

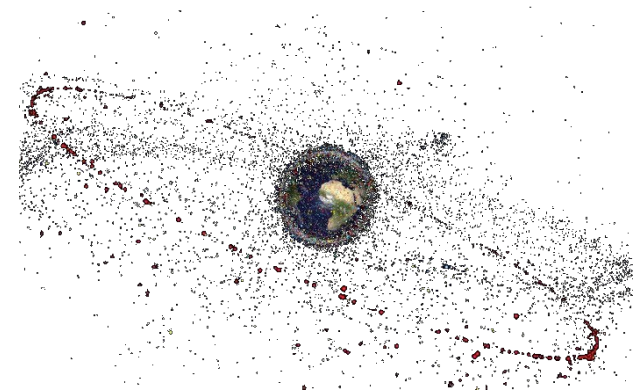
Orbit Determination and Conversion Processes at the Space Debris Office

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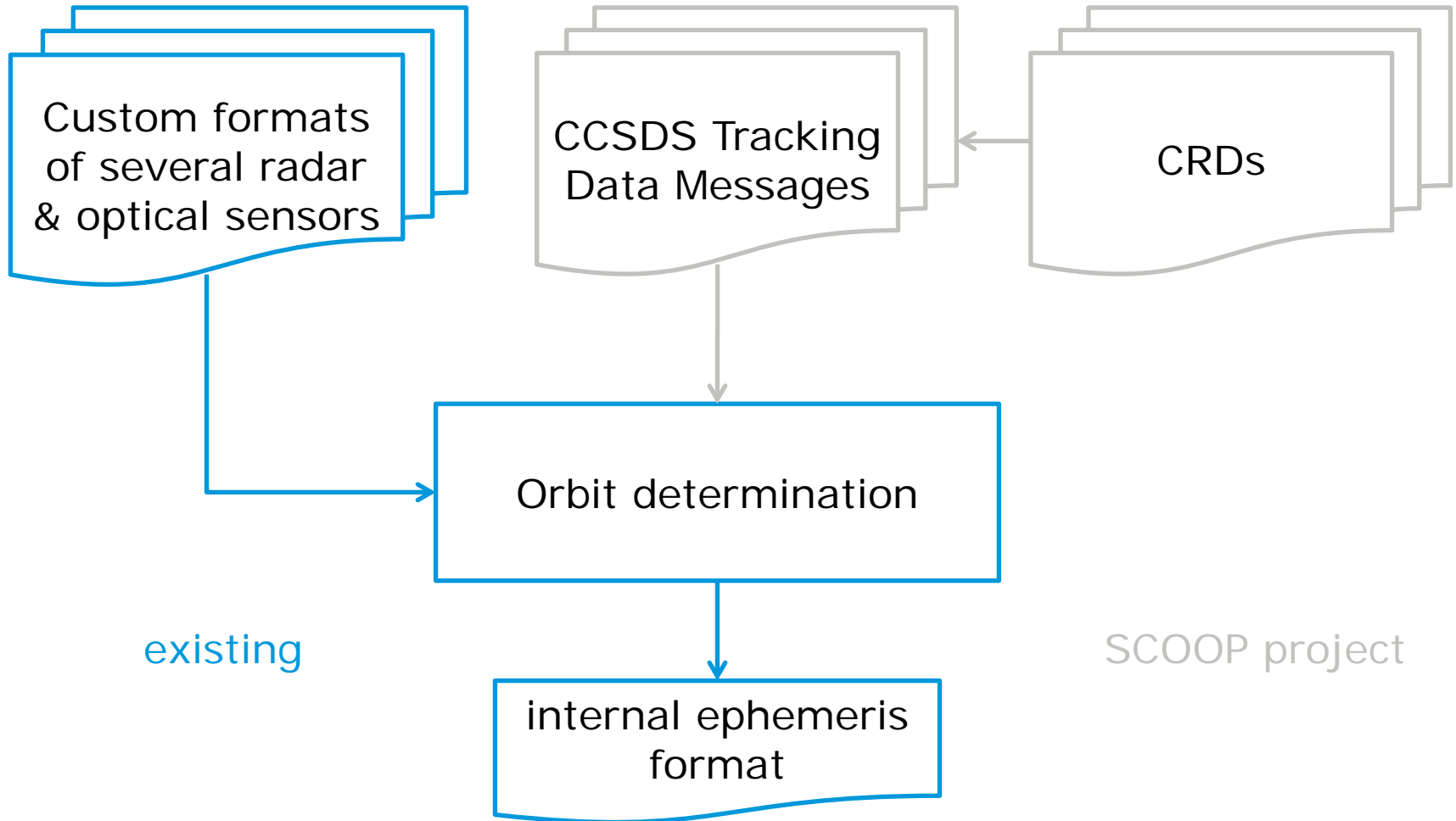
1. Where we come from
2. Orbit determination process
3. Ephemeris format conversion
4. CPF validation
5. Tracking campaigns
6. SCOOP

