LeonSVF Characterisation Case Study#2

Airbus Defence & Space (F) developed the Leon Software Validation Facility (LeonSVF) for on-board computers based on Leon2 (AT697) and Leon3 processors – see also separate abstract "LeonSVF Multicore prototype for Leon3". Telespazio-Vega GmbH (TPZV) was tasked to characterise independently the LeonSVF for single core Leon3 in a flight-representative application, in order to feedback improvements on the system. The characterisation assessed general aspects of usability, ease of integration within system simulators as well as quantitative performance figures.

TPZV used the MASCOT asteroid lander on-board software as flight-representative application which they developed. The MASCOT is a DLR system developed by TPZV and hosted on the Japanese Hayabusa-II satellite currently travelling in the solar system towards the target asteroid Ryugu (formerly 1999JU3), C type asteroid and planned to deliver the MASCOT lander in 2018/2019. For the LeonSVF characterisation, TPZV replaced the Leon3 software emulator (TSIM) in their pre-existing Software Development and Validation Facility (SDVF) with the Leon Emulation Board (LEB) using the TSIM-adaptation layer from the LeonSVF. TPZV then executed a number of pre-existing operational scenario tests and compared the performance of the LEB-based SDVF with the TSIM-based SDVF.

Findings and enhancements identified during the work were implemented in the LeonSVF product prior to the characterisation or later in the CCN3 which is presented in the session "LeonSVF Multicore prototype for Leon3". The speed factor of the SDVF while simulating the 40MHz MASCOT Leon3 processor varied between 1.0 and 0.5 at high loads, i.e. all slower than real time, both on the TSIM and LEB depending on the relative CPU and I/O loads. At higher CPU loads the LEB-based SDVF performs better than the software simulation (1.0 versus 0.5), while at higher I/O loads the overall SDVF performance reverses. In normal load cases, the two platforms had similar speed factor around 1.2.

Overall the Leon Emulation Board for single Leon3 core was found to be a good product with similar performance compared to the software simulators.