

# **EOMPA - Adopting the CCSDS standards to promote interoperability and compatibility in the ground segment**

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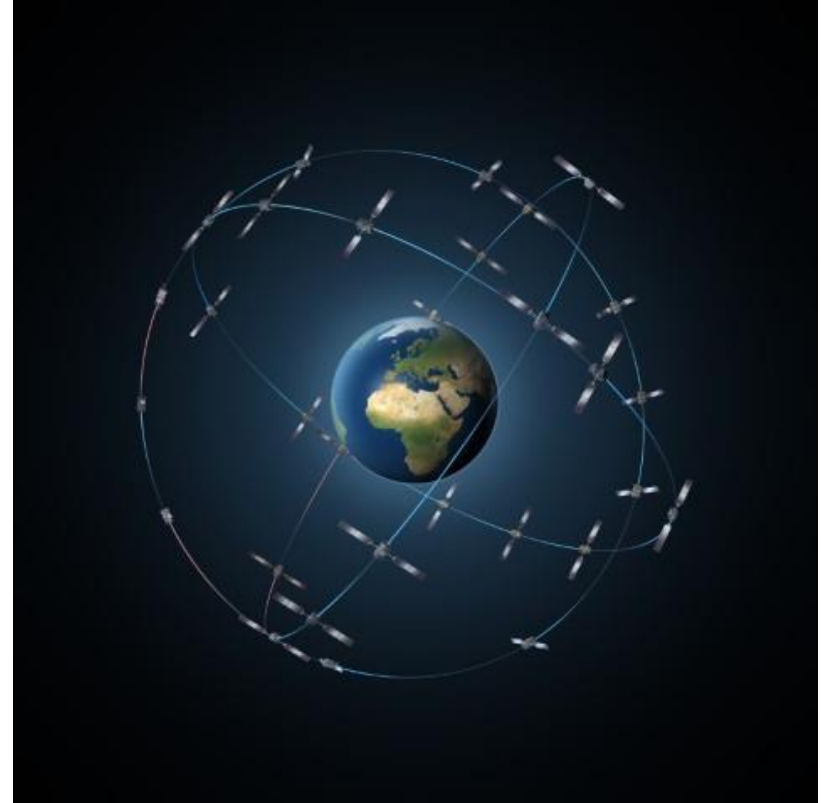
# Future Mega-Constellations

The next decade will see an unprecedented increase in the volume of satellites launched.

Mega-constellations planned for LEO and GEO for satellite communication, Earth Observation and broadband services.

The expansion implies a greater complexity for Mission Planning in the management and exchange of information within in the ground segment

Interoperability is needed for the MPS to manage heterogeneous mega-constellations as they will have different vendors, different owners and different operators



# Consultative Committee for Space Data Systems

The CCSDS is a multi-national forum to support the development of standards for space data and information systems in the space industry.

Informational Reports and Recommended Standards have been published for a range of information systems within the space and ground segment.

For Mission Planning, the aim is to standardize the information exchanged between involved parties in the planning process by specifying the service-based interfaces.



# Benefits of standardizing interfaces

- Increased **interoperability** between agencies
- Option of **re-use** between missions
- **Reduced cost** of mission specific deployment
- **Functions can be migrated**
- Increase of **vendor independence**
- Improved **maintainability**

# MPS Services Catalogue

These services are agnostic – independent of architectures and implementations

## Planning Request Service

- Submit Requests
- Cancel Requests
- Update Requests
- Subscribe to Requests
- Retrieve requests

## Plan Distribution Service

- List Plans and statuses
- Subscribe to updates in Plan Status
- Subscribe to receive new Plans
- Query filtered set of Plans
- Retrieve partial Plan

## Plan Execution Control Service

- Submit Plan for execution
- Activate and deactivate Plans and sub-plans
- Subscribe to receive execution status of Plans and sub-plans
- Suspend and resume execution
- Reports on execution status

## Plan Information Service

- List and retrieve:
  - RequestDefinitions
  - EventDefinitions
  - ActivityDefinitions
  - ResourceDefinitions
- Retrieve MPS configuration data

