Paper ID: 35092
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SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

Author: Mr. Pieter van Duijn
HEAD Aerospace Netherlands, The Netherlands

Mr. Frits Teule
China HEAD Aerospace Technology Co., The Netherlands
Mr. Roger Hsu
China HEAD Aerospace Technology Co., China

A RECONFIGURABLE SIGNAL PROCESSING INSTRUMENT FOR COMMERCIAL SMALLSAT MISSIONS AND 'BIG DATA' OPPORTUNITIES

Abstract

Over the last decade, the development and use of small satellite missions for new space born applications have grown dramatically. Small satellite missions are in fact the largest growth market in space.

The natural progression from technology and concept demonstration to operational missions with small satellite platforms is taking place. With small satellite platforms becoming more advanced and capable to support missions for (large) constellations, the associated opportunities for commercial services and big data applications grow exponentially. This evolution results in a growing demand for more advanced and capable payloads and instruments.

This paper describes the rationale, architecture and technology used to develop a reconfigurable RF signal processing instrument that will maintain a proper balance between Size, Weight and power (SWaP) performance, reliability and cost. In addition, the instrument will be designed taking into account specific technology and export constraints, which could otherwise restrict its use and deployment.

The instrument will be composed of a number of re-usable, re-configurable building blocks that cover a typical RF and signal processing chain down to data storage and payload data transmission level. The instrument development will follow a state-of-the-art development and qualification approach leading to a flight demonstration/capability demonstration mission by the end of 2018.

As the design of a 'one-fits-all' instrument and related building blocks would not be practical nor cost effective, the initial instrument deployment focuses on low-to-medium bandwidth signal processing applications to be used for a number of business cases that have been identified. Initially targeted applications are: - The constellation-based reception of aircraft ADS-B transponder signals - The collection and processing of ground-based sensor data from space - Synthetic Aperture Radar (SAR) Front-End electronics - Software Defined Radio (SDR) in combination with a low-cost, in-flight reconfigurable RAIP (Redundant Array of Inexpensive Processors)

Examples of the applications (context, data, service) and the respective configurations of the instrument are addressed as well.