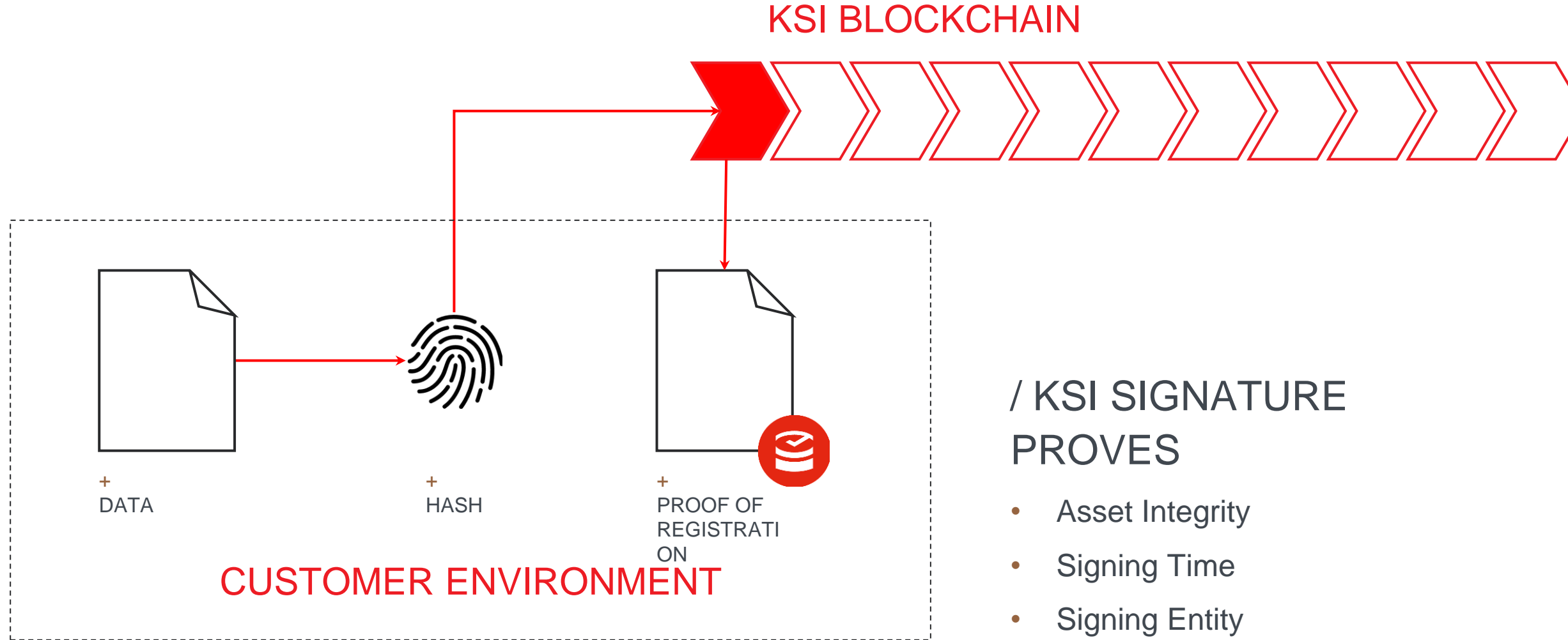
## Highlights

- Designed for data ingest at massive scale
- Guaranteed signature response in next second
- Proven track record, 24/7 uptime since 2010
- KSI Signature allows independent verification of data properties by third parties



# KSI BLOCKCHAIN /CUSTOMER INTERACTION

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## / KSI SIGNATURE PROVES

- Asset Integrity
- Signing Time
- Signing Entity

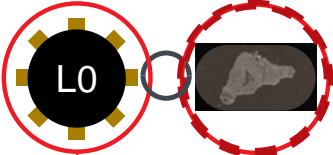
# Problem we are solving

- EO data security
  - + Provision of a secure, reliable archive of EO data
  - + Data integrity demonstration
  - + Recording and trace provenance demonstration
  - + Alerting to unauthorized changes, specific alerts to dashboard
- EO data distribution
  - + Evidence and validation to users (L1 and L2 products)
  - + Full chain of custody for downstream services (Parametric insurance)

