LoRelei – Low-energy and Reliable reconfigurable processing systems

Marie Curie Actions – Project No: 295231

Report of the mobility of

Eduardo Chielle

from Universidade Federal do Rio Grande do Sul (UFRGS) to Politecnico di Torino (PoliTo)

Eduardo Chielle was introduced to the research group of Prof. Matteo Sonza Reorda and Prof. Luca Sterpone at PoliTol regarding the reliability of embedded processors. He was allocated in a desk at Lab. 03 and made use of his laptop, and a board from the Lab to develop the proposed cooperation work.

Eduardo Chielle gave a seminar on Nov. 5, 2015, entitled “Selective SIHFT Techniques to Detect Soft Errors in Processors with Reduced Overhead”. The main goal of the seminar was to present his research area as well as his proposed cooperation work.

The main goals of his stay at PoliTo were divided into three steps:

• Protection of several benchmarks with his SIHFT (Software-Implemented Hardware Fault Tolerance) techniques for the miniMIPS processor used by the research group
• Combination of the SIHFT techniques with a hardware module to improve the fault coverage of processors
• Evaluation of the SIHFT techniques, hardware module, and combination of SIHFT techniques and the hardware module regarding fault coverage, execution time, and code size. A paper with the developed work was accepted for publication.

To address the first point, it was used the CFT-tool [1], a tool developed by Eduardo Chielle, which is capable of applying SIHFT techniques to the assembly code of processors of different architecture.

The second step was performed together with Matteo Sonza Reorda’s Ph.D. student, Boyang Du. The hardware module was improved by adding a timeout control. Three resulting versions of the hardware module were produced:

1. CFC: dynamic control-flow checking of basic blocks during the program execution
2. Timeout: the timeout control alone, which gives a time limit to the execution to finish
3. CFC + Timeout: the 1 and 2 combined.

The benchmarks hardened by different SIHFT techniques were evaluated individually, as well as together with the hardware module. The hardware module was also evaluated individually. In total, 52 cases were evaluated per benchmark.

The results achieved with the work developed during Eduardo Chielle’s stay at PoliTo are five times better than previous work, according to MWTF metric [2].

---

REFERENCES:
