Astral

A versatile, end-to-end, modular ground segment solution

STARION

Astral

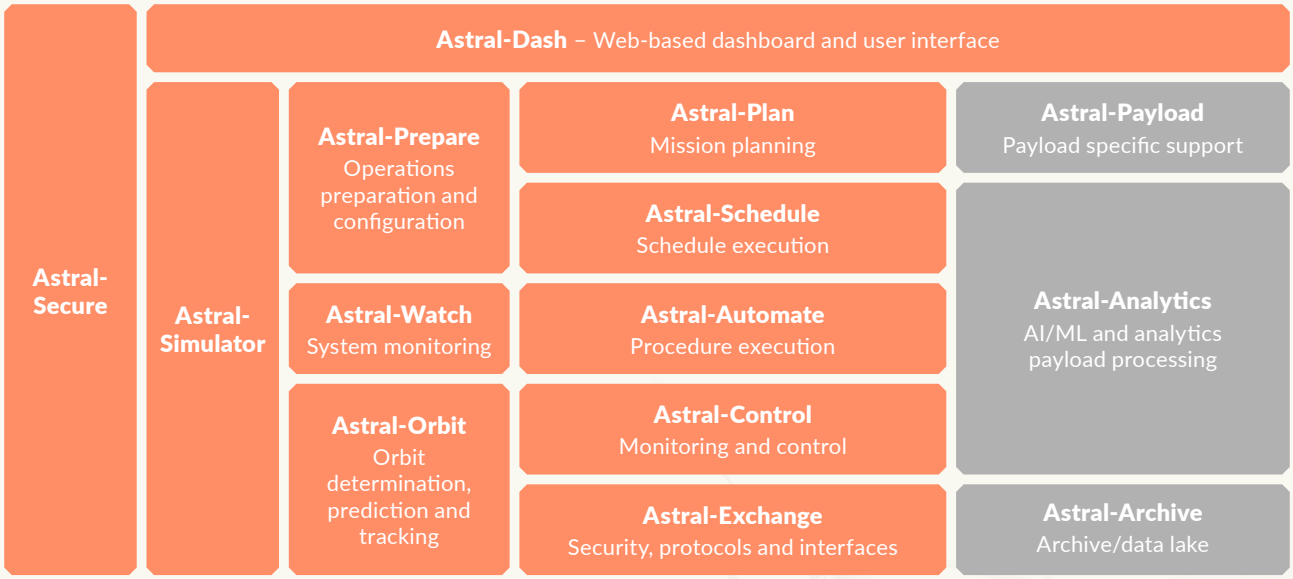
Astral is a component-based satellite ground segment solution, allowing customers a high degree of flexibility to integrate their own or third-party components and interface to other systems. Astral is operationally proven and offers a high degree of automation supporting multiple spacecraft, and includes an industry-leading operations preparation environment. It can be deployed on servers, private cloud and public cloud infrastructures.

Astral builds on Starion's long-standing operational heritage in ground segment development, mission automation and operations preparation.

The Astral approach

Astral provides an integrated environment for different ground segment systems, enabling end-to-end support from preparation to operations with the same toolset providing major benefits:

- Low learning curve for users avoiding having to learn different systems
- Complete end-to-end configuration of the mission via a single system
- Seamless integration between assembly, integration and test (AIT) and operations
- Well-defined and standardised interfaces between Astral components and external systems, where required
- Cloud enabled with integrated security by design.



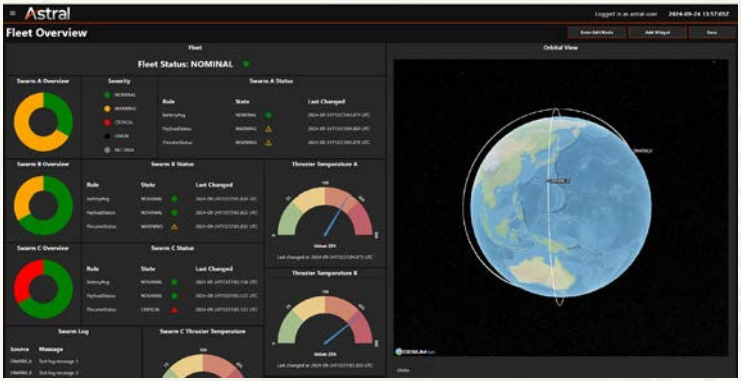
Astral consists of various components, each supporting different ground segment elements. Each element can be replaced by customer-provided or third-party components. The grey components tend to be mission specific and are not included as standard.

