Trusted (CMOS) System-on-Chip Design


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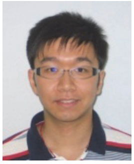
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Application-specific ICs (ASICs) and system-on-chips (SoCs) provide the best power-performance product for any particular task. However, implementation of ASICs in the most advanced technologies has become so challenging to manufacture that exposure of sensitive IP to chip foundry is often a requirement for reliable manufacturing. As a part of work that began in C2S2 and recently has been extended to the DARPA-funded GRATE project, a methodology for reliable design of high performance ICs on an application- and/or technology-specific sea of regular geometry patterns (a fabric) with performance and area that is comparable, or even superior, to that which is obtainable via a traditional design methodology, has been developed. In the Trusted (CMOS) System-on-Chip Design project**,** we propose to utilize this methodology to facilitate a trusted split-fabrication methodology.

In the trusted split-fabrication technique [Fig.1], the FEOL layers will be manufactured in a non-TRUST facility, where the digital, analog, and memory circuits will all be mapped to an application-specific sea of transistors that will not disclose any IP or system design intent. The BEOL layers will be then completed in a U.S. TRUSTed facility. This split-fabrication of extremely regular high performance ICs will provide IP obfuscation, as well as reliability and high security from hostile parties through back-end testing, and enable aggressive time-to-mission schedules. It will also facilitate the design of application-specific "logic-in-memories" that provide significant performance and power advantages, the demonstration of reconfigurable self-healing analog circuits, and the benefits for 3D heterogeneous integration. To demonstrate the methodology we will implement the principal logic, analog and memory components for a small size UAV Swarm [Fig.2] that includes on-board low-power processing of filtering data to cope with limited downlink bandwidth, cognitive radio modules, and reconfigurable multi-band RF filters using self-healing resonator arrays.

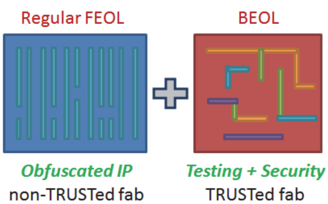

Fig. 1: Split-Fabrication

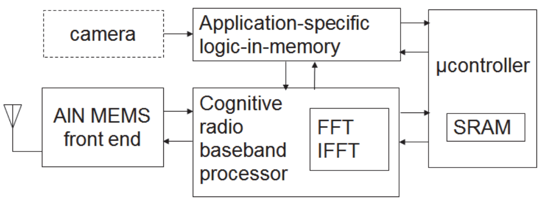

Fig 2: Proposed System Driver for UAV Swarms