The Space Debris Office is in charge of development and maintenance of an infrastructure in support of ESA's commitment on space debris mitigation and risk reduction

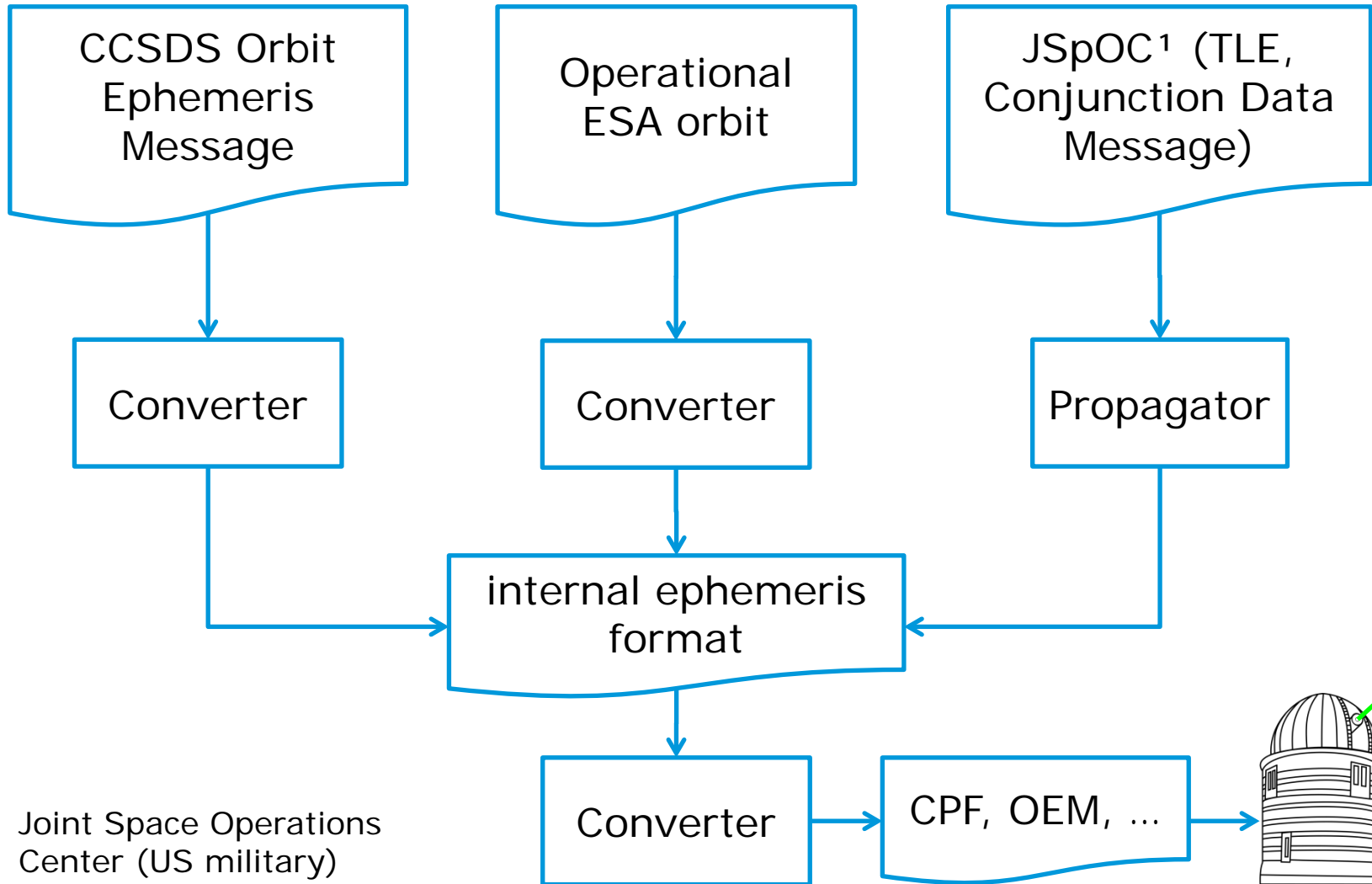
- Development & maintenance of debris environment and risk analysis **tools** → MASTER-2009, DRAMA, see <https://sdup.esoc.esa.int>
- Acquisition & processing of **measurement** data
- **Operational & contingency** support to ESA and 3rd party missions (mainly LEOP, collision avoidance & re-entry)
- Coordination of **ESA debris research**
- Contribution to ECSS, CCSDS and ISO **standards**
- **Engineering** Support (SSA, Clean Space)
- Promotion of ESA-internal & **public awareness on space debris** issues