A modular system

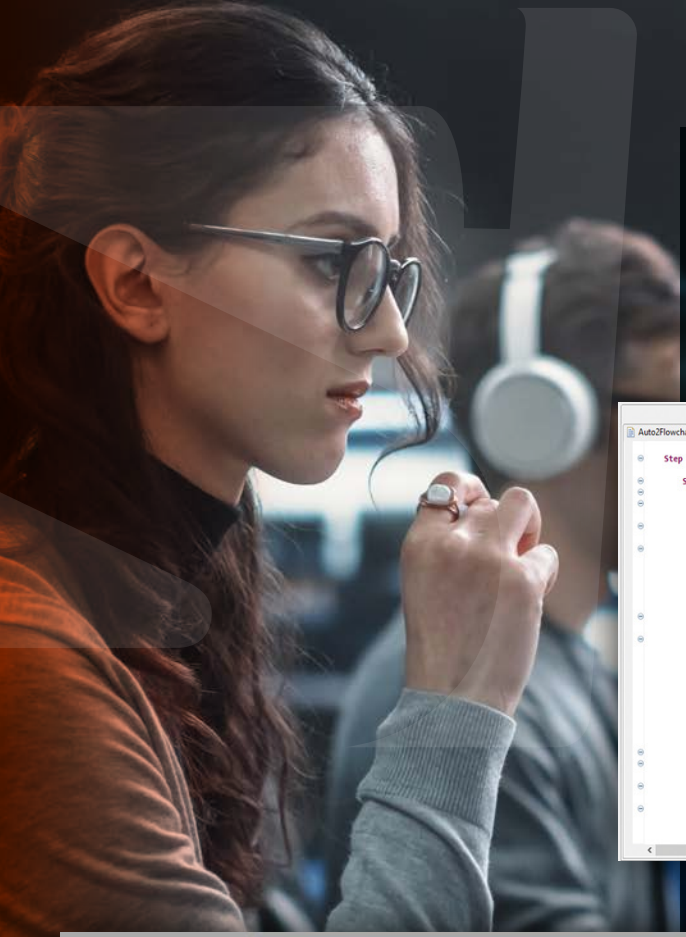
Astral offers component-based satellite ground segment modules, which allows a high degree of flexibility for customers to integrate their own or third-party components, and interface to other systems. The modules within the Astral suite include:

Astral-Dash – provides a high-level, browser-based view of the overall spacecraft and ground segment status and can be closely linked to each operator's concept of operations.

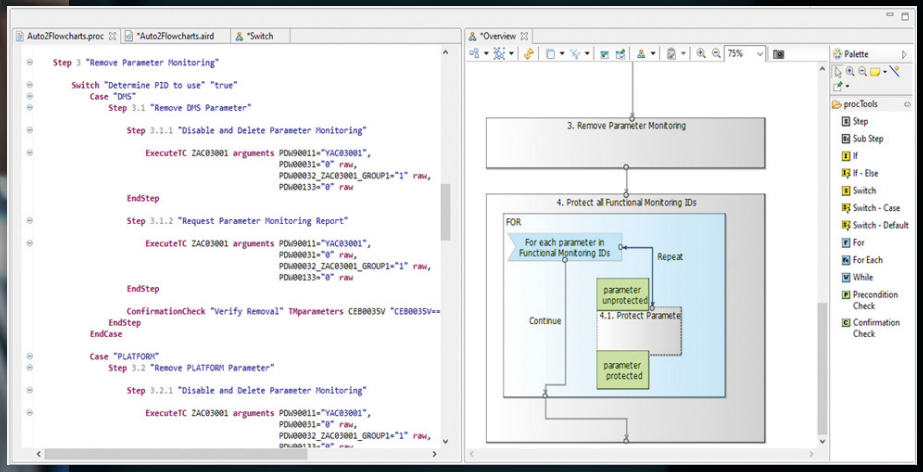
Typical dashboard displays can include: individual spacecraft and ground station status (e.g. red / green); next spacecraft pass over a ground station; status of ground segment elements; and current executing timelines. It can also include 3D views of the spacecraft orbit/attitude.



