

SPACE SYSTEMS SYMPOSIUM (D1)  
Space Systems Architectures (4)

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SMART AND FLEXIBLE ON-BOARD PAYLOAD DATA PROCESSING

**Abstract**

Today we are faced with an ever increasing stream of data provided by scientific space missions focussing on Earth Observation, Astronomy and Planetary Exploration. Matching that stream with the needs of its users, the scientists and their institutions, is therefore becoming a more and more complex task. To face both the data management (available computer memory) and the data transmission (available bandwidth) many recent RD activities study how to move the data processing from the Ground Segment to the Space Segment through the development of the so-called On-board Payload Data Processing. The main idea is that, often, the “useful” part in acquired (raw) data is only a piece of the whole, so it makes sense processing final information already on-board and transmitting only these to the ground. Data reduction work-flow is thus moved from the ground to the space segment. In addition, having such information already on-board can increase the efficiency with which the actual space mission is operating. For example, pieces of information processed with on-board systems can be used to steer the automatic control of a satellite constellation, modifying data acquisition schedule. The instrument pointing can be moved to the spot of interest, or an acquisition request can be transmitted to the next cooperating satellite. For example, this will increase the efficiency of monitoring specific events that are limited in time, such as oil spills or illegal traffic, as compared to the traditional ground segment workflow. The authors and their companies can count on a sound experience in design and development of open, modular and compact on-board processing systems. Actually they are involved in a program, the Space Payload Data Processing (SpacePDP) whose main objective is to develop an hardware and a software framework able to perform both the space mission standard tasks (sensors control, mass storage devices management, uplink and downlink) and the specific tasks required by each mission. SpacePDP is an Open and modular Payload Data Processing system, composed of Hardware and Software modules included a SDK (Software Development Kit). The whole system is characterised by flexible and customizable building blocks that form the system architectures and by a very easy way to be integrated in the missions by the SDK (a development environment with encapsulated low-level drivers, HW support and testing environment). Furthermore Space PDP presents an advanced processing system to be fully adopted both as on-board module for EO spacecrafts and extra-planetary exploration rovers.