RESCUE EDA Toolset for Interdependent Aspects of Reliability, Security and Quality in Nanoelectronic Systems Design

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Keywords— reliability, security, verification, test, fault tolerance, EDA tools, nanoelectronic systems design, H2020 MSCA ITN.

I. Description

The demonstrator introduces an EDA toolset developed by a team of PhD students in the H2020-MSCA-ITN RESCUE project.

The recent trends for the nanoelectronic computing systems include machine-to-machine communication in the era of Internet-of-Things (IoT), complex safety-critical applications, extreme miniaturization of implementation technologies and intensive interaction with the physical world. These trends set tough requirements on mutually dependent extra-functional design aspects. RESCUE is focused on the key challenges for reliability (functional safety, fault management mechanisms, BTI ageing, soft errors), security (tamper-resistance, PUF technology, intelligent security) and quality (novel fault models in FinFET, functional test, FMEA/FMECA, verification and debug techniques) and related EDA methodologies. The objective of the interdisciplinary cross-sectoral team is to develop in collaboration a holistic EDA Toolset for modelling, assessment and enhancement of these extra-functional design aspects.

One of the ambitions of the RESCUE project is to establish holistic EDA methodologies along with corresponding tool flows for the interdependent design aspects (see Fig. 1). In RESCUE, the cutting-edge academic research ideas are planned to be first implemented into experimental frameworks and have a potential to be integrated into industrial tool flows around the Cadence EDA platforms. zamiaCAD is one of the academic open-source experimental platforms supported by several early-stage researchers. In practice, EDA toolsets and methodologies can be application specific targeting at systems' domains such as automotive and autonomous driving, space applications, IoT edge devices, security-enabling HW, fault management infrastructures (IJTAG/RSNs), specific architectures (NoCs, many-cores, HMPSoCs), etc.

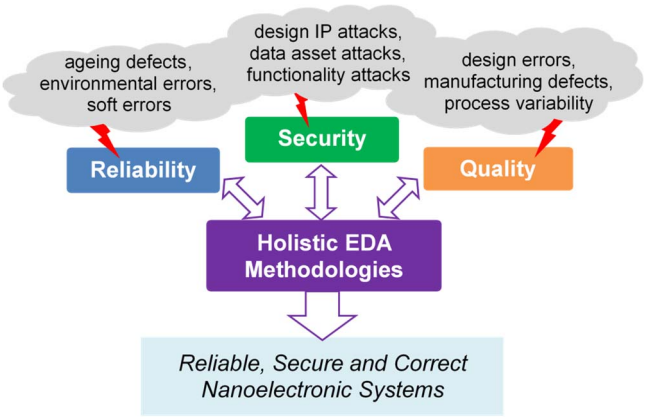

Fig. 1. RESCUE holistic approach to EDA tools and methodologies

The first components of the EDA toolset include:

- Tools for reliability analysis and enhancement, e.g. soft-error reliability evaluation, NBTI ageing hierarchical modelling and rejuvenation techniques for logic in processor designs and memory systems;
- Tool and methodologies for design on-line test mechanisms and analysis of cross-layer fault-tolerance and fault management, in particular for multi-core architectures;
- Tools for functional safety verification and validation, in particular by advanced fault injection techniques;
- Tools for multi-layer security modelling and enhancement, e.g. security and reliability analysis in PUF structures, a framework for evaluating tamper-resistant crypto implementation by optical fault injections.

Acknowledgments

This work was supported by H2020 MSCA ITN RESCUE that has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 722325.