Orbit determination process

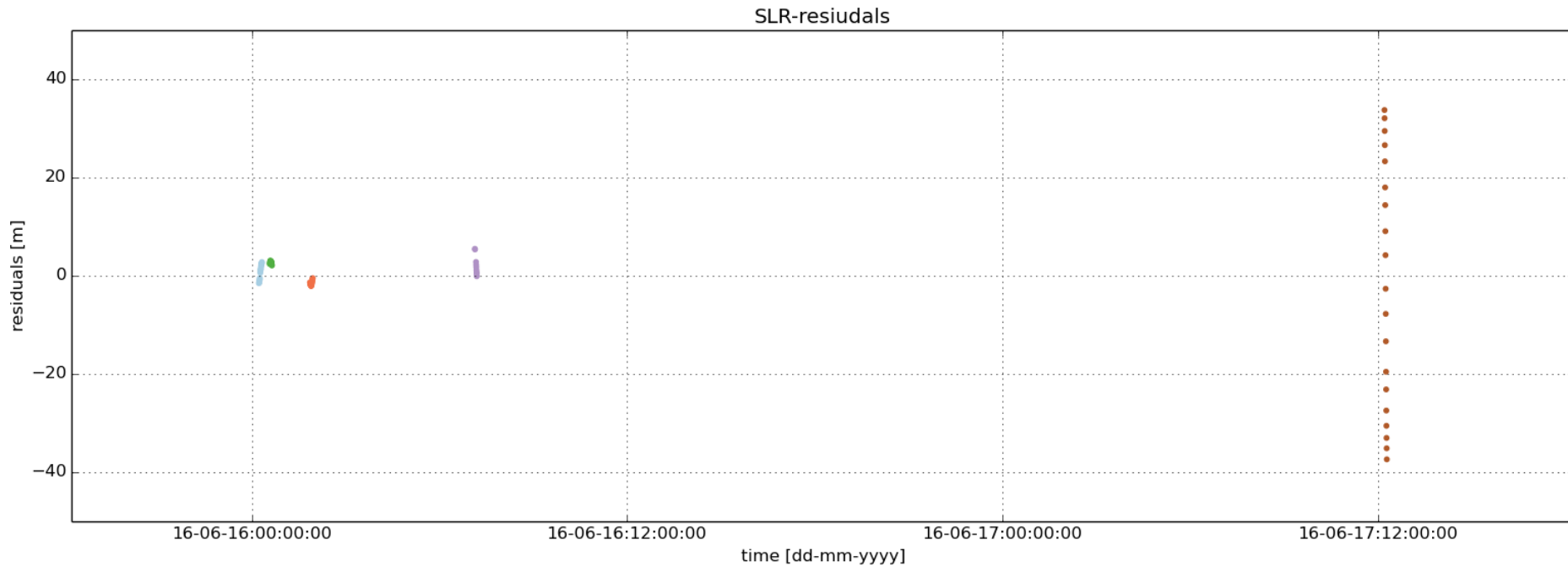


Ephemeris format conversions

