Measuring inter-task interferences in the NGMP

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Improving performance by means of processor's frequency increment or Instruction Level Parallelism (ILP) has reached a sudden stop caused by the unsustainable increase of power consumption. Chip-Multicore Processors (CMP) are increasingly being considered as an effective solution to cope with current performance requirements of Critical Real-Time Embedded (CRTE) systems, like those used in space domain. CMPs feature several processors inside a single die where the cores share different level of hardware resources, guaranteeing performance improvement by means of Thread Level Parallelism (TLP). By doing so, the total performance of a multi-core is improved offering a better performance/Watt ratio than a single core solution with similar performance, while maintaining a relatively simple processor design.

This trend have been followed by many processor vendors in different CRTE domains like the Aeroflex Leon4 Multicore processor [NGMP], implementing a four-core processor for space domain, the Freescale MPC5510 [MPC55] and MPC5668 [MPC56], both implementing a dual-core processor for automotive and avionics domain and Texas Instruments TMS570 [TMS57], implementing a dual-core processor for transportation safety applications.

The objective of the activity is to define and develop a /benchmark suite/, representative of /reference ESA applications/, suitable to exercise the new NGMP multicore processor, so the level of confidence of the design of the NGMP increases. The benchmark suite will be capable to generate different inter-task interference scenarios that may arise in the NGMP processor, by stressing the different processor hardware shared resources. The benchmark suite developed has to be flexible enough such that different processor components can be stressed in different levels, e.g. configurable number of tasks running simultaneously inside the processor, CPU load, memory load, I/O load, etc. The ultimate goal of the benchmark suite is to provide a methodology to measure the real-time and time-composability capabilities of the NGMP.

In this presentation I will show 1) the general structure of the NMGP, 2) the main components of our experimental framework and 3) some initial results of the interaction of benchmarks running on the NGMP.