

A Rescue Demonstrator for Interdependent Aspects of Reliability, Security and Quality Towards a Complete EDA Flow

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Abstract—The demonstrator highlights the various interdependent aspects of Reliability, Security and Quality in nanoelectronics system design within an EDA toolset and a processor architecture setup. The compelling need of attention towards these three aspects of nanoelectronic systems have been ever more pronounced over extreme miniaturization of technologies. Further, such systems have exploded in numbers with IoT devices, heavy and analogous interaction with the external physical world, complex safety-critical applications, and Artificial intelligence applications. RESCUE targets such aspects in the form, Reliability (functional safety, ageing, soft errors), Security (tamper-resistance, PUF technology, intelligent security) and Quality (novel fault models, functional test, FMEA/FMECA, verification/debug) spanning the entire hardware software system stack. The demonstrator is brought together by a group of PhD students under the banner of H2020-MSCA-ITN RESCUE EU project. They are part of a larger interdisciplinary cross-sectoral team from Tallinn UT, TU Delft, BTU Cottbus, POLITO, IHP, IROC, Intrinsic-ID, Cadence and Bosch who collaborate on a holistic solution for modelling, assessment and enhancement of these extra functional design aspects.

Index Terms—Reliability, Security, Quality, Fault-Tolerance, EDA tools, nanoelectronic systems design

I. DESCRIPTION

Developed by a team of PhD students from the H2020-MSCA-ITN RESCUE project framework, the demonstrator introduces methods for an EDA toolset to accommodate the needs of modern nanoelectronic systems. It would display a holistic approach undertaken to combat reliability, security and quality issues in a cross dependent fashion.

Some of the methods and features include

- Methods and Tools for reliability assessment and enhancement (like soft error reliability evaluation, ageing

and rejuvenation techniques for processors such as CPUs, GPUS etc).

- Online test mechanisms and cross layer fault tolerance methods with special attention to multi core architectures.
- Methods and Tool adaptation for advanced fault injection (such as laser based fault injection), functional safety verification and validation.
- Tools for multi layer security modelling. ie security and reliability analysis for Physical Unclonable Function (PUF) structures, tamper resistant crypto implementation frameworks etc.

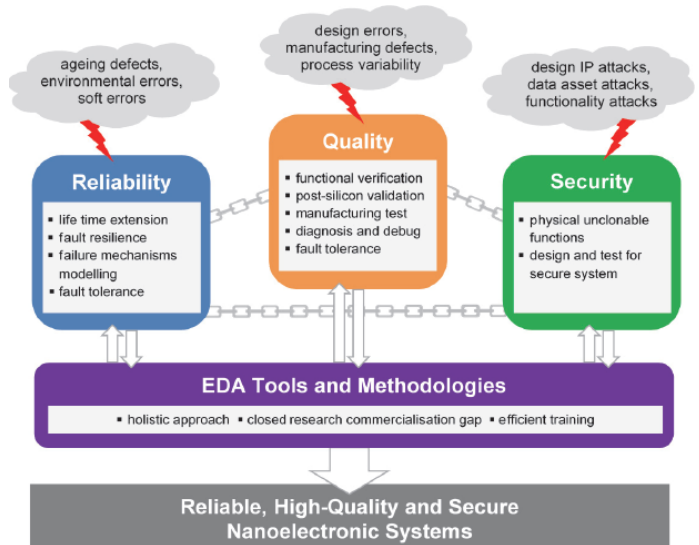


Fig. 1: The RESCUE holistic model

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Figure 1 describes the holistic view of the RESCUE project and the interdependent aspects of reliability, security and quality.