

| Index | Paper | EC1: Which functional domain(s) does the study analyze and/or modify in relation to SW architecture changes? E.g. ADAS, IVI (In-Vehicle Infotainment), Powertrain, Chassis... | EC2: Which system limitation(s) does the study identify as drivers for SW architecture changes? E.g. Busload, computing power, development costs, development time... | EC3: Which specific technologies does the study identify as enablers or catalysts for changes in the SW architecture? E.g. High-Performance Computing in automotive, AI & machine learning, electrification, Over-The-Air updates and continuous deployment, connectivity - V2X and 5G... | EC4: How does the study technically address the integration of diverse software requirements (real-time, non-real-time, safety-critical, etc.) within a centralized automotive software architecture? E.g. virtualization via hypervisors, containerization... | EC5: Which architectural patterns or design practices are proposed to systematically support mixed-criticality in centralized automotive software architectures? E.g. Mixed OS environments, Service-Oriented Architectures (SOA), mixed-criticality scheduling, safety island / redundant compute... | Comment |
|-------|---|--|---|--|---|--|--|
| 1 | Development of vehicle domain controller based on ethernet | ADAS | Communication | "real-time analysis of on-board Ethernet system to ensure that the system can communicate normally", ?compliance with standards like autosar? | - | - | the amount about mixed criticality is rather low |
| 2 | Contradiction of separation through virtualization and inter virtual machine communication in automotive scenarios | IVIS | reduce amount of ECUs - saves weight, energy and space, reduces hosts for expensive hardware, enables the use of applications from other OSs - reduce development and engineering cost and time | "fully digital cluster instruments (FPKs) create new design possibilities and combine safety critical applications (e.g. digital speedometer) and non-safety critical applications" | hypervisor for virtualization, partly isolations (concept depending on approach) | multi-OS environments - clear separation approach - interconnection of layers to restrict areas - minimalistic approach | discusses three different approaches, 1. clear separation approach, 2. interconnection between two VMs, - keep safety critical system isolated - UI layer different heterogeneous UIs from different VMs are composited - 3. minimize interconnection between two or more VMs by using only certain interconnections (one-way/readonly, virtual input/output devices) - reduce dependencies and to eliminate the use of complex protocols (still needs test to ensure that real world requirements can be fulfilled). Interconnection is necessary, access of layers can be used by categorizing, Work in Progress |
| 3 | Autonomy-driven Emerging Directions in Software-defined Vehicles | SDV | hardware and software architectures that are proving to be a bottleneck -> computation-intensive, use of service-oriented creates timing uncertainty, fundamental timing analysis problems -> WCET (according to authors never fully solved). | service-oriented communication in SDVs - SOME/IP, DDS | containerization | - | Digital Twins, real-time guarantees are difficult to provide in service-oriented automotive in-vehicle communication architectures, discussion about the timing analysis time and WCET - and that it highly will never be 100% solved |
| 4 | Time-sensitive autonomous architectures | ASDVs | Computing Power, | high-connectivity -Time-Sensitive Networking (TSN)- "adoptable solution for enabling TSN on such platforms where the number of available Ethernet ports is limited", Ethernet-based, V2X | - hypervisors providing strong isolation and virtual access to TSN for VMs -VTSN: - based on the Inter-VM shared memory (IVSHMEM) feature, - central solution point: specialized VM, hereafter named the Virtual Switch (VS), which allows other VMs to send and receive Ethernet frames to and from the TSN network connected to it. -isolations | TSAA scheduling | - "partitioning hypervisor for enabling mixedcriticality and heterogeneous OSes (including RTOS) and real-time networking with TSN protocols" - "towards the deployment of VTSN-based design" - . . . |
| 5 | An Enhanced Algorithm for Memory Systematic Faults Detection in Multicore Architectures Suitable for Mixed-Critical Automotive Applications | ADAS | functional safety, computation power and data integrity, | HPC und multicore processors, ISO26262 somehow also as the solution? | memory data integrity faults detection (based on redundancy),FFI | "Multiple copies, and double inverse redundant storage design mechanisms are presented with new modified algorithms to mitigate the CPU load and memory consumption." | complexity is increasing proposes new safety mechanisms to overcome memory interference, in high ASIL separation from safety-relevant and safety-non-relevant, design complexity is increasing, redundant copies, critical paths, done via 2 algorithms |
| 6 | Software Architecture Modeling of AUTOSAR-Based, Multi-Core Mixed-Critical Electric Powertrain Controller | Powertrain | complexity | - | - | - | discusses an "approach with the help of a real-life experiences on software architecture modeling of multi-core, mixed-critical, electric powertrain controller project." but the focus here is not on the mixed-critical part its just that the system has mixed-criticality |
| 7 | Problems and their mitigation in system and software architecting | Automotive, process automation, and power transmission industries | - | - | - | - | interview study - interview, survey workshop in Table 2 where the problems are listed no mixed criticality and overall the focus is not on that topic |