

Development of a modern Airbag System Prototype COSIDE User Experience

Dr. Thang Nguyen
(Infineon Technologies Austria AG)

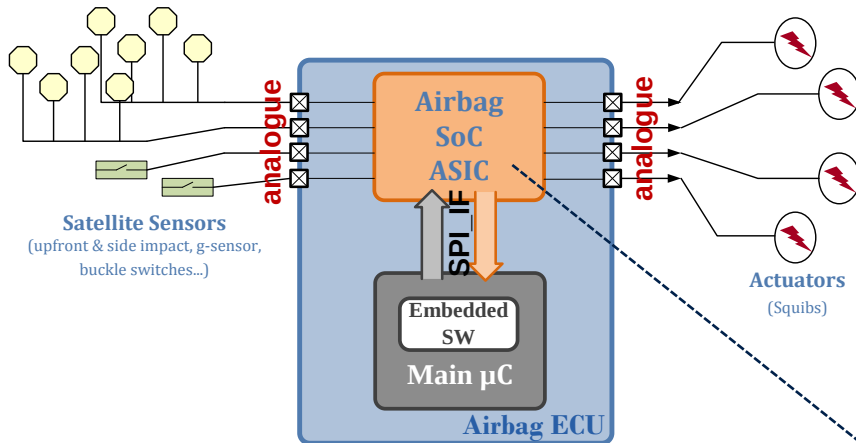
SystemC AMS – COSIDE® User Group Meeting 2014



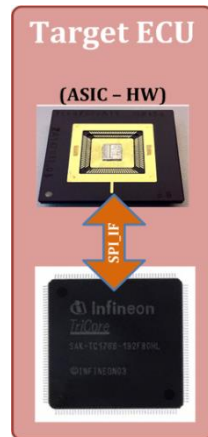
Agenda

1. Overview of Airbag System Application
2. Motivations
3. FPGA-based Development Framework
4. Accelerated System Co-Verification Framework
5. COSIDE Use Cases by IFAT
6. Real-life case study

Airbag System Application – Overview & Challenges

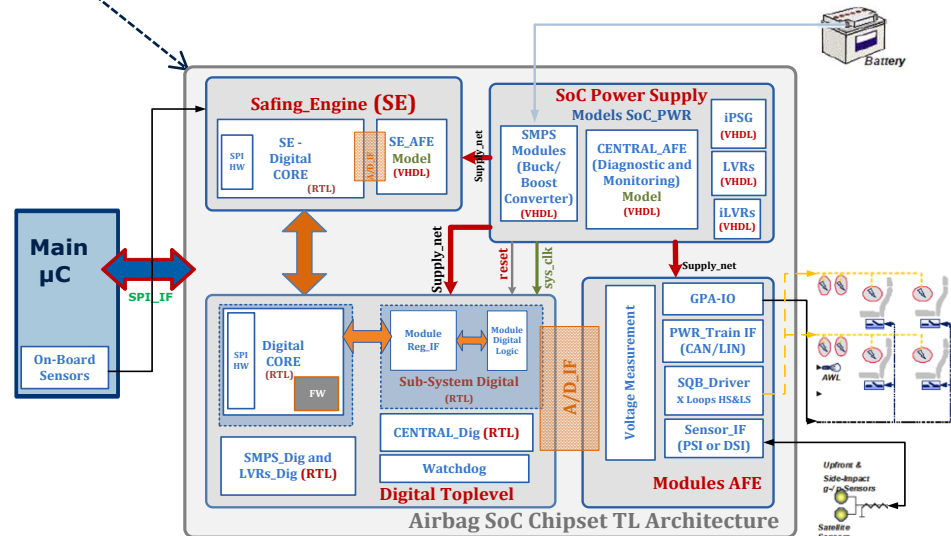


Airbag System Overview
(Sensors <--> Controller <--> Actuators)