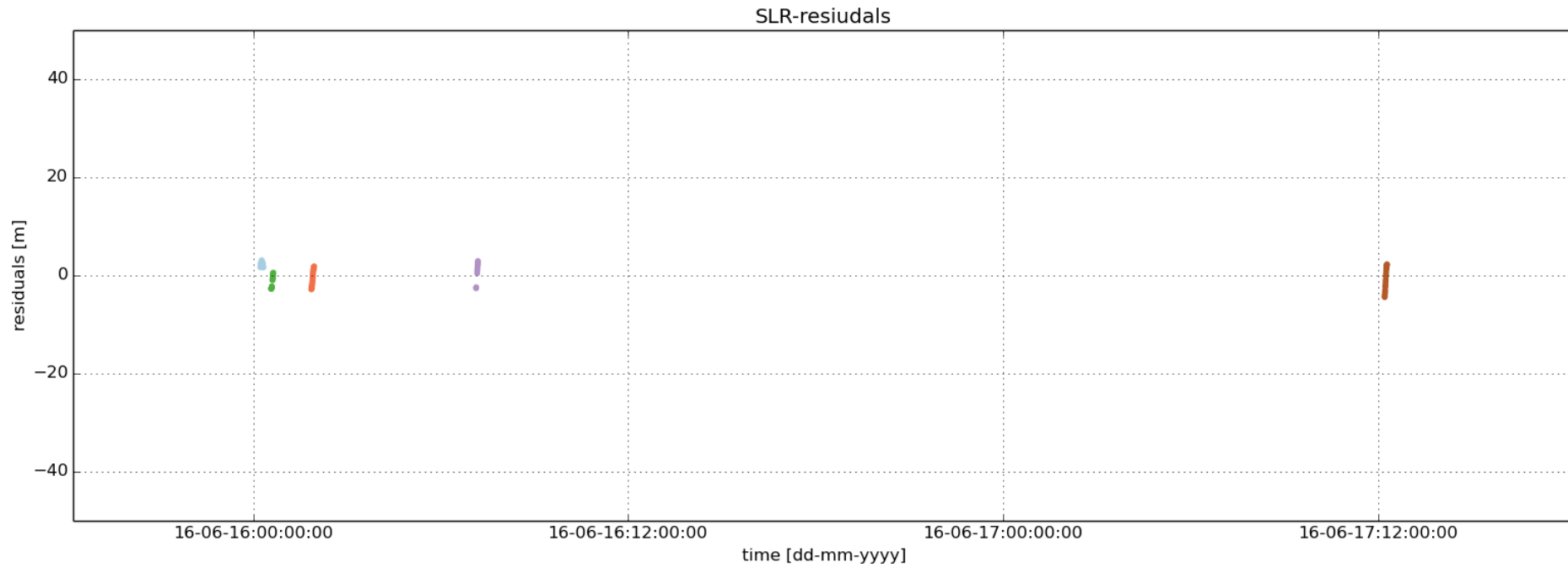


1) Joint Space Operations Center (US military)

