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Space Systems and Architectures Featuring Cross-Platform Compatibility (7A)

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VPNI: DESIGN OF A SERIES PRODUCTION NANO SATELLITE PLATFORM BASED ON A BUS PLUG AND PLAY ARQUITECTURE

Abstract

In the last few years, the interest of R&D in the aerospace sector in Mexico has been increasing significantly. This fact has driven the Mexican space agency to support innovative projects that involve the dynamics of triple helix University-Industry-Government. In this way, the VPNI project is evolving from the early development between 2013 and 2014 through a consortium involving the collaboration of several universities and NGOs from México and abroad. This consortium has been set and lead by the Mexican Talent Network, while funding has been divided between the Mexican Research Council (CONACyT) and the private sector.

VPNI aims for the development of a modular nanosatellite bus, which offers a flexible solution that can be adapted to several payloads with the additional value of offering a cost-efficient solution to accelerate the production of a platform. The development proposes a comprehensive design for manufacturing: mass production and testing philosophy that takes advantage of the bus plug play. Interestingly, the design of this bus and subsystems is based on commercial off-the-shelf (COTS) components, thereby decreasing the risk of failure and shortening the time for the platform validation to space. This bus is developed in an efficient communication protocol, which allows handling information retrieved by any payload or subsystem through master-slave architecture. If an external device is connected to the satellite bus, the OBC (On-Board Computer) shall first establish contact with this device automatically and autonomously, in order to configure it as part of the satellite. To that end, the OBC shall assign proper resources from the other subsystems. In addition, its design takes into account redundancy so that in case of fault detection or damage of a certain bus, the OBC autonomously recovers. To validate the bus, two electrical interfaces are being evaluated, namely I2C and CAN. Furthermore, dedicated Ground Support Equipment (GSE) is being developed in order to assemble and test the VPNI prototype in a representative pilot plant in small run. Finally, to analyze the effectiveness of the bus flexibility to different scenarios in the production line, several missions based on real data are being simulated.

The development of this project is certainly core for the Mexican space development, and it will help for the creation of low-cost customizable satellites in the medium-term. It is of great importance for the VPNI Project to continue adding international collaborators to ensure the applicability of the development.