SPACE SECTOR INNOVATION PROJECTS

Guardtime has been involved in 7 space sector innovation projects in the past 5 years to gain industry traction for some of our key technologies and solutions like KSI, MIDA, Alphabill, etc. Our main source of projects and strong technology assessor has been the European Space Agency (ESA). We have also received a contract from EUSPA (European Union Agency for the Space Programme) and are targeting Horizon Europe initiatives in this field. Currently, we are actively involved in 3 space projects:

- **EOGuard** – traceability and guarantee of origin of Earth observation data.
- **Space Traffic Coordination Monitoring (STCM)** – trusted and secure exchange of satellite coordination messages to prevent collision of satellites and conformity monitoring of Space Traffic Management regulations.
- **SPACE4Green** – secure and trusted positioning and traceability service for food supply chain applications (Android mobile device).

The connections and know-how created with these three projects can be used to generate new technology demonstrations and to create a potential basis for forming new business lines when the market needs have been validated with additional clients and stakeholders.

A short overview of these three projects is presented here. It highlights the challenges that we are solving and generalizes the status of our current work.

EOGuard (2020-2023)

AIM: to demonstrate the feasibility of automated data and software elements traceability and to enhance the cyber security of stored EO data and the security of related provenance information.

WHAT DO WE DO? We have developed the EOGuard solution to safeguard the full supply chain of EO data and to provide security for EO data archives to facilitate the availability and usability of these datasets and reduce the costs of archiving EO products. EOGuard is deployed in two pilots.

TECHNOLOGY IN ACTION:
KSI blockchain/resonance

https://guardtime.com/eoguard

guardtime.com

EOGuard

01. ESA ESRIN pilot
cooperating with ESA to deploy EOGuard on ESRIN's heritage mission long-term archive to ensure data integrity and traceability.

Problem

The increase in Earth Observation (EO) data volumes, along with its variety and velocity, requires disruptive changes in the ways data is stored and how users interact with EO products, especially considering EO data's vulnerability to malicious changes when these massive data flows go through data processing centers.

Solution

Leveraging KSI blockchain, changes to EO data are detected. EOGuard guarantees data integrity and immutability while mitigating risks of accidental data corruption, processing errors and other vulnerabilities like security violation, data tampering or malicious interference in the databases.

Status

We have successfully deployed EOGuard to ESA ESRIN long-term archive (LTA). Follow-up tasks include more sophisticated provenance capability to different actors in the system, advanced monitoring capability, and enabling other 3rd party users/service providers to interact with the EOGuard features.

02. CloudFerro pilot
cooperating with the Copernicus data hub operator to provide traceability for EO products with EOGuard.

Problem

CloudFerro's platform needs traceability functionality for EO products so that the users could have means to secure their data and to ensure accessibility and usability to said data.

Solution

Leveraging KSI blockchain, changes to EO data are detected. EOGuard guarantees data traceability.

Compared to ESRIN's pilot, here the solution is not just deployed on an archive but on cloud infrastructure with on-demand services.

Status

We have successfully deployed and tested EOGuard in CloudFerro's cloud infrastructure. The goal is to onboard more users to explore the traceability functionality that EOGuard can deliver and evaluate its potential business value.

esa EOGuard and STCM are funded by ESA.

SPACE4Green is funded by Horizon Europe.

Space Traffic Coordination Monitoring

(2023 - 2024)

AIM: to develop and test means to monitor and manage space traffic coordination systems that exchange collision avoidance data between entities in a secure and trusted way and allow conformity monitoring of space traffic management regulations.

WHAT DO WE DO? We lead one of ESA's CREAM (Collision Risk Estimation and Automated Mitigation) initiatives to ensure safer and more effective management of space traffic through secure data exchange – a solution that will be a part of a commercial space traffic coordination platform, procured by but not owed by ESA.

TECHNOLOGY IN ACTION:
KSI blockchain

SPACE4Green (2022-2024)

AIM: to enable a scalable B2B platform for trusted digital data sharing supporting automated verification of data integrity, including the time, position and identity associated with the data handling process.

WHAT DO WE DO? We are the key provider of blockchain technology. We integrate KSI into the envisioned solution to assure the authenticity and integrity of data and the immutability of supply chain events.

TECHNOLOGY IN ACTION:
KSI blockchain

https://www.space4green.eu/

Contacts

For more information, please turn to project managers:

EOGuard

Priit Anton,
priit.anton@guardtime.com

STCM and SPACE4Green

Kaarel Hanson,
kaarel.hanson@guardtime.com

Space Traffic Coordination Monitoring

Problem

Considering that there are thousands of active satellites orbiting the Earth and millions of pieces of debris in space, operating satellites safely is resource intensive. Solutions to alleviate such resource-intensive coordination activities to manage conjunctions and potential collisions are required. Moreover, regulations are being put in place to better control space traffic management and means to assess and oversee that they are correctly followed, is required.

Solution

We are creating a PoC for secure and immutable data exchange between different parties. This will include means to visualize activity and events happening in the space coordination process, identify conflicts and inconsistencies in the coordination network, and support the management of the communication infrastructure (e.g., recording of failures, decision processes, alert times, etc.). Our solution will be able to assess the quality of the operator data, log the transmission of messages between the involved actors, and ensure that the data is authentic, immutable, and unaltered during the communication and its visibility is restricted, leveraging distributed ledger technology. Moreover, the solution will be a tool for STM Authorities and regulators providing global status overview of space traffic coordination and conformity monitoring of Space Traffic Management regulations.

Status

The implementation is ongoing until the end of 2023. However, it is the intention of the ESA to take further steps in integrating different separate ongoing implementations together to form a single platform. ESA has already drafted a work plan for new developments in 2024.

SPACE4Green

Problem

Supply chain traceability and authenticity of goods and products is gaining elevated importance in many different areas and industries. Establishing trust between producers and consumers is a difficult, yet an essential one.

Solution

Space4Green solution builds upon the integration of European Space Technologies, namely Galileo OSMA, which provides tamper-proof location data. Leveraging KSI Blockchain, we will offer proof of time and integrity of electronic data as well as attribution of origin, i.e., endpoint authentication to support traceability of goods and services. KSI will be integrated with prototype services to support verification of location metadata potentially associated with any digital object stored in the infrastructure.

The end solution consists of a smartphone application and a distributed infrastructure integrated with blockchain to store and link together the submitted data.

Status

The solution, with KSI integration, will be demonstrated and tested in real-life environments to validate the maturity and usability of the technology by the end of the project in 2024. The maturity of the solution should allow onboarding new customers to support their ambitions in ensuring authenticity and integrity of their goods and traceability of their supply chain.

EOGuard and STCM are funded by ESA.

SPACE4Green is funded by Horizon Europe.