Functional Error Mitigation Schemes for Latency-Constrained Wireless Systems

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Introduction

Many streaming applications, exhibit not only throughput requirements but also the combination with hard latency constraints. This is the case for wireless baseband applications, especially when they are oriented to high throughput communications. Typical examples of this are connectivity standards like WLAN 11n/ac or 11ad as well as cellular standards like Long-Term Evolution or LTE Cat5/6/7. Functional reliability guarantees should hence be provided, which are not just quality-of-service trade-off based but that are hard requirements on the system implementation. Today's reliability mitigation approaches cannot meet these requirements except with a very large hardware (area) cost, as in triple redundancy methods. Alternatively, EPFL and IMEC have been working on a cost-effective approach [1] that is based on smart checkpointing and a heavily optimized run-time manager that takes care of hard throughput guarantees with minimal overhead.

Project Description

In this project we want to extend the existing approach to deal also with the highly-challenging above mentioned combination of throughput and latency requirements. In particular, we will map functional reliability mitigation technique(s) on a recently developed HW platform (i.e. BODRES, c.f. Figure 1) at IMEC, which runs realistic wireless driver(s). This primarily requires an initial understanding of the HW platform, SW driver, and the mitigation technique. Then, we will develop a customized optimal mapping of the mitigation technique [1] on the target platform. This may cause an extension of the originally developed mitigation technique in order to meet the prospective challenges in the target platform constraints and requirements.

The student would optimize the mapping of the mitigation technique and even extend it to meet the rising challenges of the target platform.

Tasks of the student

The student will:

1. Prestudy at EPFL on the current functional reliability mitigation approach [1].
2. Study the detailed requirements of realistic wireless applications at IMEC.
3. Optimize the existing mitigation technique and develop and extension to it based on the platform requirements, in a cooperation between EPFL and IMEC researchers.
4. Apply the extended technique on the IMEC benchmark to demonstrate the feasibility and the cost advantages to the standard solutions.

Requirements

1. Good knowledge of C programming.
2. Basics of wireless baseband applications.
3. Interest in mapping applications to architecture platforms.

References