CGI Estonia AS

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- **Space**

Brief entity description

CGI Estonia is an Estonian-based IT company, part of an international CGI Group, established more than 20 years ago with offices in two major Estonian cities - Tallinn and Tartu. CGI Estonia is among the market leaders in providing custom IT solutions and services in Estonia, both in public and private sector. The main activities are system analysis and requirement engineering, software design, development and providing quality assurance in various business sectors such as space, telecommunications, energy & utilities, public sector, etc.
We have been involved in space business for more than 8 years, consisting of a team of 15 highly skilled architects and engineers. Our staff is working closely with CGI Germany, UK and other business units, delivering solutions in ground segment and earth observation domain to the European Space Agency, EUMETSAT and local clients. Our main experience is in ground segment engineering, specifically mission control, security, planning and data archives, though, earth observation and remote sensing is an area of increasing expertise. In addition to the aforementioned, a new area of business exploration is on GNSS services and applications based on Galileo services.

Key technologies and technical facilities

- Software Engineering
- Mission Planning
- Satellite Monitoring & Control
- Earth Observation Processing Platform

Current and planned developments with potential for use in space

- **Mission Planning and Scheduling Services:** Space community is missing standardized services and solutions in the area of mission planning. Different entities part of a mission need mutually agreed interfaces for better data exchange and simpler system integration. CGI Estonia is working on a proof-of-concept solution in partnership with ESA, to validate CCSDS mission planning standards currently in-development.
- **Science Operations Configuration Control Infrastructure:** System engineering process includes several complicated activities, therefore, a usable solution is needed to make the tasks as efficient as possible, mainly in the areas of problem and change management, document management and version control, requirements management and test management. CGI is developing an integrated platform of applications that takes the next step towards a common software engineering environment, with a focus on Science Operations.
- **Interactive Hosted EO Processing:** The abundance of EO imagery creates a problem for near real-time or long time-series product processing. Conventional way of image processing (especially over long time series) is a timely process, requiring many steps, including downloading, processing and displaying of the imagery. CGI Estonia has developed a proof-of-concept next-generation platform that provides rapid image processing, delivering interactive performance. It can be used for near real-time and long time-series processing, providing results in minutes or even seconds.
- **Predictive Maintenance:** Large hardware setups, e.g. ground stations, require regular maintenance, which is a time-consuming and costly process. If the maintenance can be managed on a demand basis, the process could be made faster and focus set on the hardware parts that require maintenance immediately before irreparable damage occurs. CGI is investigating this area, however, noting tangible is available at the moment.

Desired contacts

- **Partner 1:** Earth Observation image provider.
- **Customer 1:** Company that requires software engineering support with domain knowledge, in the areas of mission planning, monitoring & control, data archival, or general software solution development.
- **Customer 2:** Entity requiring EO imagery (specifically SAR) processing services, especially for products consisting of long time-series and fast processing needs.

AS DATEL

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● USA ● Europe

Brief entity description

Datel Group is a software service company with extensive experience in creating various map applications, spatial data analysis and big data visualization, as well as in the development of monitoring systems in various fields. Also during its 27 years of operations, Datel has made life easier and more convenient for many Estonians by creating numerous e-state services. Datel has an R&D cooperation agreement with the European Space Agency and this has contributed greatly to the development of Sille.

Targeted at the global market, SILLE allows users to monitor the shifts, deformation and subsidence of infrastructures everywhere in the world. The early warning system uses data from European Space Agency satellites and can detect movements of infrastructure such as bridges, pipelines, ports, mines, buildings and large objects with the precision of up to 1mm. This innovative service helps to prevent accidents caused by deterioration of infrastructure and thus contributes to the general safety of society. Built in collaboration with scientists and partners from USA, Italy, Germany, Australia, Czech and Spain.

Key technologies and technical facilities

- Spatial data analysis, GIS, enterprise services, programming, remote sensing, SAR, InSAR
- Full team of remote sensing application developments
- Automatic InSAR deformation calculation globally
- Software and hardware to download, analyze, and publish big volumes of value added information

Current and planned developments with potential for use in space

- **Current / planned development 1:** Remote sensing data analytics in satellite
- **Current / planned development 2:** Machine learning and Insar Processing

Desired contacts

- **Partner 1:** Experienced InSAR analyst, reseller of Sille, partner in cooperation projects (H2020, ESA, SME etc), procurement/ tender partner,
- **Supplier 1:**
- **Customer 1:** Large value infrastructure owner, large volume real estate owner, cities (smart city), large volume pipeline owner.

European Space Agency
Agence spatiale européenne

FACT Industries

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●Thermal management components ● Bio-implants by 3D printing ● Feedstock for additive manufacturing

Brief entity description

FACT Industries provides customized research & development assignments in the field of materials engineering. We focus on improvement of materials, analysis of products and development of resource-efficient-technologies utilizing additive manufacturing. One of the key features of the company's expertise is implementation of binary and ternary composites (metal/ceramic) by selective laser sintering/melting technique.

