Invited Papers
ASIL-Conformant Deployment and Schedule Synthesis Using Multi-objective Design Space Exploration

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The growing complexity of functionalities in automotive vehicles and their safety-criticality, including timing requirements, demands sound and scalable approaches to deal with the increasing design space. Most often, such complex automotive systems are composed of a set of functions that are characterized by a set of contradicting requirements when it comes to a valid system architecture and configuration.

These functionalities perform more and more safety-critical tasks, thus increasing the challenge on assuring the safety of such systems. Furthermore, as safety-critical systems must perform the desired behavior within guaranteed time bounds, a valid system configuration is needed including a time-correct schedule that fulfills all timing requirements. This contribution proposes a systematic and correct deployment and scheduling synthesis of complex automotive software systems that ensures multi objective design constraints (e.g. ASIL-conformant deployments) of software components.
Model-Based Contract and Service for Self-managed Components in Cyber-Physical Systems

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Abstract. Modern automotive vehicles represent one category of cyber-physical systems that are inherently safety & time-critical. Future automotive technology will to an increasingly large extent be based on an integration of general purpose components for shortening the innovation loops and enabling efficient product evolution. Nevertheless, the adoption of general purpose solutions in automotive vehicles will not be a trivial task. Currently, while domain-specific frameworks like AUTOSAR and ISO26262 facilitate component-based system development based on well-formulated assumptions and interfaces, challenges remain in the areas of contract synthesis, conformity assessment, and diagnostics when issues like mode behaviors, timing, and failures are of concern. This talk presents the EAST-ADL modeling framework and discusses an EAST-ADL based approach to system modularity and risk analysis in order to integrate separately developed electronic components into safety-critical automotive systems. Special attention is paid to the synthesis of both component contracts and the associated runtime services for lifecycle and quality management, anomaly treatment according to ISO26262.

Keywords: Cyber-Physical Systems (CPS) · Model-Based Development (MBD) · Domain-Specific Modeling (DSM) · Component-Based Engineering (CBE) · Real-Time System (RTS) · Functional safety · EAST-ADL · ISO2626
Automotive Ethernet: Towards TSN and Beyond

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Abstract. As a new generation of E/E architecture, Ethernet is rapidly penetrating into the automotive domain. To accommodate the stringent quality-of-service (QoS) requirements of automotive applications, Ethernet is evolving towards mixed criticality aware time-sensitive networking (TSN). This talk will first present a landscape brought by TSN for complex automotive distributed real-time applications such as advanced driver assistance systems (ADAS). Then we will exemplify how TSN can better cope with application requirements than conventional Ethernet, in particular, in adaptively delivering QoS assurances under vehicle internal conditions and external situations. Finally we shall discuss challenges and opportunities on deploying TSN as a new E/E infrastructure for advanced automotive applications under safety concerns.

Keywords: Automotive E/E architecture · Automotive ethernet · Time sensitive networking (TSN) · Mixed criticality systems · Quality of service (QoS) · Functional safety
Dataflow-Based Verification of Temporal Properties for Virtualized Multiprocessor Systems

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Over the last decade we have witnessed ever increasing use of virtualized multiprocessor platforms in the design of advanced digital systems. This is due to the fact that virtual platforms, by means of virtual machines, facilitate the design of complex systems involving large numbers of applications by providing both spatial and temporal isolation between them. In particular, each application is assigned with a fraction of the platform’s (spatial and temporal) capacity and can be treated as if it were executing on a platform of its one. This means that in cases where applications have stringent temporal constraints we can analyze their temporal behavior in isolation because the behavior of one is not affected by the other. In this talk we reflect on the model-based design flow developed at Eindhoven University of Technology that by the use of aforementioned virtualization principles guarantees composability and predictability. In particular, we discuss how timed dataflow-based design flow implemented in the SDF$^3$ tool enables real-time dataflow applications to be automatically mapped, verified and executed on the CompSOC temporally composable platform providing strongly temporally isolated virtual multiprocessor platforms.
WARUNA: Modeling and Timing Verification Framework

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WARUNA is a French research project aiming at developing a framework to model and verify timing properties in real-time embedded systems. The framework covers all design phases and allows evaluating the impact of the design decisions on the response times. It also allows merging the timing results obtained at different design levels from the different analysis tools. The WARUNA framework is integrated in the modeling environment.

In the talk, the WARUNA framework will be presented, as well as the project objectives and the partners’ role. More details about the WARUNA project can be found on the project website: http://www.waruna-projet.fr/.
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