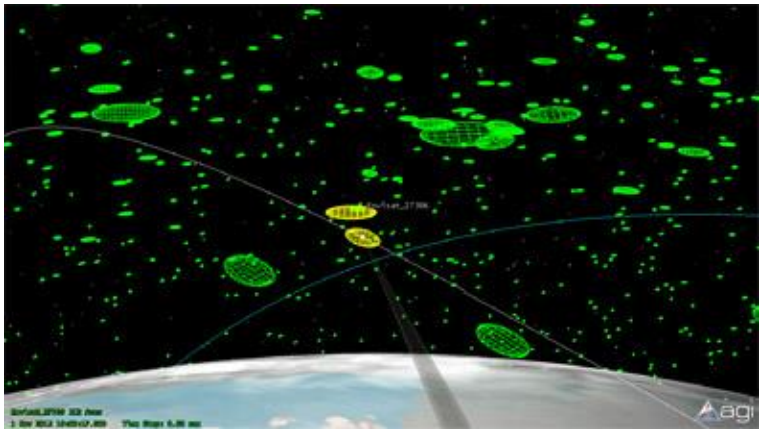
ORBIT GUARD –GMSPAZIO Satellite Tracking Toolkit

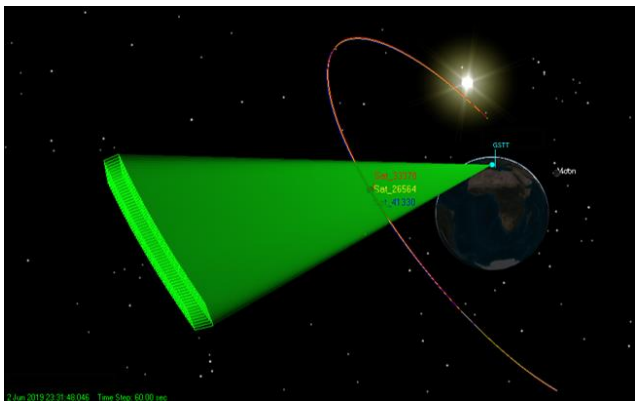
Worldwide satellite operators keep under control space around the Earth to **locate, track, identify,** and **evaluate threats** affecting orbiting assets' safety and their performances.
Many vital programs are trying to find a standard solution to this issue, but costs and time are considerable constraints.

ORBIT GUARD has been designed and delivered by GMSPAZIO to fill the gap between user needs and easy-to-use solutions, helping end-users to manage potentially complex issues, dramatically reducing costs and delivery time, using its:
Planning, **Scheduling**, **Acquisition**, and **Data Processing** features.



Steering a satellite platform to a safe position to avoid collisions and improve performance is the main target for any satellite mission control center operator. Unfortunately, space around the Earth is becoming more crowded every day. Any movement need requires precise pre and post maneuvers measurements to limit damages, which are potentially disruptive for the entire mission lifecycle.

The first user requirement has been thus identified as the need to have precise measurements of "my asset position" in the space over time. Doing that is difficult because of the resources involved and onboard energy-saving needs. Thus, very often, gathered data are in the form of statistical data. Their practical evaluation requires many downloads to become a consolidated data set used for a reliable estimate.



Any subsequent operation must wait for this feedback to proceed further; consequently, risks grow, and the probability of unexpected collisions rises.
The second user requirement to be satisfied is related to the capability to process measured data to obtain a precise forecast of "where will my satellite be at a certain time in the future." It seems to be a simple process, but space scientists spent many days and nights of work to find excellent and acceptable solutions to this issue, spending a lot of energy and time.
Another need is the possibility of carefully evaluating proximity position data to estimate reaction time and maneuvers entities on the way to save resources and avoid undesired damages.

Last but not least, the capability to exchange data in standard formats between different data sources & destinations is one of the main opportunities to be reactive and possibly also proactive in SSA activities.
ORBIT GUARD software interacts with third-party products using standard ICT and ASCOM protocols working over TCP/IP networks to control local and remote measurement and observation sites.

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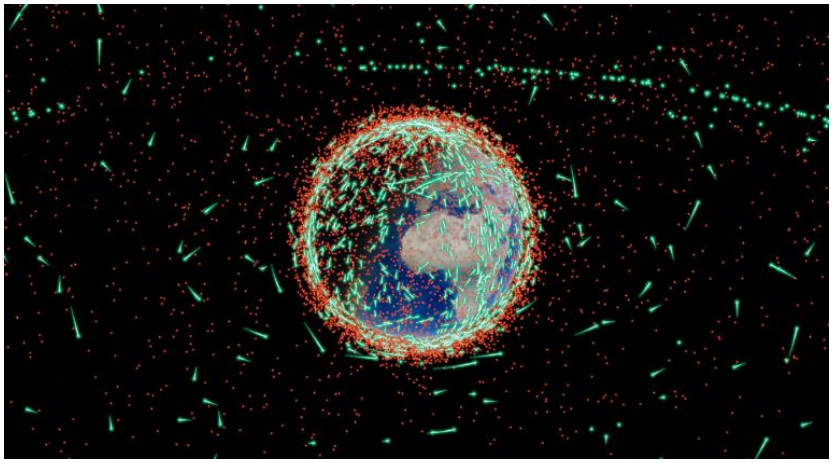
Briefly, ORBIT GUARD software offers the capability to:

- plan measurement/imaging activities along the time
- schedule activity plans and de-conflicting overlaps
- ingest multiple input source data (remotely sensed data, telemetry, images, etc.)
- automatically process and standardize input data
- produce measured orbital position data
- propagate orbital position data
- evaluate collision probability

ORBIT GUARD cooperates with ANSYS-STK™software suite from Ansys (USA) to ingest, evaluate and calculate all the space/time-dependent helpful information to plan tracking and measurements. Time series of digital observation images are processed by ORBIT GUARD software to extract orbital positions, passed to ANSYS ODTK™, from Ansys, (USA), to process gathered data exploiting its features: Optimum sequential filter and fixed interval smoother, Realistic error covariance, Autonomous measurement editor, Tracking data simulator, Simultaneous satellite estimation, High-fidelity orbit propagation, Time-varying biases, Dynamic atmospheric density correction.



ANSYS STK™CAT –Conjunction Analysis Tool is then used to go deeper into threat analysis and further improve Mission Control Center operation decisions.

ORBIT GUARD offers the capability to employ its sensors and a network of commercial sensors using these measurements together to locate, track, and predict the movements of space objects. Its incredible precision (around tenths of meters) is feasible due to the combination of GMSPAZIO software tools and advancements in highly effective commercial sensing technologies, offering unparalleled accuracy and a high degree of certainty to obtain the best avoidance prediction and enable near real-time maneuvers' detection.

ORBIT GUARD offers reliable and cost-effective SSA/SST capabilities to satellite operators to avoid collisions in LEO, MEO, and GEO orbits, by **integrating and processing data from multiple sources** (radar, telescope observations, IR, RF), thus increasing precision.

ORBIT GUARD architecture has been designed to offer a "plug-and-play" fully customizable interface approach to end-users interested in being **accurate**, **reactive**, and **effective**, approaching new solutions while preserving previous investments.

ANSYS technology has been chosen, as a foundation of this project, due to its long-term reliable presence in the Aerospace market, offering to end-users thousands of features able to satisfy the most complex data processing needs for modeling assets behaviors over space and time.