See more: [guardtime.com/eoguard](https://guardtime.com/eoguard)

# KSI® Blockchain for provenance of EO Data in Digital supply chain

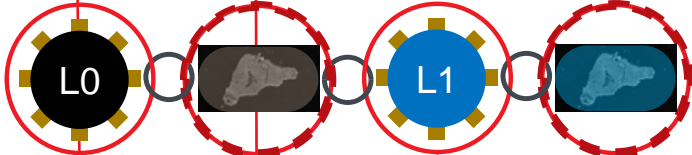
GROUND STATION



PRODUCE L-0  
PRODUCT

VERIFY L-0

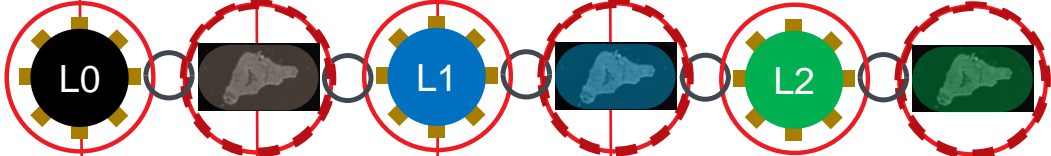
PROCESSING AND ARCHIVING CENTRE



PRODUCE L-1

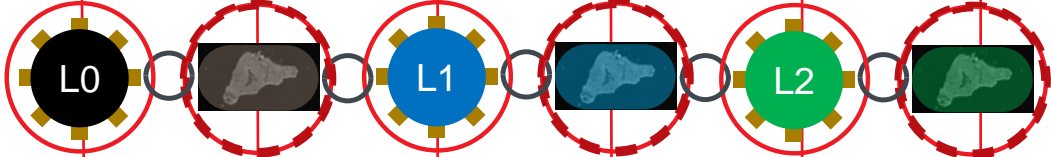
VERIFY L-0, L-1 AND  
PRODUCE L-2

FURTHER PROCESSING AND DISSEMINATION



VERIFY L-0, L-1 AND  
PRODUCE L-2

END USER



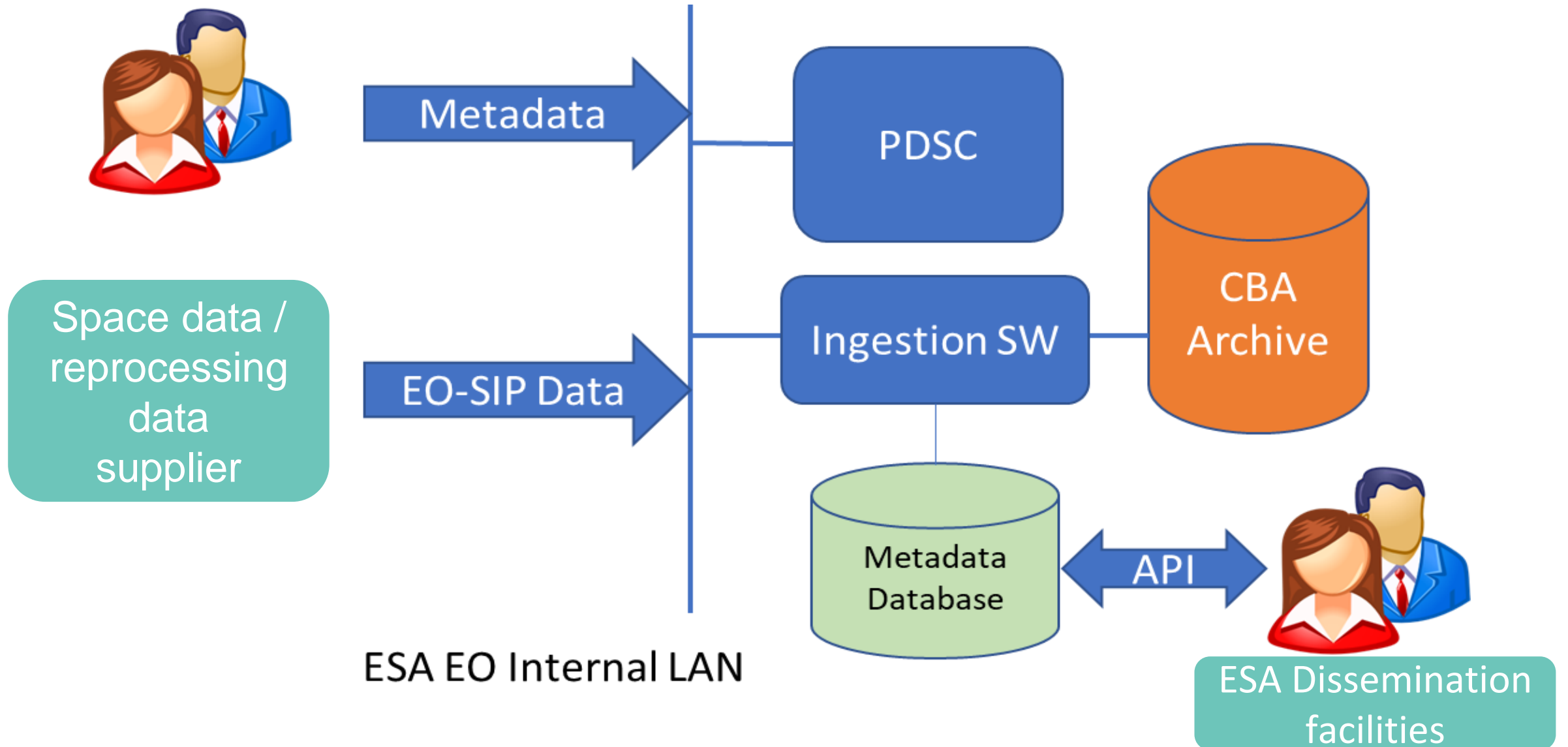
VERIFY L-2 AND PRODUCE L3

KSI® BLOCKCHAIN  
AS A SERVICE



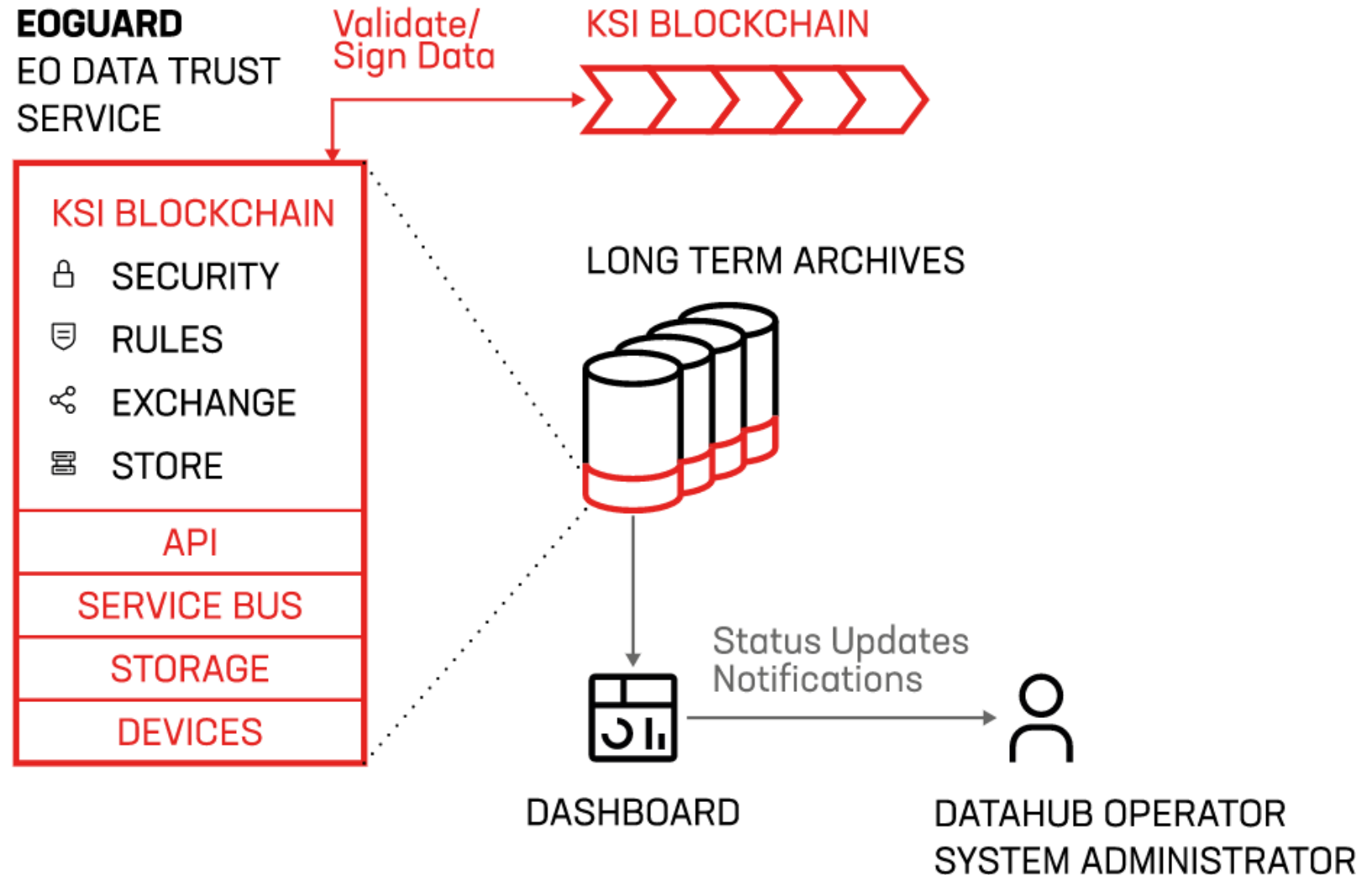


# Demonstration setup - ESA Space Data Preservation Archive

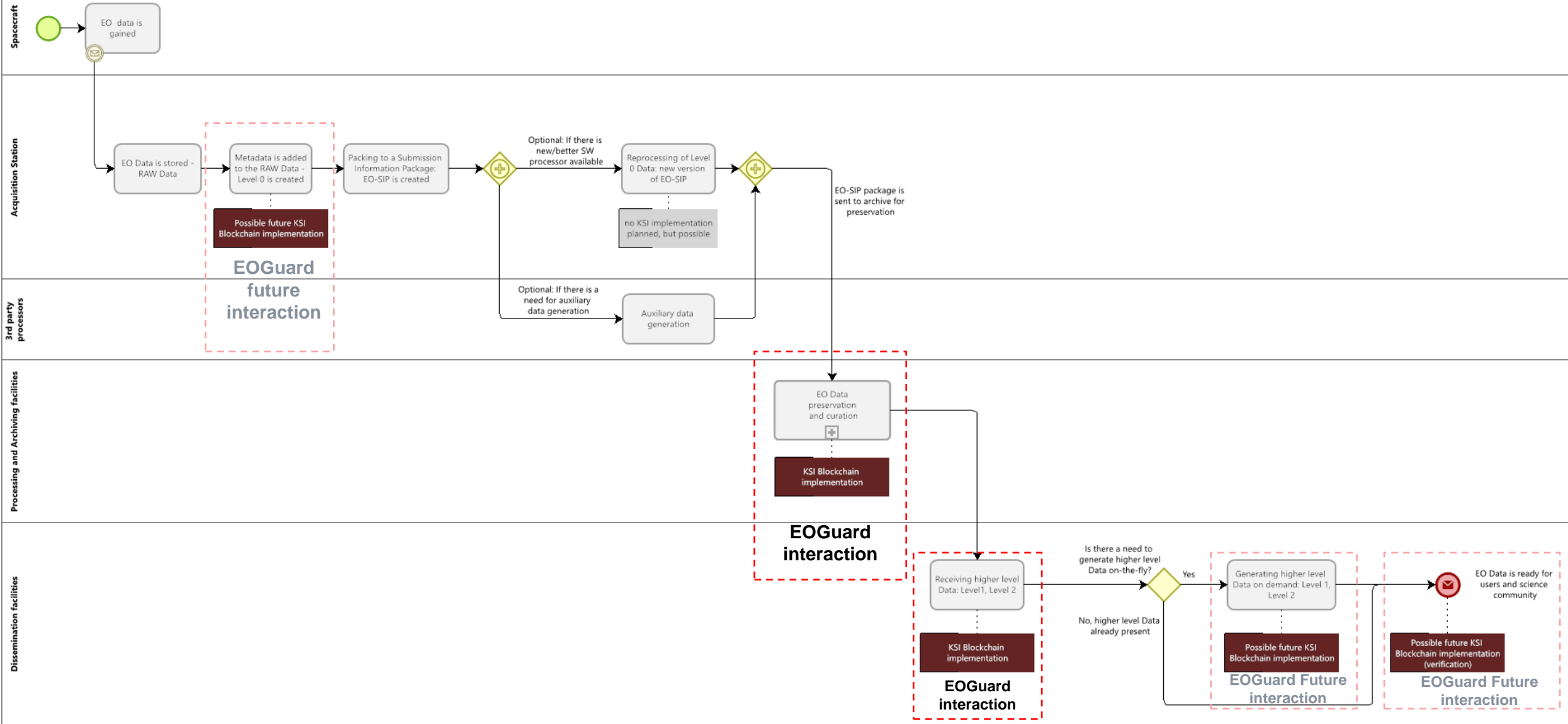


# What will be delivered

- Security and trust service
