

The ESA Earth Observation Mission Software

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What is it?

- *a set of multiplatform **software libraries** which are made available free of charge to any user involved in supporting the ESA Earth Observation Missions preparation and exploitation.*
- widely used in ESA Earth Observation Missions:
 - Completed: **Envisat, GOCE**
 - In the operational phase:
SMOS, Cryosat, Swarm, Sentinel-1/2/3,
 - Future: **Aeolus, EarthCARE, SeoSAT, MetOp-SG, Sentinel-5P, Sentinel-6, Biomass.**

Thanks to its modular design, the EOCCI SW can be used for the development of facilities and tools belonging to different domains:

- **Mission Analysis Tools:**
 - *support to definition of Mission Requirements/Performance*
- **Mission Planning Systems:**
 - *Calibration/observation planning*
 - *On-ground activities planning*
 - *Downlink and GS acquisition*
 - *On-board and on ground Operation schedule*
- **Data Processing**
- **End to End Performance and Instrument simulator**
- **Data Generation**
- **Graphical Tools:**
 - *the EOCCI SW is used as engine for orbit/attitude/instrument related computations*

- **File/Data Handling:** *file Input/Output.*
- **Lib:** *Low-Level functions (e.g. Time/Co-ordinates conversions).*
- **Orbit:** *Orbit Propagation / Interpolation.*
- **Attitude:**
 - *Attitude computation (interpolation, attitude law);*
 - *target pointing (e.g. direct/inverse geo-location with DEM);*
 - *geometric properties of calculated targets.*
- **Visibility:**
 - *instrument swath computation and zone intersection;*
 - *zone/station visibility events;*
 - *observation opportunities for instruments (time segments and coverage).*

The ESA Earth Observation Mission Software Core Functionalities

Visibility Computation

VISIBILITY CALCULATIONS
(PASSES OVER STATION/REGION OF
INTEREST)

INSTRUMENT SWATH
DEFINITION

INSTRUMENT SWATH
CALCULATION

TIME SEGMENT MANIPULATION
(AND, OR, NOT, SORT,...)

Orbit Calculation

TIME - ORBIT CONVERSIONS

ORBIT PROPAGATION
ORBIT INTERPOLATION

ATTITUDE FRAMES AND
ATTITUDE MODEL
DEFINITION

Attitude Calculation DEM and Target pointing

DIGITAL ELEVATION MODEL
CALCULATIONS

TARGET POINTING

Geophysical & Astronomical Model Time Correlations

GEOPHYSICAL / ASTRONOMICAL
MODELS DEFINITION

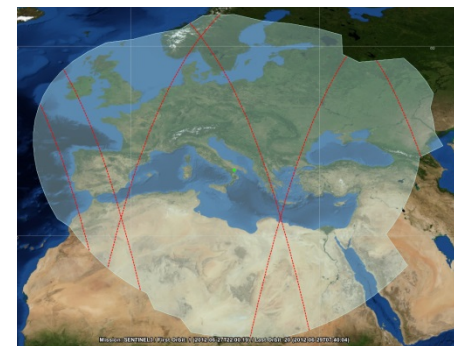
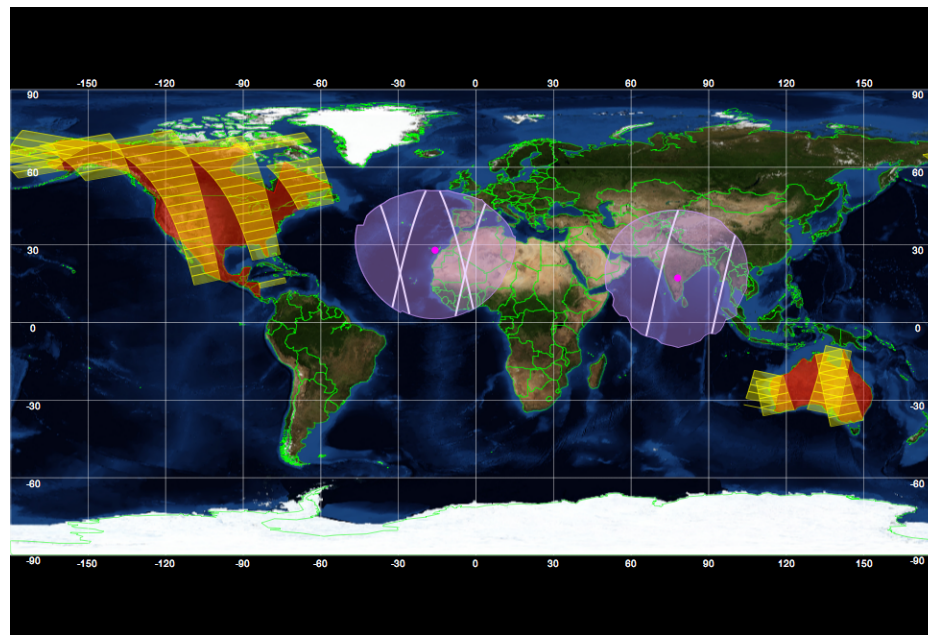
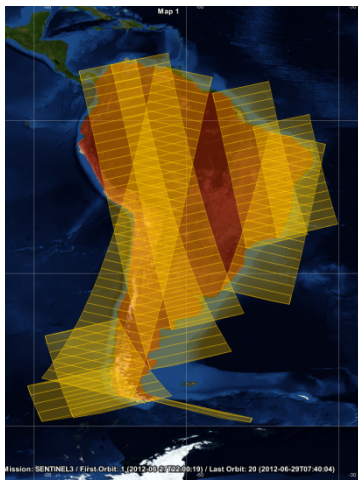
TIME CORRELATIONS DEFINITION

