

## An Open-Source on-board computer platform for CubeSats

*Sunday, 13 December 2020 14:50 (20 minutes)*

We will present an ongoing project of hardware development for CubeSat applications. Vision Space Technologies has been working on this project known as VST104 since mid 2020. Our goal was to design and open-source a small family of hardware boards in the PC104 format. The effort was aimed to onboard computers (OBCs) and their development & testing auxiliaries. At the moment, a single MCU board has been printed, soldered, and successfully validated. A FlatSat is also included for testing. Internally, this project's outcome will be a platform for testing mission control systems (MCS), and eventually, new algorithms with a future extension of an onboard field-programmable gate array (FPGA) technology. For now, we handle this project as a contribution to the LibreCube initiative and as a support of the local university club TUDSaT.

At the workshop, we would like to talk briefly about this project and to present the significant members of our new PC104 CubeSat family:

**Board Sierra** - Single redundant OBC board. This module is driven by the STM32L496 microcontroller and combines many exciting features. Our goal was to fulfill most of the space industry requirements while keeping the cost down and manufacturing easy. A significant number of redundant peripherals with separate isolators are available for communication with other CubeSat modules. With redundant external memories and precise clock sources, this module can handle various user-case scenarios. A robust power management circuitry, a group of temperature sensors, and other safety measures contribute to the reliability of this module. Of course, all of the components are military rated with automotive certifications.

**Board Delta** - Double redundant OBC board. This module implements Board Sierra in full double redundancy. The original Sierra module was extended with its own mirrored copy resulting in two independent OBCs on the same PC104 module. The potential of this board is in user scenarios where reliability is essential. In case of a system fraud, a supreme logic can simply switch between the identical OBCs sharing (almost) the same software and electrical characteristics.

**Element Foxtrot** - FlatSat with external power module. This auxiliary board serves as a development and show-off board. The flatsat is capable of hosting four PC104 modules with LibreCube PC104 header pinout. A breakable part serves as an external power module driven from a power adapter or USB-C (handshake is supported). Element Foxtrot is an ideal tool for testing and developing different CubeSat modules, temporary replacement for power distribution unit (PDU), and a nice way to present already developed modules.

As we mentioned, this VST104 project is still active, with a group of exciting milestones steadily approaching. Therefore it would be our pleasure to contribute to your workshop and to inform our community about it.

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