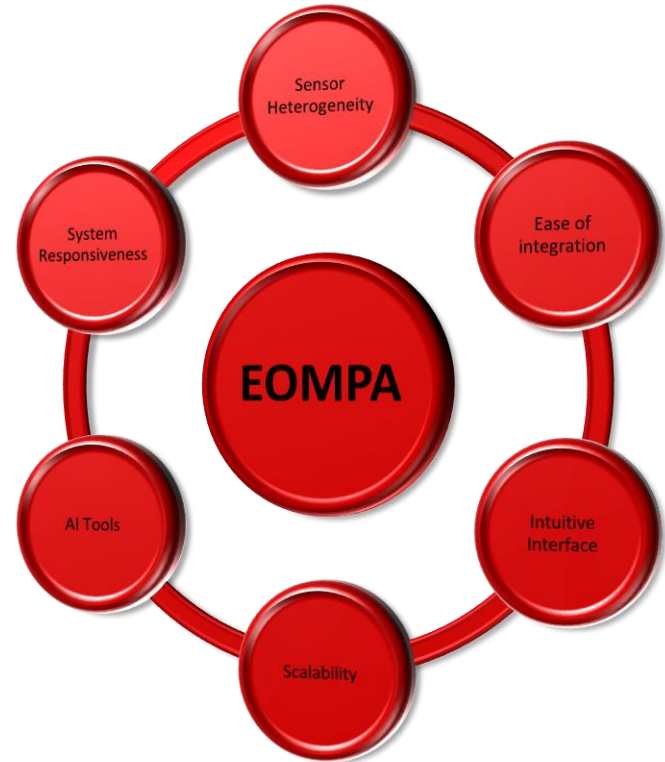
## Plan Edit Service

- Update Plan Status
- Insert or Delete Activity
- Update ActivityInstances
- Update Resource value
- Update Resource profile
- Apply a time shift to a plan

# Earth Observation Mission Planning and Analysis

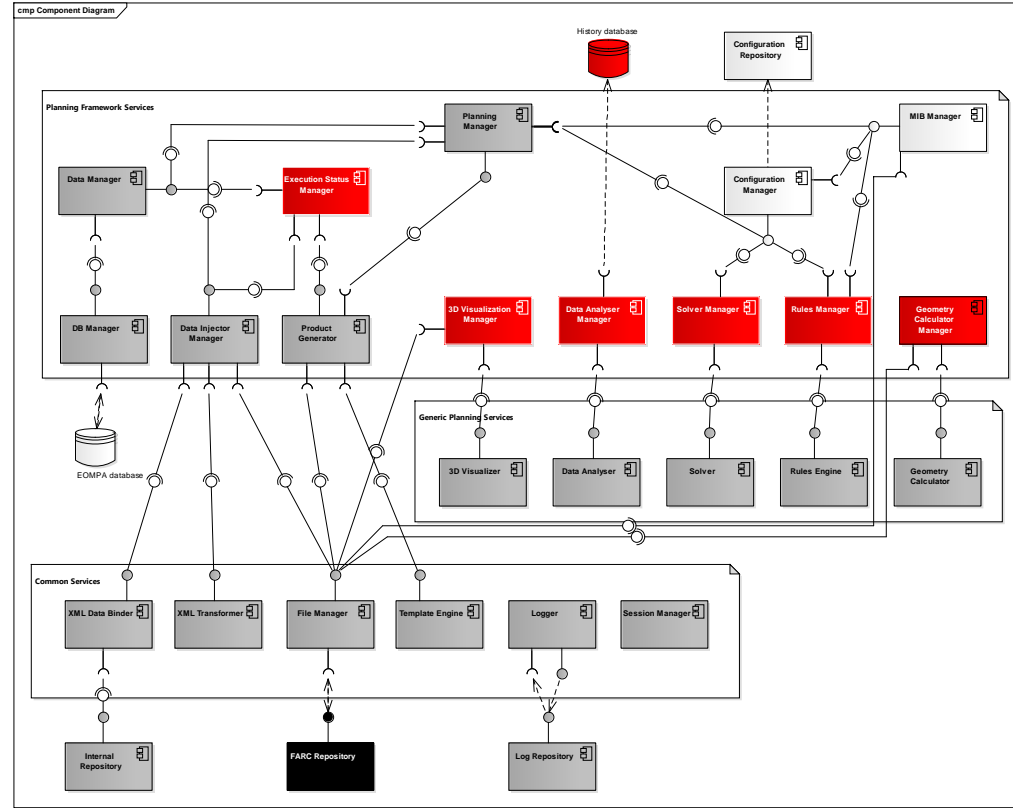
- EOMPA is an ESA funded study lead by GMVNSL
- Technology Demonstrator to lay the foundations for a future operational planning framework
- Selected as the validator for the CCSDS MPS Service Study
- This study will be the first to adopt these standards in a semi-operational system

