

HPDP - High Performance Data Processor

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Need For the *High Performance Data Processor*

Conventional satellite payloads have the drawback to have their architecture fixed for the lifetime of the satellite (15 years) and therefore cannot adapt to changing communication standards and market/application evolution (like multimedia applications). A way to alleviate the rigidity is the use of onboard reconfigurable technology in order to be able to modify the processing of the signals performed onboard. Functions like (de)modulation, (de)coding, interference cancellation etc. might need minor modifications or adaptations to introduce flexibility in processor payloads.

With the increasing use of remote sensing and earth observation technologies, the large amount of data collected by image or data sensors onboard these satellites requires high performance and fast processing hardware for image or data compression. At the same time along with the number of images, the resolution and richness of content have also been increasing. And the demand for digital data transmission is steadily increasing with the introduction of a whole variety of new services. In particular, Ka-band communication networks are requested of providing digital links at data rates of hundreds of Mbps. The algorithmic and processing requirements for such processing are of a magnitude larger than those which could be successfully handled by classical processors.

The standards can not be guaranteed to be fixed over a lifetime of a satellite. High protocol layers are subject of adaptations and improvements. Dynamical variations in traffic loads need to be designed into the processor from the beginning. It mainly affects the interconnectivity and the amount of chips on the processor. To alleviate these problems, a flexible processor configuration is required to provide the routing, signal and data processing and manipulation capabilities, and therefore a way to alleviate the rigidity of classical processors.

Therefore, there is a need for a powerful and flexible processor, that can process large amount of data at high speeds, and at the same time, be reconfigurable to adapt to changes.

About the *High Performance Data Processor*

Currently Astrium GmbH is involved in the development of the High Performance Data Processor (HPDP), a software reconfigurable processor for a wide range of next generation of onboard payload data processing applications. The development of the HPDP includes the selection of the technologies for the core, assessment of suitability for a large variety of different applications, the design, manufacturing and testing. The activity also includes the demonstration of the feasibility of the reconfigurable processor technology and its associated reconfigurations. The HPDP core consists of a dynamically reconfigurable array processor on a radiation tolerant ASIC technology (like ATC18RHA from ATMEL) providing high throughput data I/O paths, resulting in a processor having high performance and low power consumption.

The problems with onboard processing is that customer or mission requirements affect the design of the processor in terms of overall traffic capacity and switching flexibility. The potential of the HPDP lies in the processing capability of high data volumes in the signal processing domain, especially where flexibility and in-orbit programmability or reconfiguration is required. Data streaming tasks are used frequently in telecom payloads, which must deal with more and more signal processing since the demand for regenerative payload is rising. A regenerative solution, capable of switching data on a packet basis, is best able to provide the flexibility needed to handle a variety of multimedia services through a single satellite. Onboard processing provides increased efficiency and performance for communications satellites. It allows improved connectivity, optimization of uplink/downlink connection, and supports spot beam technology.

The development of HPDP has high strategic and technological importance for Astrium as it deals with the development of onboard programmable payloads for telecommunication and earth-observation applications characterized by their ability to sustain a high data throughput combined with a high performance level and the flexibility to adapt to emerging standards and improvements.