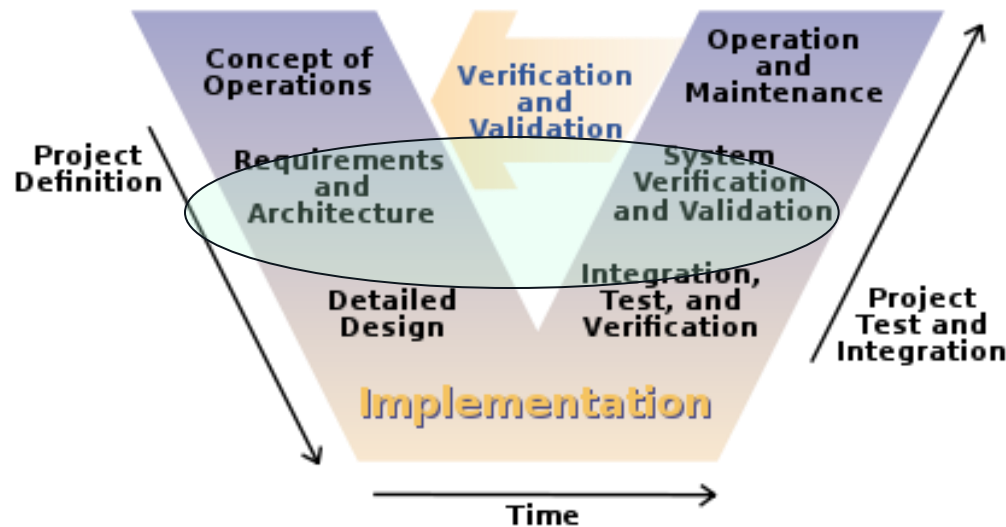
Target System-under-Evaluation

- **Sophisticated** = **Safety** Critical Real-time Embedded (SW/FW) Mixed-Signal
- **Cost-Reduction** = high integration → challenges in verification effort



Late bugs are **expensive!!**

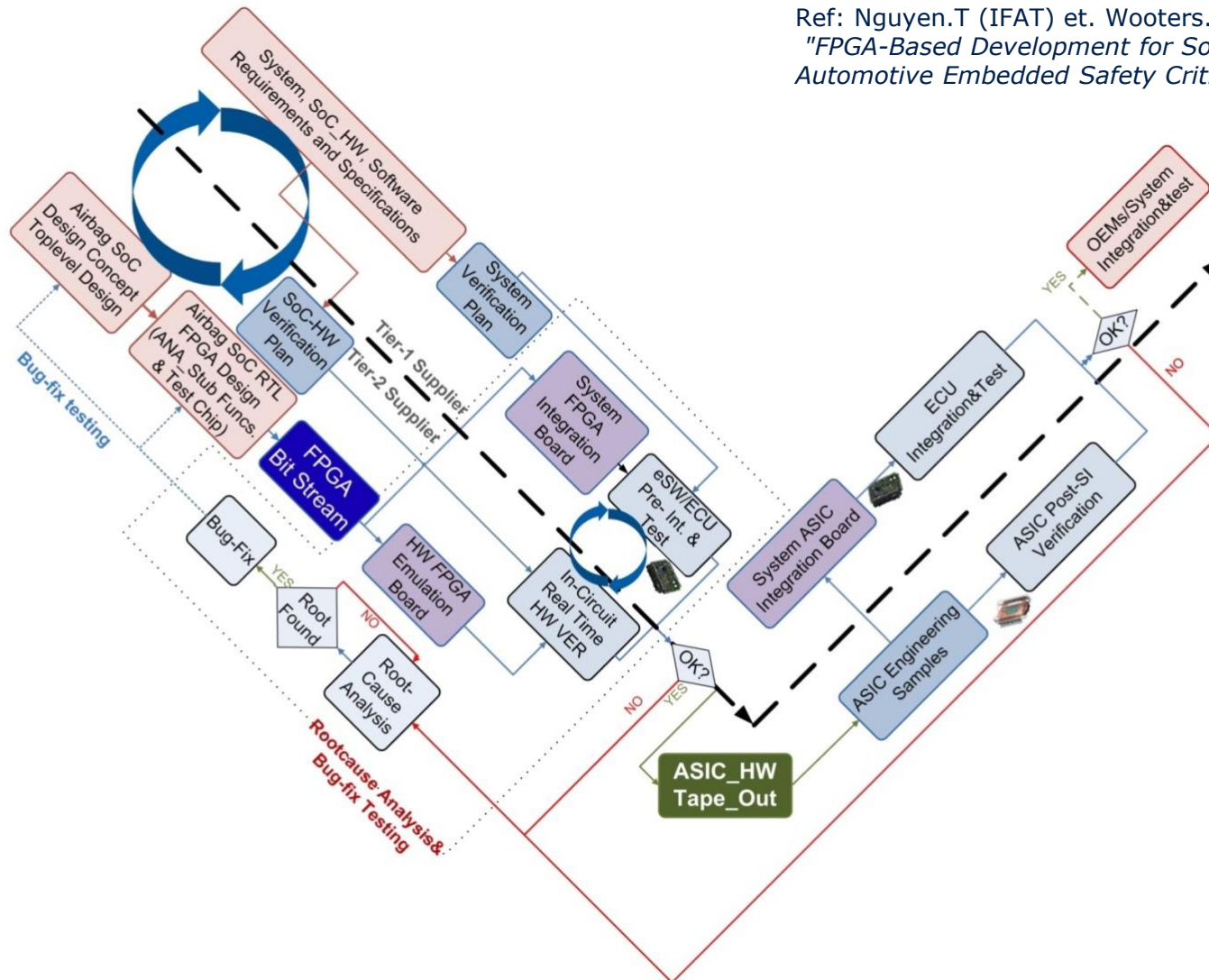
Rapid Prototyping (Emulation) can help!



