Toward generic OBC specs
Roadmap and perspective for SCOC3 based computers& associated software
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This paper presents an analysis of what could be a generic specification for On-Board Computers (OBC). This analysis is illustrated by the characteristics of the OSCAR SCOC3 based computer which has been developed by EADS Astrium to fulfil the need of such a generic OBC. This paper includes a description of the major innovations introduced into the hardware, but also a description of the approach of a unique software development environment for user which has appeared to be essential for a generic product.

Therefore, it appears that onboard computers are today built around few Si dices: computer (3-1750, ERC32, LEON2), FPU, TM/TC, interface drivers, FPGA for customization and reconfiguration.

The SCOC3 ASIC, designed by EADS Astrium, is a System-On-Chip for Spacecraft Control and Data Handling, featuring inside a single chip the LEON3-FT processor with GRFPU-FT, TM/TC interfaces, various on-board interfaces (RMAP SpaceWire, CAN, 1553, UART), time management and event routing.

Regarding the CPU, the LEON3 has been selected for fault tolerant space computer, 32 bits, European, and available as an IP, mandatory condition for a SoC design. Moreover, for a generic OBC approach, the LEON3 offers a huge computation power, oversized for its main applications, opening broad horizon for its use (payload processing, new system architectures …) what seems essential to a generic system.

Regarding the memories, in order to go with SW requirement on RAM and ROM increase capacity, the capacities are upgraded significantly but minimising impact on mass, volume and cost.

Another important point in a generic approach is to cover the widest range of applications (LEO and GEO missions). On this point, when agreed with the customers, the use of COTS plastics SDRAM and EEPROM cubes authorises a high data volume of RAM and ROM memory in a very compact size.

EADS Astrium takes benefit of these innovations (System On Chip, SDRAM, EEPROM cubes, MCM) to propose a computer board within a half double Europe format, where former solution required 2 double Europe boards.

‹ A standard low-level HW/SW Interface with Boot & BIOS generic definition,

‹ The definition of a SCOC3 Basic software to provide some I/O drivers,

‹ Some standard tools to develop software on SCOC3, including a representative SCOC3 Simulator with real-time capabilities,

‹ A low-cost SCOC3 tool-kit providing a board for software evaluation, prototyping and first integration & validation.

OSCAR (Optimized Space craft Computer Architecture with Reconfiguration), the new onboard computer product family of EADS Astrium, is based on this new board, proposing a generic space computer within up to 5 kg for a full redounded equipment.

Besides these hardware characteristics, the generic approach has led to make an effort to define and provide some key software development means as:

With these components, it is possible to develop a family of on board computers offering the same interfaces, functionality and embedded SW for any satellite project quality class. The hardware are functionally identical in all cases, and then the customer applicative SW development is based on the same SW development environment, process and tools whatever the final target applications.