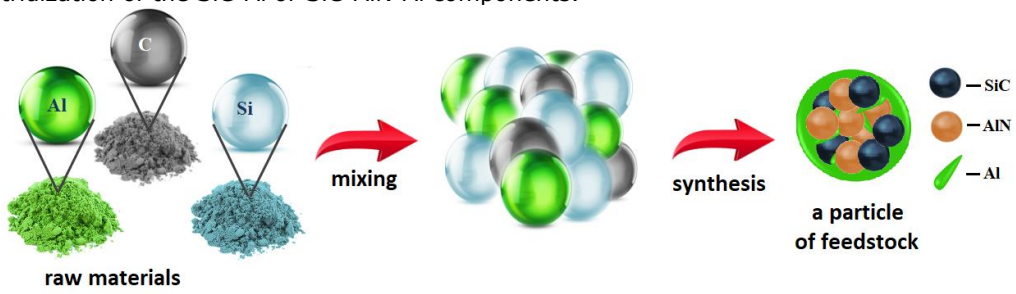
Key technologies and technical facilities

Technologies	Facilities
Customized feedstock preparation for additive manufacturing	Freeze granulator, ball millers, spray dryer, combustion synthesis reactor, hot air dryers, vacuum ovens
Additive manufacturing of ceramic-metal based components	Selective laser sintering, polymer-based 3D printers, free access to Plasma Arc AM system, Fused Deposition Modeling (FDM), Cold Spray AM, Direct Energy Deposition, Stereolitography

Current and planned developments with potential for use in space

Prototyped technology 1 (TRL 5):

- Preparation of SiC-Al and SiC-AlN-Al feedstock to be manufactured by Selective laser sintering (SLS);
- SLS of the components;
- Nitridization of the SiC-Al or SiC-AlN-Al components.



Current development 1 (TRL 3):

- Preparation of SiC-AlN-Si composite powder;
- SLS of the components;
- Carbidization of SiC-AlN-Si;
- Post-heat treatment of the components to improve the mechanical properties.

Desired contacts

- **Partners:** Tallinn University of Technology (Estonia), Institutes of Ceramics and Glasses, CSIC (Spain); Thermal Spray Centre in University of Barcelona (Spain); RHP-Technology GmbH (Austria), RIMSA Metal Technology, S.A. (Spain).
- **Supplier:** ELKEM, Saint-Gabain group, Navarro S.A, S.A; Resitec.
- **Customer:** SMW Engineering Ltd (heat exchanger for cars), RIMSA Metal Technology (brake pads), Ericsson (thermal management components, research stage).

FACT INDUSTRIES

Guardtime

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● Cyber Security ● Supply Chain Management

Brief entity description

Guardtime AS (SME; EE; 170+ FTE) is a system engineering company, engaged in R&D in hash-based cryptography, building core technology and value-added solutions that provide real-time situational awareness into the integrity state of electronic systems and data. Guardtime's core technology – KSI® blockchain technology – enables its customers to know and be able to forensically prove whether any part of their systems or stored electronic data have been changed. In addition to building customized end-user solutions based on the KSI® technology stack, Guardtime offers cyber range services delivering tailored and realistic exercises to governments and enterprise customers.

Key technologies and technical facilities

- **KSI® Blockchain** - High-scale, high-frequency blockchain technology for real-time integrity instrumentation of systems, networks, processes and data. KSI blockchain allows to register and verify 10^{12} data items every second, with high availability (99,999%) and 100% data privacy guaranteed.
- **BLT** –a next-gen quantum immune human and machine identity schema with a level of non-repudiation consistent with existing digital signature schemes. BLT provides a scalable, secure alternative to RSA - practical for authenticating not only data in motion, but also for data at rest in the cloud or as part of infrastructure.
- **Black Lantern® infrastructure -** an integrated hardware and software platform, purpose built to mitigate both remote and physical attacks against infrastructure and applications. It's able to identify, defeat, deter, and react against cyber-attacks in different scenarios: defend itself, its hosted applications and customer network-based critical assets.
- **Guardtime supply chain management** – Adds transparency and trust to otherwise opaque and discrete supply chains, while preserving supplier privacy. The solution uses massively scalable blockchain combined with digital twin technology. It assures provenance of goods and business process, automation, anti - counterfeit, proof of identity, recall management, and other necessary functionalities based on customer needs.
- **Cyber range and exercises –** developing cyber range software and providing realistic exercises to governments and enterprises. After identifying customer needs, exercises are carried out based on tailored scenarios to increase preparedness for cyber incident handling. Services include risk assessment, training, adversarial evaluations and red teaming.

