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An Operational History for Space Missions: application to *Planck*

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An operational history for a space mission is a method for providing the status of a satellite throughout the course of its mission. This type of information is useful to scientists as a complement to the data they are analyzing. In addition it is useful during operations of the space mission to retain a history of the state of the spacecraft which is easily accessible. The Planck Operational State History (POSH) is such an history which was developed for the Planck mission (Planck Collaboration 2011). In this poster contribution, we outline the motivations for introducing the Operational State History into Planck, we explain its structure and very briefly describe possible future applications.

The Operational History

Due to the type and quantity of data that describes the state of a satellite and its instruments, it is common for it to exist over a large number of files and formats which have to be retrieved from a large number of systems that are most of the time not compatible with each other. In addition there are a significant number of occurrences throughout the mission which are often not found in any one single repository, such as mission milestones, definitions of operational days or anomalous events.

The initial motivation for the creation of the operational state history for Planck was to provide the states of the spacecraft and its instruments in an easy way. States to be included were the operational phases and the operational status/mode of each of the major payload components. The intention being that this information could be used to assist not only in the operational work in monitoring the status of the survey but also as a data source that could be consulted whilst analyzing science data.

The pipeline for the production of the POSH relies on a three level approach (Fig. 3): 1) Mission dependent data sources and data access methods; 2) Intermediate storage; 3) Creation of user accessible files.

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Structure of the POSH

Two record types are stored in the POSH: EVENTS, consisting of occurrences during the mission that can be described by a start and end time (e.g. survey and OD boundaries, anomalies, manoeuvres) and HK SUMMARY which consist of timelines with one data point per pointing period (e.g. temperatures, position in the sky, drift rates, sun angles). This data set contains a very compact summary of the entire mission and can easily be used to correlate any event in the mission with anomalies in the HK and science timelines. Figs. 1 and 2 illustrate the two record types discussed here.

Event_ID	*Start_Time_UTC*	*Start_Time*	*End_Time_UTC*	*End_Time*	*Title*	*EventType*	*SubType*
Unique identification of event	Start of event as a String	Start of event as a number	End of event as a String	End of event as a number	Brief description of event	Number representing event type	Binary number representing the event's subtype
7-digit number iinnnnn	yyyy-mm-dd hh:mm:ss	In seconds since launch of Planck	yyyy-mm-dd hh:mm:ss	In seconds since launch of Planck		2-digit number ii	8-bits 00000010

Fig. 1: Structure of event records

PREF	*Start_Time_UTC*	*Start_Time*	*End_Time_UTC*	*End_Time*	*House_Keeping_Data*
Pointing reference number	Start of stable pointing as a String	Start of stable pointing as a number	End of stable pointing as a String	End of stable pointing as a number	Columns of house keeping parameters
8-digit number	yyyy-mm-dd hh:mm:ss	In seconds since launch of Planck	yyyy-mm-dd hh:mm:ss	In seconds since launch of Planck	

Fig. 2: Structure of HK records

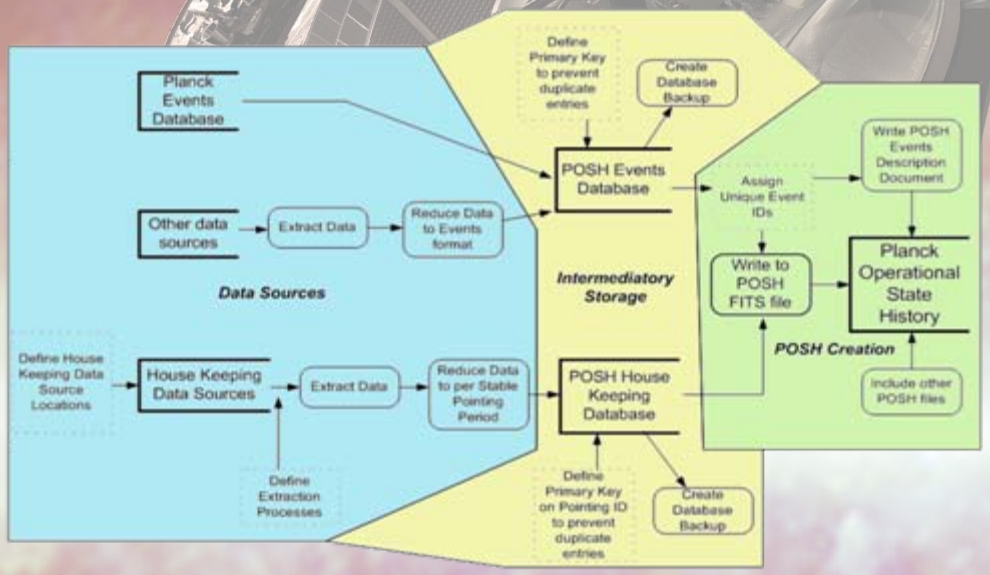

Fig. 3:The POSH pipeline: the POSH production happens in three stages: 1) Extraction and processing of data from the different data sources; 2) Intermediate storage in a Database; 3) Creation of the POSH.

FUTURE DEVELOPMENT

The POSH was implemented for Planck following the diagram in Fig. 3. and it will be distributed to the public through the Planck Legacy Archive (see PLA poster) in early 2013. Further than that, the concept of the Operational State History as presented here could be adapted for use in future ESA Science Missions. Not only would this concept be useful as a repository of the mission status during and after operations but also during the planning stages.

REFERENCES :Planck Collaboration 2011, A&A, 536, A1

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