- Interactive Concept Development
- Support test scenario where SIM is impractical
- **Early** (before Integration&Test)
 - Concept Verification
 - System Validation

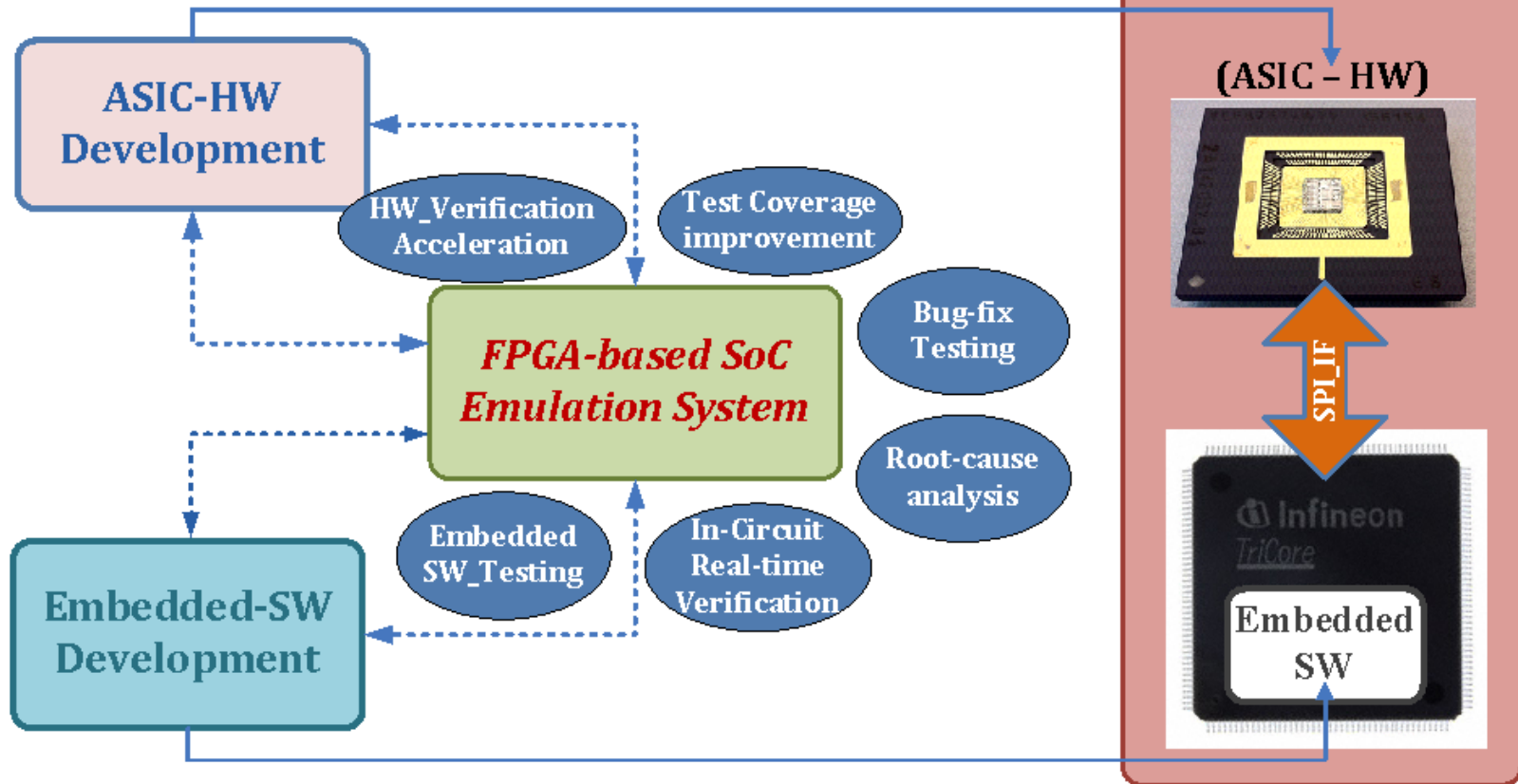
FPGA-based Development Workflow

Ref: Nguyen.T (IFAT) et. Wooters.S (TRW), SAE 2014
"FPGA-Based Development for Sophisticated Automotive Embedded Safety Critical System"