BASIC GEOMETRICAL AND
MATHEMATICAL COMPUTATIONS

TIME REFERENCE AND FORMAT
CONVERSIONS

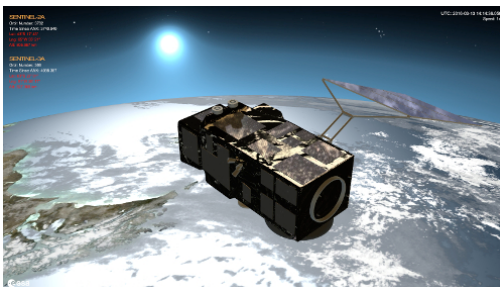
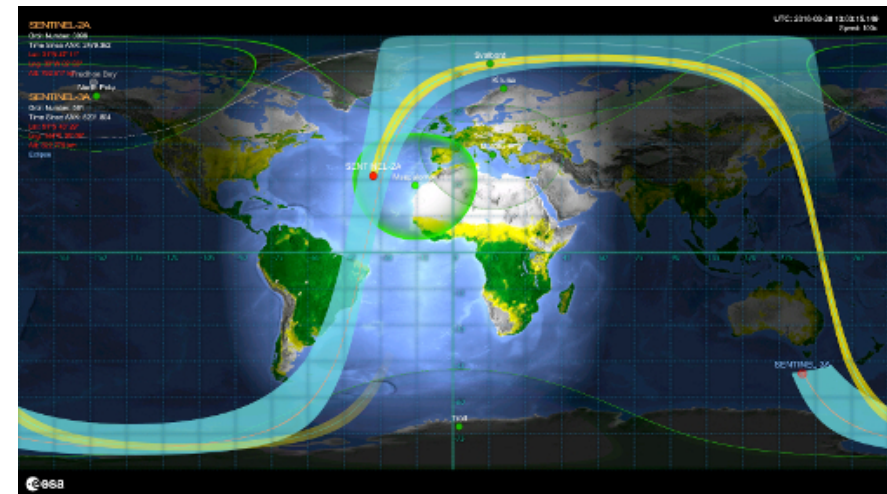
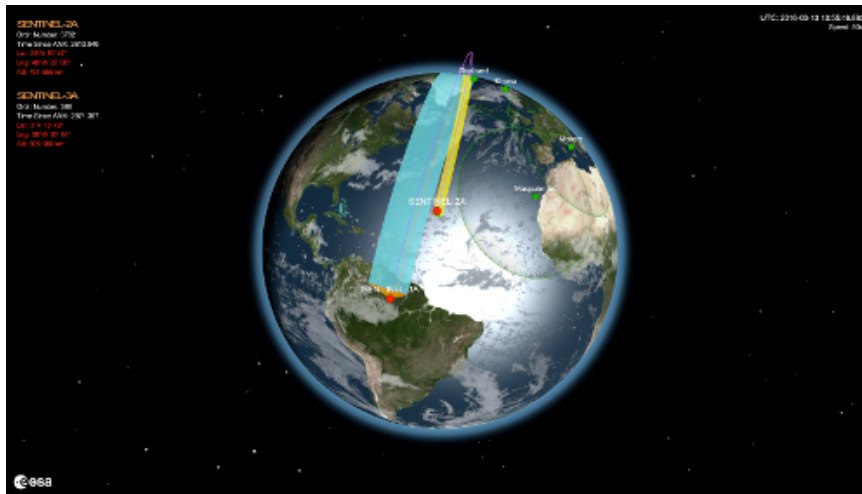
COORDINATE FRAME
TRANSFORMATIONS