Astral-Dash

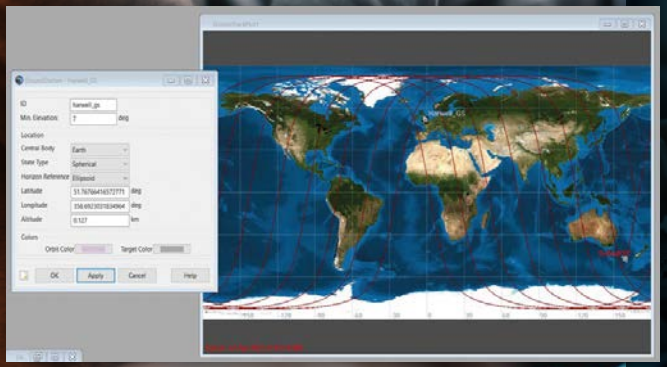


Astral-Prepare – provides management and editing of operational procedures. Validated operations procedures, whether manual, semi-automated or automated, are essential to ensure safe, reliable operations of your space segment and corresponding ground segment elements.



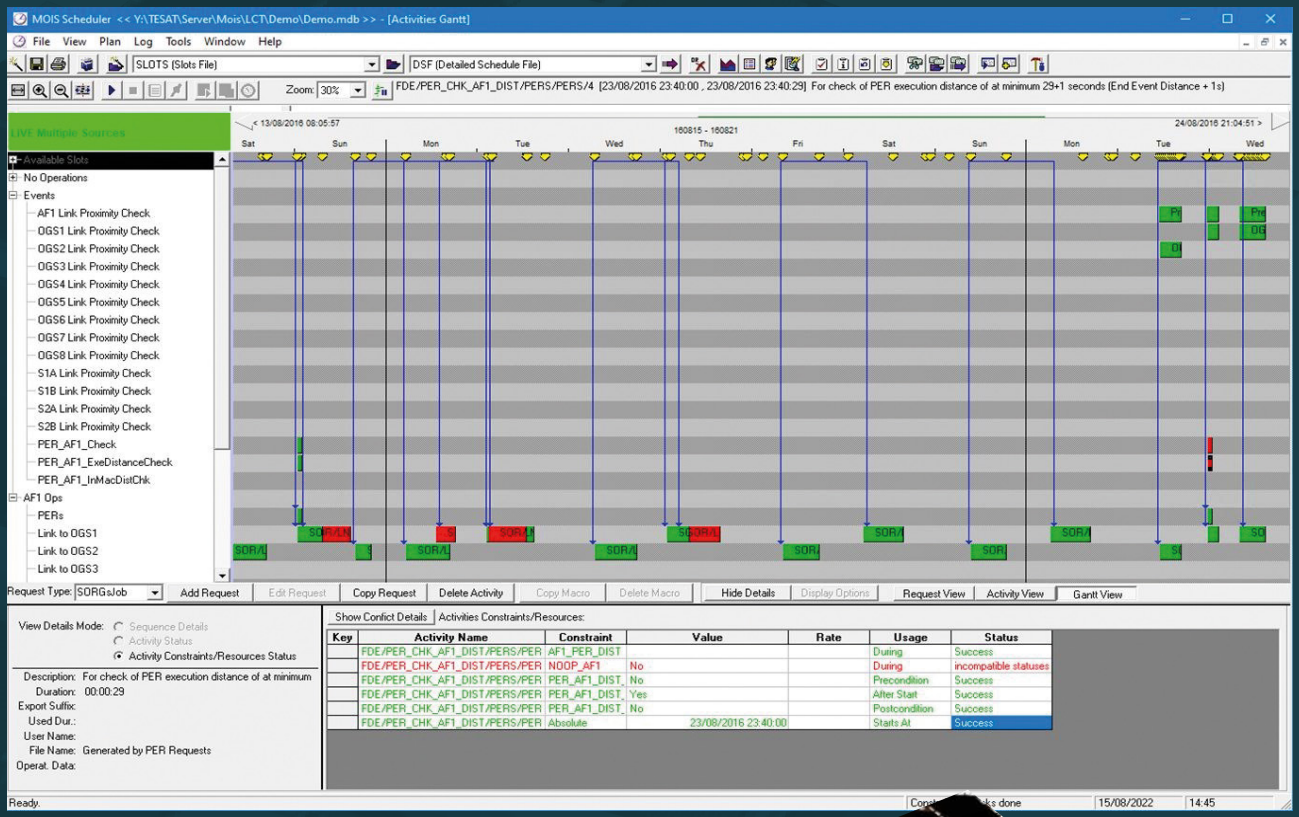
Astral-Prepare

Astral-Prepare supports authoring of manual and automated spacecraft and ground procedures and consistency checking of telemetry (TM) and telecommands (TC) with the spacecraft database. It also supports the validation and publishing of procedures to a flight operations manual and the spacecraft database management functions.