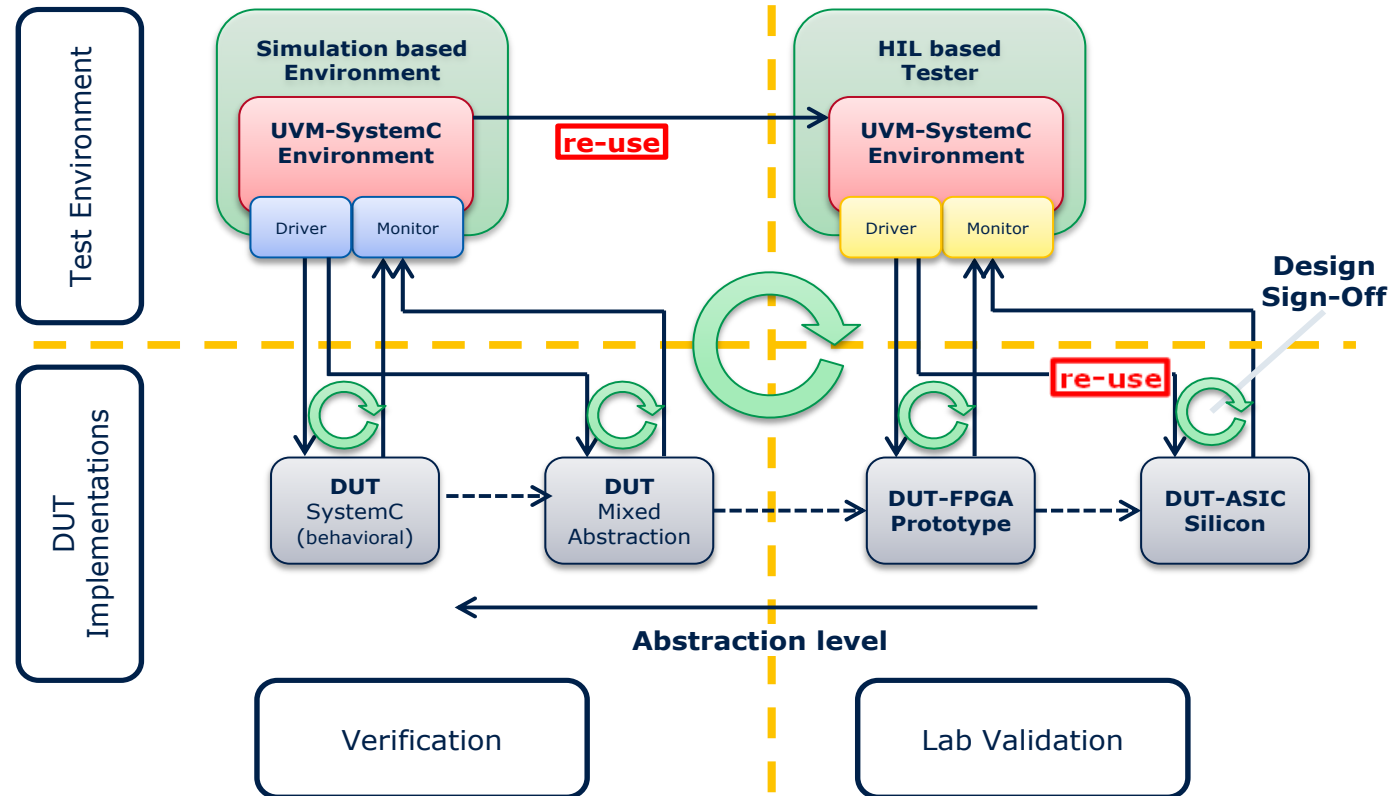


Advantages of FPGA-based SoC Emulation System

FPGA-in-the-Loop for Automotive Embedded System Development



Accelerated System Co-Verification Framework



Ref: Nguyen.T (IFAT) et. P.Erhlich, T.Vörtler (FhG), DVCON Europe 2014
 "UVM-SystemC based HIL-Simulations for accelerated System Co-Verification"

■ Highlights:

- Acceleration of verification activity, including scenarios which are impractical for simulation
- Reuse → Link between Pre-SI and Lab Evaluation
- Cost-effective HIL-based tester, e.g.: Zedboard vs. dSPACE
- UVM Layering concept

1. *FPGA Toplevel Integration and Front-End Design*

→ especially, Analog Functional Stub Modeling

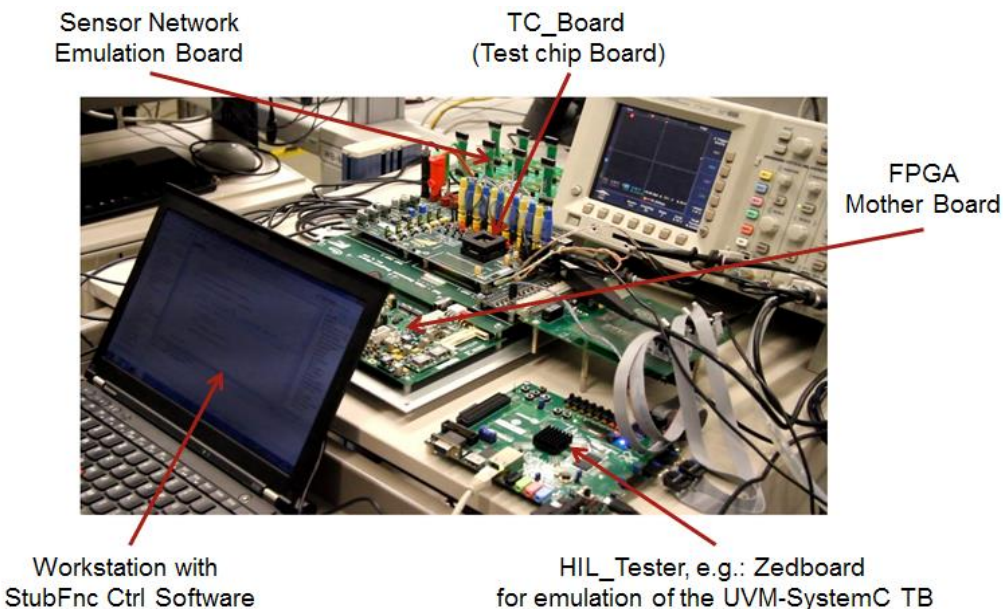
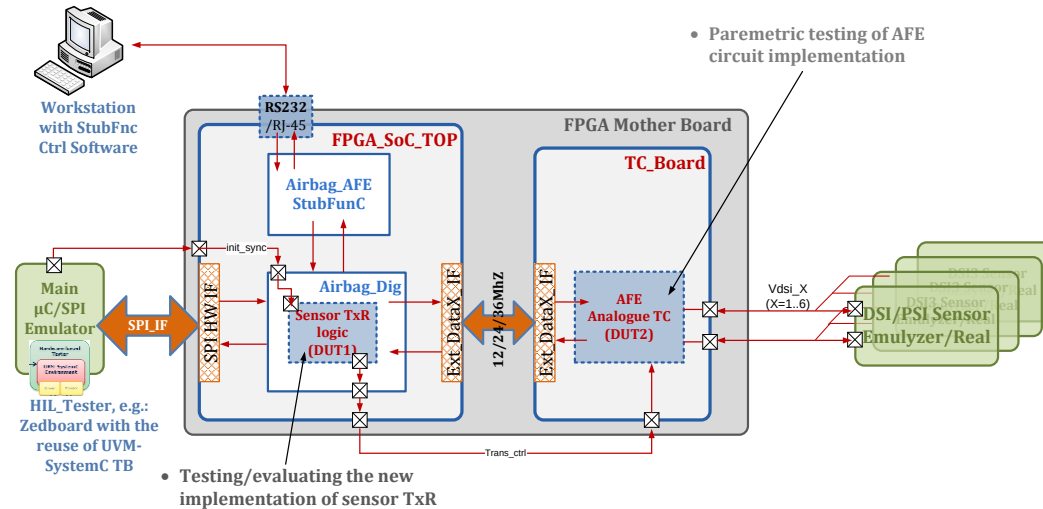
2. *Supporting FPGA Back-End Implementation*

- a) Scripting for Xilinx ISE for System HW realization
- b) Data2Mem scripting for System Firmware update

3. *Verification & Lab Validation of the Prototype*

- a) Test Scenarios Development
- b) Test Stimulus Development and Validation
- c) Test Bench Generation and Test execution
(@ SIM & physical HW)
- d) SIM root-cause analysis and bug-fix testing support

Case study: Real-life Airbag SoC Sensor IF



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