Current and planned developments with potential for use in space

- **Integrity of EO data processing and archiving:** Guardtime is building a fundamental digital integrity platform for ESA Earth Observation data products, providing immutable proof of integrity and provenance for all satellite data residing on ESA platforms.

Desired contacts

- **Partner 1:** An entity operating in and targeting the cyber security sector, addressing challenges defined in ESA Digital Agenda 4.0 framework and similar activities in H2020 and beyond.
- **Supplier 1:** An entity that operates satellite control, downlink and data storage components and is interested to contribute to building next generation cyber resilient and scalable platforms that address big data and cyber threat scenarios.
- **Customer 1:** An entity who is providing EO data storage, archiving and distribution.

Precision Navigation Systems OÜ

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• Drones and UAVs • GNSS CORS data providers

Brief entity description

Precision Navigation Systems OÜ is developing software and hardware solutions for the variety of non-standard applied and infrastructural tasks using GNSS technology and geotechnical sensors.

Our flagman product — HIVE — is a cloud-based solution for super accurate GNSS-positioning and navigation. By smart utilization of GNSS-data from existing ground-based GNSS continuously operating reference stations across the world HIVE helps drones, robots and other GNSS-equipped autonomous systems to be positioned, navigated and tracked with up to 1 cm precision.

Key technologies and technical facilities

- GNSS infrastructure management software, technologies, standards and services
- NTRIP, RINEX, RTCM

Current and planned developments with potential for use in space

- **Current development:** Virtual operator for high precision GNSS positioning and navigation "HIVE" on the basis of existing GNSS CORS in the ESA Member States.
- **Planned development (on the basis of HIVE):** Software-Defined GNSS Receivers — receiver with digital processing done in software on a general-purpose computer, needing only (relatively) cheap and simple hardware to receive and digitize signal.

Desired contacts

- **Partners/Suppliers:** Public GNSS data providers (Estonia: Estonian Land Board; Latvia: LatPos, EUPOS-RĪGA; Lithuania: LITPOS; Europe: EUREF Permanent GNSS Network, EGNOS)
- **Customers:** drones (airborne and rolling), robots, unmanned autonomous vehicles, IoT companies.

Proekspert AS

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• Predictive analytics • Production optimisation using machine learning tools

Brief entity description

25 years of experience in building mission critical embedded software and application software. F.e. frequency converters (FC) to reduce electrical consumption of motors by enabling to change torque load or to feed back to the power supply, re-channelling braking energy, etc.

Using our sw development experience and handling of big data, we have been building machine learning/predictive analytics models and algorithms for predictive maintenance, production optimisation and deficient/defective product analysis.

Key technologies and technical facilities

- python
- tensorflow
- Key technical facility 1
- Key technical facility 2

Current and planned developments with potential for use in space

- **Current/planned development 1:** vibration pattern classification and degradation detection
- **Current/planned development 2:** equipment failure prediction in multidimensional time series sensor data

Desired contacts

- **Partner 1:** product/equipment developer where data science tools and methods can be applied
- **Supplier 1:** producer/developer of equipment with rotational/moving parts
- **Customer 1:** ThalesAlenia, Airbus

PROEKSPERT

Testonica Lab OÜ

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● FPGA design and troubleshooting ● Embedded Instrumentation

Brief entity description

Founded in 2005, Testonica Lab has become a world-wide pioneer and leader in developing automated synthetic and virtual embedded instrumentation. Currently Testonica Lab offers cutting-edge technologies and tools for high-speed test access and at-speed test application based on JTAG and FPGAs, which are used by leaders in consumer electronics, telecom, automotive, military, aerospace, industrial electronics, entertainment and fundamental science segments. Testonica Lab is a product-oriented company that sells licenses for its tools via globally-present strategic partners.

Testonica Lab has strong relations in academic world due to being historically a spin-off from Tallinn University of Technology and located in the Tallinn Science Park Tehnopol.

Testonica Lab has a broad experience with many computational platforms including embedded CPUs, microcontrollers, reconfigurable FPGAs, and SoC-FPGAs.

Key technologies and technical facilities

- FPGA-based diagnostic instrumentation
- FDIR – Fault Detection Isolation and recovery

Current and planned developments with potential for use in space

- **FDIR:** Systematic approach for real-time fault handling, prognostics and Self-Health Awareness.
- **Embedded Instrumentation:** proprietary framework that checks for stability issues & defects.

Desired contacts

- **Partner 1:** company interested in advanced FDIR solutions/research.
- **Customer 1:** company interested in advanced testing for stability issues & defects.
- **Customer 2:** company that needs FPGA development resources and/or embedded programming.
- **Customer 3:** company that needs testability analysis or test strategy for electronic assemblies.

Entity Logo & Relevant Images