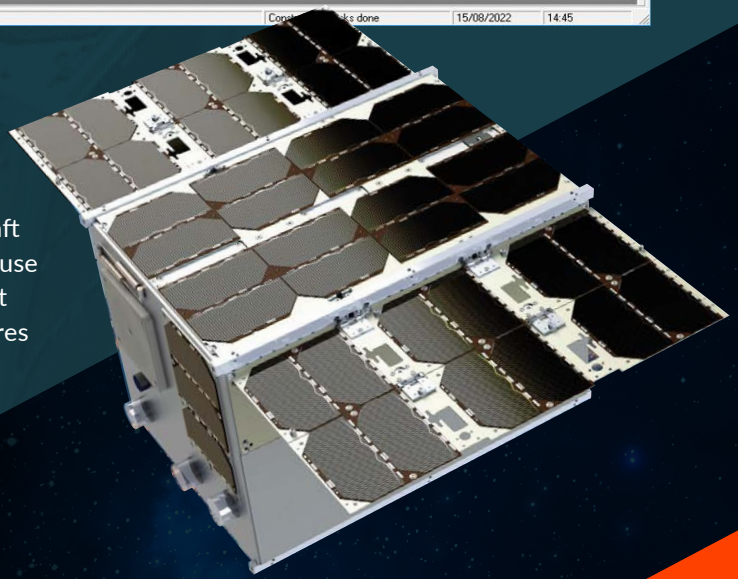
Astral-Orbit

Astral-Orbit – is an integration of GMAT, a third-party flight dynamics package supporting the automation process. GMAT provides a low-cost capability suitable for many missions. Third-party packages can be used instead, according to the client's preferences and needs.



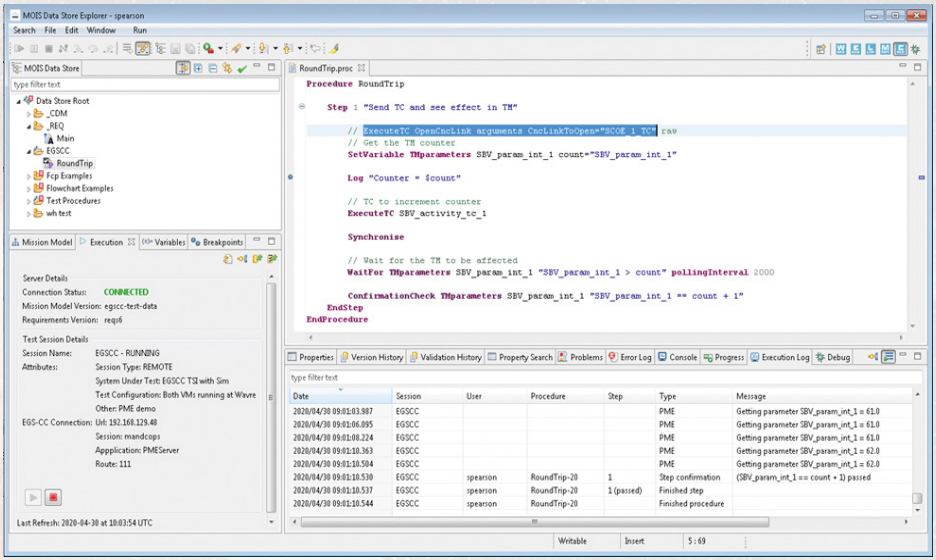
Astral-Plan

Astral-Plan – is a mission planning system enabling constraint-based planning for platform and payload operations. It supports planning of multiple spacecraft operations and multiple domains, allowing each spacecraft to have different payload and resource constraints. Because Astral-Plan is integrated with other Astral components, it will be aware of available spacecraft operations procedures and spacecraft commands.

