

イグアス ソフトウェア システムズ

Iguassu Software Systems, founded 1994

Space software technologies for ESA & EUSPA since 2005

Since 12 years a supplier of SSA software for ESA


**Since 19 years develops GNSS/SBAS performance tools
and sells worldwide**

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Main expertise

- **GNSS** - principally SBAS/EGNOS
 - from educational tools to professional SBAS performance monitoring tools and volume simulator; clients ESA, EUSPA, Spaceopal, ESSP, ENRI 
- **SSA / Space Safety** - robotic telescopes, image processing, optical sensor qualification, NEO, space debris, collision avoidance, Flyeye telescope
- Clients ESA, Matera
- **launchers** – flight and ground segment telemetry processing, clients Ariane 6, Critical Software, CNES

Products

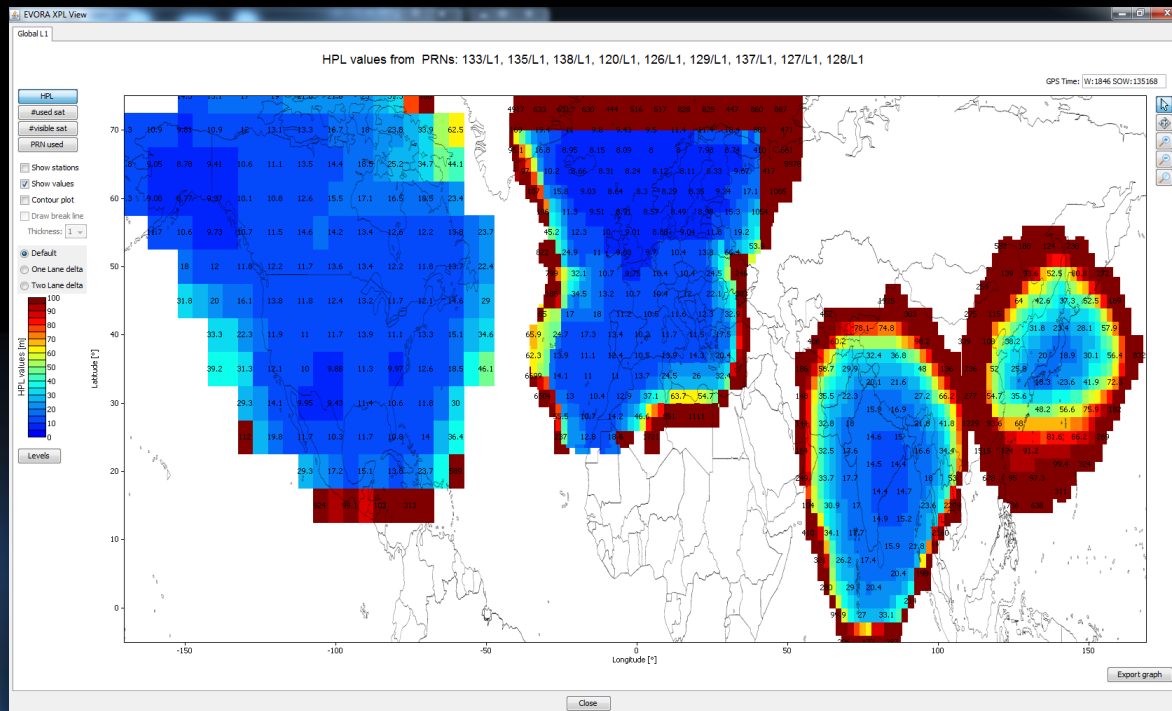
GNSS

- **EVORA** – real time SBAS performance monitoring tool qualified to DAL E – in use in EGNOS by TAS-F and CNES, Japanese government research institute, contracts with ESSP etc and Spaceopal
- SENDAI – multi-constellation long term GNSS performance monitoring, and GNSS data mining (GPS, Galileo, Glonass, QZSS, Beidou)
- **SBAS Simulator 2**, sold e.g. to West African ANS
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- Interference monitoring System for GNSS stations
(with Airbus Space and Defence Germany)



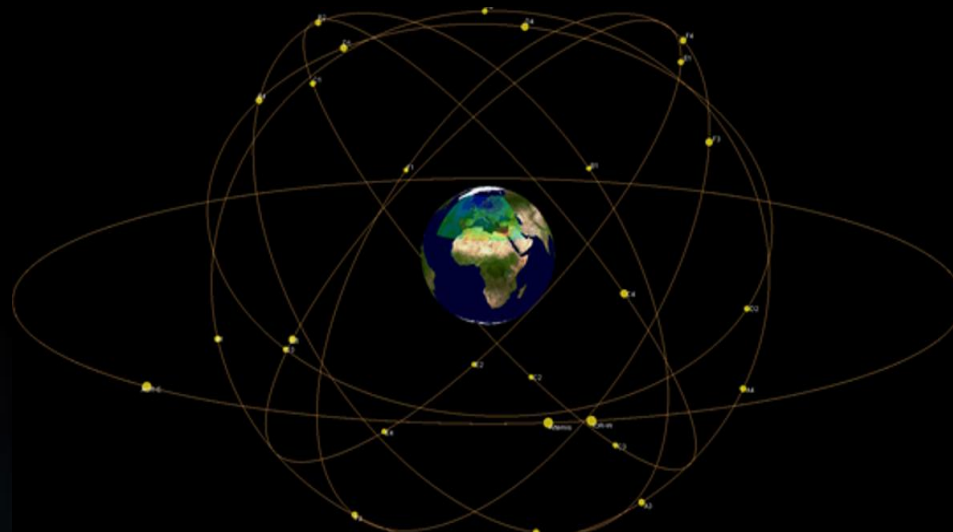
GNSS : EVORA

- EVORA real-time that processing of ephemeris, observation and navigation from NTRIP or other sources show the computed results of XPL, Availability, Continuity, Accuracy, ESA Stanford, satellite tracking, in graphic and map form. Login access, alert reporting via email or GUI, report generation and command a control of server configurations.



GNSS : SBAS Simulator

- SBAS Simulator simulates different SBAS systems. The operator can configure multiple parameters like the space constellation, ground segment, the frequencies, errors, and then compute and visualize the results in different maps (2D and 3D).



Space Safety (S2P / SSA) past projects

- Test-Bed Telescopes (2012-2017)
 - Near Earth Objects (NEO), Space Surveillance and Tracking (SST), image processing
- Sensors' qualification (2016-2018)
 - Conversion between different formats for optical telescopes and SLR stations
- Robotic Telescopes (2018-2022)
 - Automation of the TBT telescopes, processing SW upgrades
 - Polish Sensor Network (2020-2022) – data formats
- Near Earth Objects (NEO), Space Surveillance & Tracking
 - NEOSTEL DPC - Image processing, NEO survey,
 - Robotic Telescopes – TBT upgrade, processing SW
 - Polish Sensor Network – data formats, SHOT telescope
 - NEO and SST software update for TBT (FlyEye DPC for TBT)
 - Maintenance for NEOSTEL

Space Safety (S2P / SSA) ongoing projects

- Flyeye Data Processing Chain (2018-now)
 - NEO surveys, 16 cameras, FoV 6.7x6.7 deg, image processing
 - First telescope in Italy, second is planned in Chile
- Robotic Telescopes2 (2022-now)
 - Flyeye DPC adaptation for TBT
 - Reusing Flyeye DPC NEO capabilities + new SST development
- CREAM3 (Collision Risk Estimation & Automated Mitigation) (2022-now)
 - Backend for collision avoidance automated decision system
 - To be upgraded during 2024

Asteroid and space debris detection

- Processing optical data and delivering asteroid astrometry to US Minor Planet Center and space debris tracklets (CCSDS TDM) to ESA platforms.
- Using robotic telescopes in Spain & Chile, and the Czech astronomical observatory Teplice

Space Safety – processing software for SST

ASAP

- Developed for TBT as part of ESA contract (Iguassu product)
- Updated for SHOT telescope (Teplice observatory)
- ASAP features
 - Automated processing of asteroids and space debris
 - SST features
 - MEO/GEO SST processing
 - Near-real time results (minutes after the observation is finished)
 - SST tracklets in CCSDS TDM format, automated storage on the disk and possibility of SFTP upload
 - Results validated in several ESA campaigns (TBT and SHOT telescope)

Space Safety – processing software for SST ASAP

- ASAP requirements
 - Observation strategy
 - Reference (stars, sidereal tracking) and object images (focus on objects)
 - Same FoV for all images
 - Objects have to be exposed as points
 - PinPoint library (3rd part library providing the astrometric plate solution)
 - SHOT telescope (Teplice) meets all the requirements + automation



Space Safety – processing software for SST

ASAP

- ASAP limitations
 - 3rd part libraries (PinPoint 6 and FitsLib) are 32-bit, ASAP is also 32-bit
 - ASAP .NET 32-bit application, 1GB RAM limit
 - ASAP limitations mitigation
 - ASAP2
 - Ongoing activity for NEO survey, SST detection to be added in 2024 + CCSDS TDM reporting for space debris tracklets
 - Not easy to transfer outside ESA projects (consortium of 3 companies)
 - ASAP PinPoint and FitsLib corrections
 - Additional development effort
 - PinPoint7 (64-bit)
 - FitLib new version does not exist, need to be coded (possible collaboration with Teplice)

Sample previous projects

- 2014 GNSS Multi-constellation Long Term GNSS Assessment, ESA project (ISS prime)
- 2014 EGSE Euclid SVM Electrical Simulator software design, ESA project (CSRC prime for h/w)
- 2012 GNSS Interference Monitor System for GNSS Reference Stations, ESA project (Astrium GmbH prime)
- 2012 EO Open-standard On-line Observation Services (O3S), ESA project (EOX Austria prime)
- 2011 GNSS Real-time Performance Monitoring Tool for EGNOS, ESA project (ISS prime)
- 2011 EO Parallel Data Mining Components, ESA project (ISS prime)

Sample other previous projects /2

- EUSPA – Galileo High Accuracy User Terminal (Spaceopal prime)
- EUSPA - EGNOS V2 & V3 performance monitoring (ESSP prime)
- EUSPA – SARPS(Standards & Recommended Practices)
Compliance Tool for verification of SBAS messages (ESSP prime)
- EVORA - Real-time Navigation performance monitoring tool. ESA project (ISS prime)
- SBAS Simulator II - ESA project (ISS prime)
- SOROCA, High-Performance Earth-Observation Open-Source Catalogue. ESA project (ISS prime)
- CCSDS MO GUI – CCSDS Mission Operation GUI. ESA project (ISS prime) plus extensions

Ongoing launcher projects for Ariane 6

- Flight software : collect TM, select only critical data as the launcher bandwidth decreases, and transmit to ground
- Ground Software : process ground station data in real time – receive and process TM, and forward to the control centre.

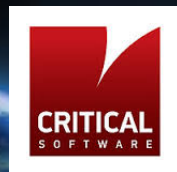




Iguassu Software Systems a.s.



Clients and partners



Japan





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**Thank you for your attention
We look forward to opportunities to work with you**

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