- Visibility to datahub operator/sysadmin
- End to end chain of custody for earth observation data



Live EO Data gathering process



**1.4 TB**

Volume of products (in PB)\*

**3**

Number of datasets\*

**4200**

Number of products (in M)\*

*\*During the last 24h*

Products signing

Products verification

Number of products signed so far

**1150**

Signing errors so far

**3**

Mission	Product type	Arrival	Size	Signed
Seasat	SEA_GEC_1P	08.10.2021 23:59:51	2.02 GB	09.10.2021 00:39:52
Meteosat	MSG-3	08.10.2021 23:59:51	0.65 GB	Failed
Cryosat	Level 1B	08.10.2021 23:59:51	1.75 GB	09.10.2021 00:39:52
Seasat	SEA_GEC_1P	08.10.2021 23:59:51	2.02 GB	Failed
Meteosat	MSG-3	08.10.2021 23:59:51	0.65 GB	09.10.2021 00:39:52
Cryosat	Level 1B	08.10.2021 23:59:51	1.75 GB	Failed

**1.4 TB**

Volume of products (in PB)\*

**3**

Number of datasets\*

**4200**

Number of products (in M)\*

*\*During the last 24h*

Ingestion charts

Historical archive composition

Historical datasets list

Live mission products list

Online mission products list

Archive integrity by **EOGuard**

Products signing

Products verification

Number of products verified so far

**840** of 1150

Verification failures so far

**2**

*First failure at 00:12:00 CET  
Last failure at 18:00:00 CET*

Mission	Product type	Size	Verification status at 00:00:00 CET	Verification status at 06:00:00 CET	Verification status at 12:00:00 CET	Verification status at 18:00:00 CET
Seasat	SEA_GEC_1P	2.02 GB	Success	Success	Success	Success
Meteosat	MSG-3	0.65 GB	Success	Success	Failure	Failure
Cryosat	Level 1B	1.75 GB	Success	Success	Success	Success
Seasat	SEA_GEC_1P	2.02 GB	Success	Success	Success	Success
Meteosat	MSG-3	0.65 GB	Success	Success	Success	Success
Cryosat	Level 1B	1.75 GB	Success	Success	Success	Success

# Future ambition after technology demonstration (BC4SA FO)

## Integration with:

- ESA processing and archiving centers
- Copernicus data dissemination platforms
- National datahubs

## Use cases

- Parametric insurance (risk estimation, automated claim settlement)
- EO downstream services – origin of data source, evidence control

[More info: https://guardtime.com/eoguard](https://guardtime.com/eoguard)

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# Thank you!

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