**EOMPA aims to develop a multi-mission planning and scheduling prototype which will maximise the efficiency of constellation operations and task management.**



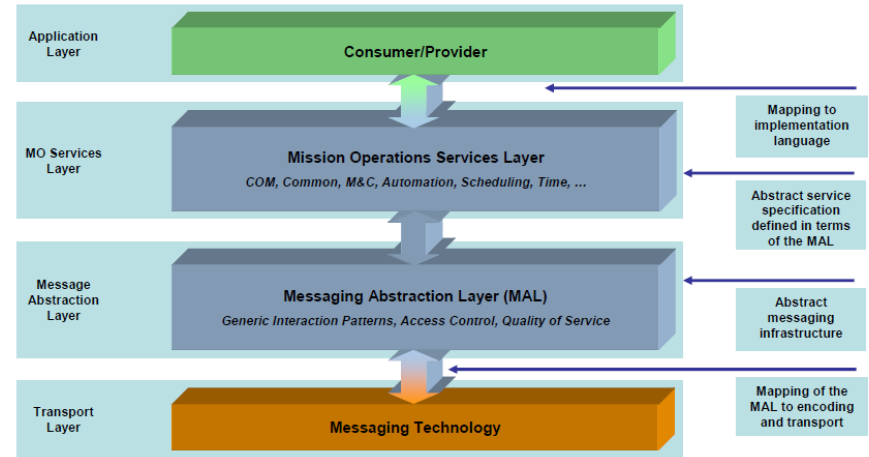
# Architecture

- The prototype design will be based on Service Oriented Architecture
- Different layers will be defined with generic services at the bottom of the stack and a higher degree of specialisation in the upper layers
- Components from legacy systems will be reused and wrapped in a standardised way so that they are suitable for integration



# MPS Data Model

- The data-model from the CCSDS will be adapted for information exchange to enable services to operate
- The communication protocol of the services will be encoded as MAL operations. There are a set of standard interaction patterns:
  - SEND;
  - SUBMIT;
  - REQUEST;
  - INVOKE;
  - PROGRESS;
  - PUBLISH-SUBSCRIBE.
- The specification is agnostic of the selected information

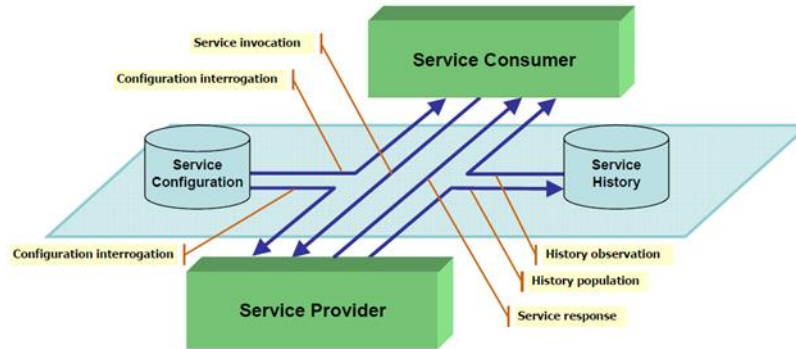


Mission Operations Services Concept, CCSDS 520.0-G-3



# Validation Plan

- Two teams have been selected to validate the CCSDS standards – GMVNSL and DLR
- Each team will develop a prototype based on the CCSDS MPS Service documentation and implement a set of the services following the specified standards
- To validate the processes, one team shall act as the consumer and the other shall act as the provider
- The interaction between the provider and the consumer shall be via serviced-based interfaces
- If the two prototypes can interface successfully and perform the services, than the objective of the study has been met



Mission Operations Services Concept, CCSDS 520.0-G-3

# Future Management of Multi-mission operations

Successful adoption of these standards throughout the industry will **improve interactions** between distributed systems and enable a greater level of **autonomy**, which will be imperative for the management of future mega-constellations.



# Thank you

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