

# CCSDS Mission Planning Services BOF Proposal

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**Title Of The BOF: CCSDS Mission Planning Services BOF**

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## **Starting Point And Background:**

The CCSDS SM&C working group has specified a generic, service oriented framework for Mission Operations (MO). With the publication of the CCSDS Mission Operations Message Abstraction Layer (MAL) [CCSDS 521.0-B-2] and the CCSDS Mission Operations Common Object Model (COM) [CCSDS 521.1-B-1] blue books, the foundation of the MO service oriented framework has been established. Domain specific mission operation services can now be specified as new MO services by the respective domain experts in an implementation and communication agnostic manner.

The SM&C working group is currently specifying the first set of domain specific services, starting with those, which pertain directly to the monitoring and control of spacecraft, the so-called MO M&C services. At the same time the SM&C working group has reached out to other CCSDS working groups and domain experts to promote the specification of their domain specific services as new MO services. This has included the Navigation, Mission Planning and Telerobotics operations domains.

An initial list of envisaged Mission Operations services is outlined in the MO Services Concept green book (CCSDS 520.0-G-3). As it can be seen in the referenced list, mission planning and scheduling services have been among the envisaged candidate Mission Operation services at the foundation of the Mission Operations concept.

In this context, two dedicated “call for interest in Planning service standardisation” meetings were held during two CCSDS meetings in Europe and in the US, which received active participation of a large community of planning domain experts from different planning agencies and organisations involved in mission operations. The first meeting took place as part of the CCSDS Technical Meeting held in Darmstadt, Germany in April 2012. 58 mission planning specialists attended the meeting, mostly from Europe. A second session was held during CCSDS Technical Meeting in Cleveland, Ohio in 2012, with similar attendance mainly from US experts.

Despite the differences in various planning application domains and the diversity of expert views, the following points crystalized rather quickly in both meetings:

- The lack of standardised services for exchange of planning data among different entities involved in mission planning scenarios was generally recognised;

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- It was acknowledged by the participants that this identified lack of standardised mission planning services lead to the invention of new format and exchange mechanisms for each planning application domain and potentially for each deployment (e.g. for each mission);
- There has been a general agreement that standardising mission planning services would accordingly reduce effort (hence cost) in both software development as well as mission operation domains, by simplifying the integration of distributed mission planning and wider mission operations systems.
- With regard to the approach for specifying standardised mission planning services, it was recommended to start with a so-called black-box approach, where the planning functionality is considered as a black box. The focus shall be accordingly on specifying the operational interfaces for exchange of related planning information items.
- With regard to the scope of the respective services the recommendation has been to start simple, i.e. focus initially on the Planning Request, Plan Result Exchange and Scheduling services rather than attempting to address the more complex problem of exchanging planning constraints and other configuration data;
- Harmonisation of terminology was considered equally important;

[Ref-1] elaborates in more detail on the outcome of the discussions and the conclusions of the technical meetings. A draft concept paper on CCSDS MO Mission Planning Services [Ref-4] was prepared in advance of the Cleveland meeting.

## **Proposal To Start A Mission Planning BOF**

Following the above-outlined recommendations of the two preceding technical call-for-interest meetings with the planning domain experts, we would like to propose start a dedicated Mission Planning Services BOF in the next CCSDS Spring Meetings, 10-14 November 2014 in London and seek herewith the approval of the MOIMS Area Director.

## **Positioning Of The Envisaged Working Group In the CCSDS Organisation**

It is proposed to start the envisaged Mission Planning Services WG in the MOIMS area.

## **Relation To Other Working Groups**

As mission planning is an integral part of mission operations, we foresee a close inter-relation between the envisaged Mission Planning and other Mission Operation services. This is particularly evident with regard to the information model of the Mission Planning services, which will involve elements from information model of other existing Mission Operation services (mainly currently defined MO COM and M&C services), such as Telemetry and Telecommand, Telecommand status tracking information, etc.

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It is therefore proposed to specify the Mission Planning services as new Mission Operations (MO) services, in order to:

- Achieve implementation and communication agnosticism
- Reuse and comply to information model of other Mission Services
- Simplify the overall mission operations concept and development of the related software applications by facilitating seamless integration with other Mission Operations services
- Take benefit of existing language and technology bindings developed for the MO framework

To achieve the above, we foresee a close relation and intensive collaboration between the Mission Planning working group and the SM&C working group.

Another very important relation is to the Cross Support Services Area. Planning and scheduling the activities of ground networks is one important ingredient of Mission Planning Services and close collaboration and coordination with the CSS Service Management WG will be required.

## **Relevant Previous Work and Input to the Working Group**

Following the approval of the area director and announcement of the BOF, we shall call for participation to the planning domain experts and ask for provision of previous work done in the area of harmonising operational interfaces for exchange of planning data, which could be considered as an input to the work of the WG.

From ESA side to particular activities have started recently (i.e. in 2013 and 2014) which we would like to bring as an starting point to the BOF/WG:

- Specification of Generic Mission Planning Services: Results of the work done by the industry in the context of a dedicated activity as part of the ESA PECS programme.
- Specification of Mission Planning Services for NetSat: Results of the work to be performed in the context of a PhD. NPI contract between ESA and University of Würzburg.

Both Activities shall provide draft mission planning service specifications.

## **Proposed Scope and Approach of the Mission Planning Services WG:**

It is proposed to follow the recommendation of the two call-for-interest technical meetings.

A green book shall be produced to outline the underlying Mission Planning Services concept.

The actual Mission Planning services shall be specified in a blue book. The final list of the Mission Planning services for the blue book shall be identified by the WG work and described

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in the green book. The initial proposed list is: Planning Request Service, Plan Service, Planning Request Status Tracking Service, Scheduling Service.

## **Proposed Schedule:**

- Approval and Announcement of the BOF: Before CCSDS Spring Meeting in London (10-14 Nov 2014)
- BOF Meeting: One day during CCSDS Spring Meeting in London (10-14 Nov)
- Concept Paper and the Charter: Develop the outline for the transition of the Proposal core to the White Book and develop the Working Group Charter:
  - o Submission of the initial draft to the BOF before the London Meeting;
  - o Review and discussion of the paper during the BOF
  - o Submission of the White Paper for approval of the WG before Spring Meeting in Pasadena 23-27 March 2015
- Start of the WG in Spring Meeting in Pasadena 23-27 March 2015

## **References:**

[REF-1] R. Thompson, "CCSDS Mission Operations Services for Mission Planning", Proceedings of SpaceOPS 2012

[REF-2] Minutes of the Call for Interest in Mission Planning Service Standardisation, 18.04.2012, Darmstadt, Germany

[REF-3] Minutes of the Call for Interest in Mission Planning Service Standardisation, 17.10.2012, Cleveland, OH, USA

[REF-4] "CCSDS MO Mission Planning Services: Draft Concept Paper", September 2012