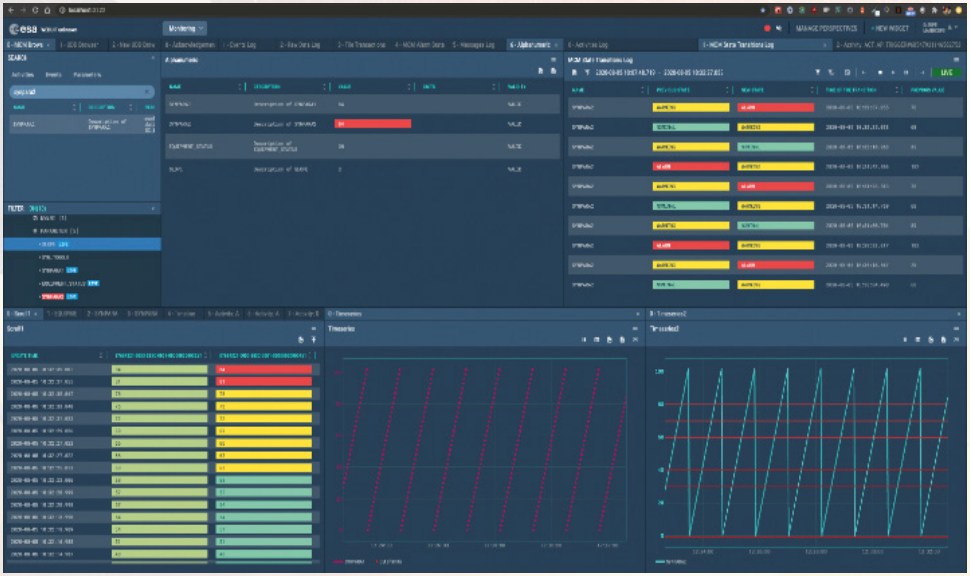


CubeSats © CubeMAP consortium

Astral-Automate – supports the execution of the schedule generated from Astral-Plan or another planning tool. It is typically used by operators as the primary view to monitor progress, only using the mission control system to look at parameter values or send manual commands. It additionally supports the automated execution and debugging of procedures developed by Astral-Prepare. It interfaces to the systems being automated (such as the mission control software) and allows you to step through a procedure to understand what is happening, and debugs accordingly.



Astral-Automate



Astral-Control

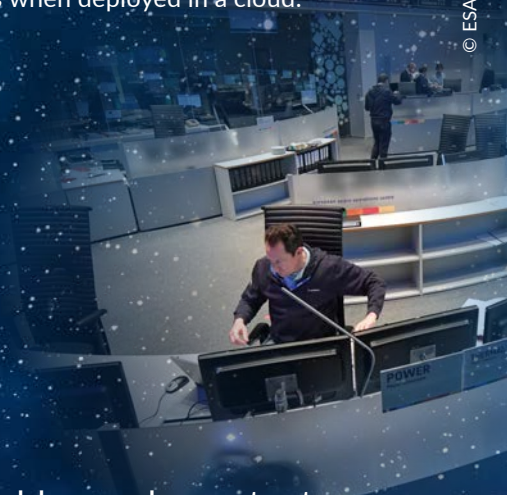
Astral-Control – is designed to be agnostic with respect to the mission control system kernel. Current deployments support both the European Ground System – Common Core (EGS-CC) and the Satellite Control and Operation System 2000 (SCOS-2000) because Starion has expertise in configuring, adapting and deploying these mission control systems. The standard deployment of Astral-Control has a web-based graphical user interface (GUI).

EGS-CC SCOS-2000®

Astral-Watch – This component provides system monitoring and control, including local security monitoring. It monitors the entire Astral deployment, collects logs and supports alerting and post-event analysis.

Astral-Verify – Often an operations simulator or flatsat is not available until rather late in the timeline of a ground segment development. Astral-Verify, configured using the spacecraft database, solves this problem, enabling early testing and end-to-end testing of the monitoring and control chain by simulating the reception of telecommands and generation of simple telemetry.

Astral-Secure – Astral employs role-based access control (RBAC) and reverse proxy technology to protect its components from unauthorised access when deployed in a cloud.



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Industry standards

Through **Astral-Exchange**, Astral supports industry standards:

- CCSDS packet TM/TC
- CCSDS SDLS
- ECSS Packet Utilisation Standards (PUS)
- AES-256 TM/TC encryption and TC authentication
- CCSDS CFDP and file-based operations
- CCSDS SLE interfaces.

Astral-Exchange support multiple ground station interfaces:

- SLE
- K-SAT
- ViaSat.

In summary

Overall, Astral provides a flexible, modular ground segment system that allows you to use the best components for ground segment operations to meet the operators' needs, whether for a single satellite or multiple spacecraft.

Astral has a modular design consisting of a set of components. Existing deployments of Astral already integrate with third-party software systems such as mission planning, flight dynamics, payload processing, operations simulators and flatsats, and third-party control systems. The Astral components can be integrated in different ways according to mission needs.

STARION

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