

Automotive Software with ASOA

Declarative Orchestration

With funding from the:



Service-oriented architectures enable highly modular and reusable software architectures offering adaptable systems to changing requirements. Especially safety-critical applications require managing the software system at runtime to guarantee a reliable and deterministic behavior. The **ASOA (Automotive Service-Oriented Software Architecture) Orchestrator** manages the system by deploying chains of software services, effect chains, which provide the requested functionality.

ASOA Visualizer: Declarative Orchestration

Orchestrator Operations

- disconnect CL:cam_left → CPU1:cam_fusion
- disconnect CR:cam_right → CPU1:cam_fusion
- disconnect CPU1:cam_fusion → HPC:ad_planner
- disconnect HPC:ad_planner → ECU:control
- connect HPC:estop_planner → ECU:control
- start HPC:estop_planner
- pause CPU1:cam_fusion
- pause CL:cam_left
- pause CR:cam_right
- pause HPC:ad_planner

Declarative Description

```

{
  "name": "safe_halt",
  "ServiceClasses": {
    "estop_planner": {"Services": ["HPC:estop_planner"], "Inputs": [], "Outputs": ["trajectory"]},
    "control": {"Services": ["ECU:control"], "Inputs": ["trajectory"], "Outputs": ["control_input:fl", "control_input:fr", "control_input:rl", "control_input:rr"]},
    "dyn_fl": {"Services": ["DMFL:dyn_fl"], "Inputs": ["control_input:fl"], "Outputs": []},
    "dyn_fr": {"Services": ["DMFR:dyn_fr"], "Inputs": ["control_input:fr"], "Outputs": []},
    "dyn_rl": {"Services": ["DMRL:dyn_rl"], "Inputs": ["control_input:rl"], "Outputs": []},
    "dyn_rr": {"Services": ["DMRR:dyn_rr"], "Inputs": ["control_input:rr"], "Outputs": []}
  },
  "Connections": [
    "estop_planner->control",
    "control->dyn_fl",
    "control->dyn_fr",
    "control->dyn_rl",
    "control->dyn_rr"
  ]
}
            
```

Operating Mode

Reset

Autonomous Driving

Teleoperation

Safe Halt

Touch

Technological Innovations

When choosing an **Operating Mode**, the **ASOA Orchestrator** parses the **Declarative Description** of an effect chain provided in JSON format. Translating both the current and the desired effect chains into directed graphs in matrix representation enables efficient computations on the effect chains. By subtracting the matrix representing the current effect chain from that of the desired one, the necessary **Orchestrator Operations** to transition to the targeted operating mode can be determined.

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