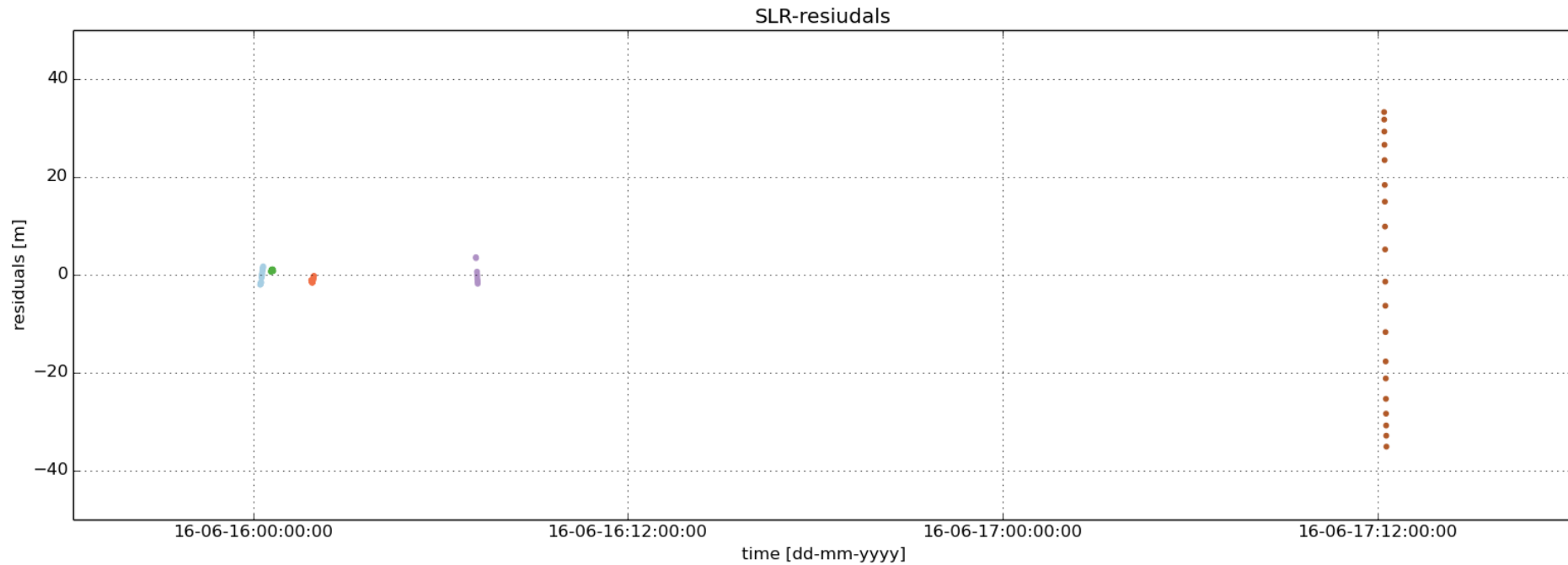
Our CPF for Cryosat-2 based on operational orbit



HTS CPF



CDDIS CPF



Tracking campaigns close to re-entry



Joining SLR debris tracking campaigns with IADC (Inter-Agency Space Debris Coordination Committee) re-entry campaigns gives some benefits:

- World-wide participation by IADC member agencies
- *TIRA* Radar measurements tasked by ESA
- Fairly good orbit available for an object close to re-entry
- Improvement of re-entry prediction accuracy expected

Laser ranging in first campaign (CZ-2C upper stage in June) not successful due to bad weather at Wettzell and Graz

Next campaign for AVUM (Vega upper stage) starting end of October.

