SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

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FROM LARGE TO SMALL EARTH OBSERVATION SATELLITES: WIDE RANGE OF APPLICATIONS FOR DATA HANDLING AND TRANSMISSION PAYLOAD

Abstract

Scalability, flexibility, reuse of design and high functionality integration now represent the most important and competitive aspects in design and development of all the platform subsystems contributing to a successful Earth Observation mission realization. The wide range of applications - from high data rate payloads with limited duty cycle to low data rate payloads acquiring in the whole orbit - have increased the need for an on-board data handling and transmission subsystem able to integrate several functionalities, in an high scalable and flexible architecture tailored to platform and mission requirements. This specific need is met by Thales Alenia Space Italia (TAS-I) through the design and implementation of a subsystem called PDHT (Payload Data Handling and Transmission). The subsystem, composed by three interconnected assemblies deputed to payload data acquisition, storage, formatting and transmission to ground, is completely independent as it is monitored and commanded by an internal supervisor. TAS –I reference PDHT architecture for large satellites is the one flying on COSMO-SkyMed spacecrafts: storage capacity of 300 Gbits, two X-Band channels at 310 Mbps, input data rate of 600 Mbps, 80 Kg of mass, maximum power demand lower than 600 W. This configuration is currently being updated to follow the increasing needs of on-going missions (i.e. Sentinel-1 and Sentinel-3): new coding schemes and high capacity memory modules allows PDHT to achieve high performances (storage capacity up to 2400 Gbits and transmission rate higher than 500 Mbps). Thanks to its modularity, PDHT can be tailored to different mission typologies: by reducing downlink performances and memory modules number, architectures for medium – large satellites can easily be adapted to smaller platforms. Mini – satellite mission with payload data rate of 600 Mbps can be supported with 512 Gbits of storage capacity, two X-band channels at 310 Mbps, 50 Kg of mass and 400 W of power consumption. Two minutes of MicroSAR imaging at 300 Mbps can be sustained with 192 Gbits of storage capacity, one X-Band channel at 100 Mbps, 15 Kg of mass

and 140 W of power consumption. To overcome X-Band limits and improve the performances, migration to Ka-Band is currently envisaged, while to further reduce the budgets – i.e. for very low demanding platform – the usage of S-Band is foreseen. The identification of the most suitable PDHT architecture for a specific mission is ensured by TAS-I using internally developed simulation tools for quick and accurate requirements analyses since the early design phases.