A-LOOP

AMP system: 2-cores ARM Cortex A9/Linux OS and 4-cores Leon3/Linux OS, OpenMP library and Hardware Profiling system

G. Valente, V. Muttillo, A. Bufalino, L. Pomante, M. Faccio, F. Federici: Center of Excellence DEWS, Università Degli Studi Dell’Aquila, ITALY

Contacts: (giacomo.valente@graduate.univaq.it, vittoriano.muttillo@graduate.univaq.it, andrea.bufalino@student.univaq.it, luigi.pomante@univaq.it, marco.faccio@univaq.it, fabio.federici@univaq.it)

Introduction: Embedded systems development is driven by basic functional specifications, enriched with a set of non-functional requirements, such as constraints on execution time, power dissipation, etc. In this context, one of the techniques that can be exploited is to develop Isles of computational elements (Modules) with different characteristics, each one able to satisfy some non-functional specifications. This can drive to the realization of smart System On Modules (SoM). In such a context, SoC with FPGA can be viewed as platforms useful to prototype these architectures.

Objective: The main goal of this demo is to present a System On Module (SoM) prototype, called A-LOOP, for aerospace applications developed starting from Zynq7000, with 2 Modules, focusing on the interactions between these 2 Isles of computational elements.

Demo Description: This demo presents A-LOOP, a SoM prototype composed of dual-core ARM Cortex A9 with SMP Linux operating system (Isle#1), able to interface with external data, and quad-core Leon3 with SMP Linux operating system (Isle#2), able to execute parallel applications based on OpenMP library. These 2 Modules share an external DDR memory, so that Isle#1 can provide data and collect results from Isle#2. Moreover, Isle#1 is able to monitor performance of Isle#2 without introducing software overhead (i.e. no SW instrumentation) by using a hardware profiling system. The whole system that executes a MANET localization algorithm will be presented.

In detail, the proposed demonstration shows:

- the more relevant steps, with related development environments and tools, needed to implement such a system;
- the running system executing an OpenMP-based application, consisting in a MANET localization algorithm (derived from the Thales Italy case study, developed in the context of the Artemis-JU CRAFTERS project).

This work has been partially supported by the Artemis-JU ASP 2011 CRAFTERS (GA 295371), Artemis-JU AIPP 2013 EMC2 (GA 621429) projects, and Thales Italy.