ESOV allows users to visualize and print Instrument swaths, Ground tracks, Zone coverage, Ground Station Visibility and to generate overpass table for generic Earth Observation LEO satellites



ESOV is available at:
<http://eop-cfi.esa.int/index.php/applications/esov>

SAMIEdit is an application which displays stunning high-definition 3D and 2D **real time animations** and simulations of ESA Earth Observation Satellites orbiting around the Earth.



SAMI is available at:
<http://eop-cfi.esa.int/index.php/applications/sami>

- **Multi-platform: *Linux, Mac OSX, MS Windows***



- **Multi-language: C, C++, Java**



- **Two releases per year**

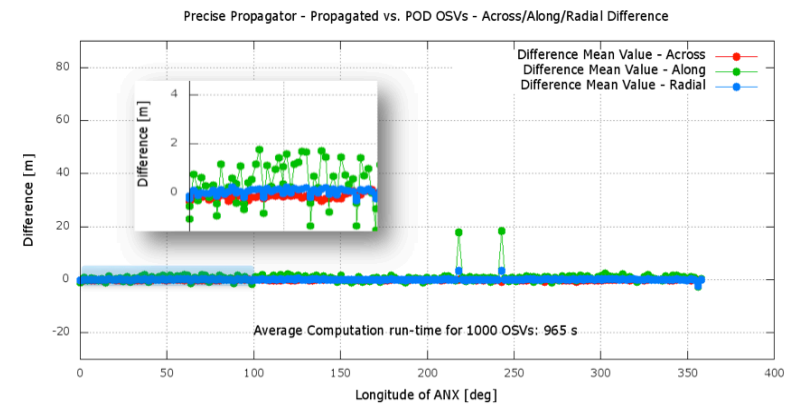
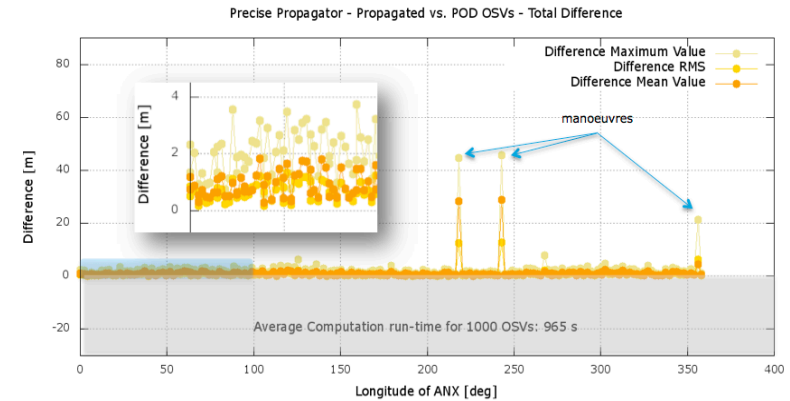
- *Maintenance (bug fixing and general improvements)*
- *New features*

- **Tools to support
Software development/validation**

- *Issue Tracker: **MantisBT***
- *Software Configuration: **Git***
- *Multi-platform build: **Cmake***
- *Orchestrator for build/validation/deployment: **Jenkins***



- Formal validation process: automated execution of **acceptance tests**, on all platforms and for all APIs.
- The software engineering validation process, as well as other steps of the development, is aided by tools implementing a so-called **continuous integration** process that ensures overall software quality and allows quick deployment of urgent releases if needed.
- The scientific validation performed on the EOCFI SW includes **accuracy assessment**, comparison with real data and to the output of other status-of-the-art Software tools or libraries.



The output of the numeric propagator has been compared to Precise Orbit Determination Data

User Support

- The Software is actively maintained by ESA and a support team is available at ESA/ESTEC to help users in:
 - using the libraries;
 - Investigate reported problems and make improvements;
 - Evaluate requests of new features.
- Two releases per year are provided in order to: resolve problems, to improve or extend already existing functionalities, the quality of the development and deployment process, the runtime performance, and to adapt it to the needs from new missions.
- Software and documentation are distributed via the System Support Division Website: **<http://eop-cfi.esa.int/>**
- Contact us at: **cfi@eopp.esa.int**