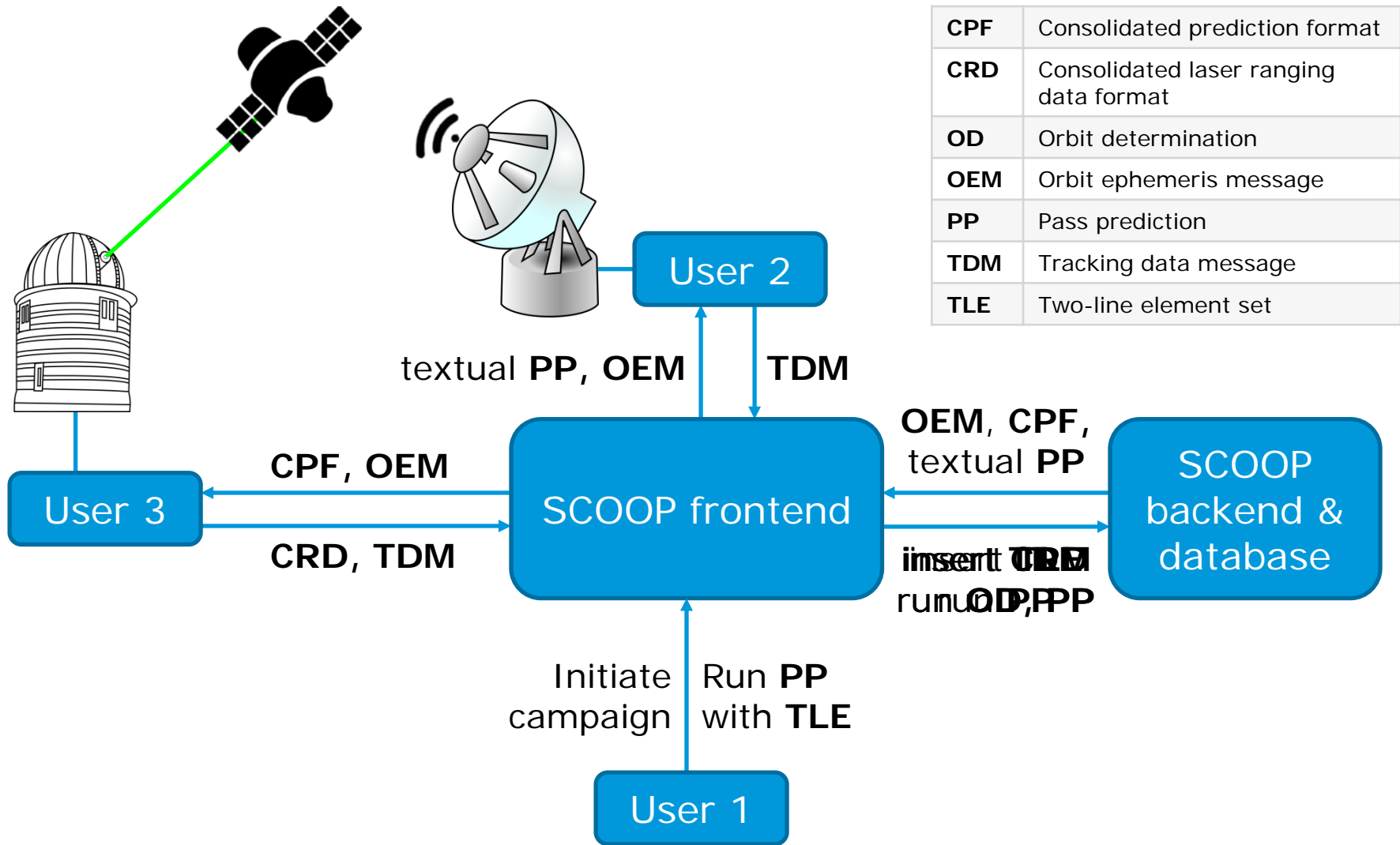
What is SCOOP?



- Web-based platform prototype hosted by ESA
- Support coordination of collaborative observation campaigns
- Combine measurements from different sensor types
- Targeted at contingency support, re-entry or validation campaigns
- Not for routine tracking
- Provide backend services for
 - orbit determination
 - pass prediction
 - data correlation
- Existing processes will be integrated in backend
- Free to use



SCOOP usage scenario



- Translation from various formats to CPF possible
- Orbit determination with measurements from different sensors possible
- Made available via SCOOP web-based platform
- Interesting for special observation campaigns like contingencies, re-entries, and validation campaigns
- End-to-end validation of orbit determination and format conversion processes still to be done
- SCOOP workshop in Jan./Feb. 2017

Thank you!