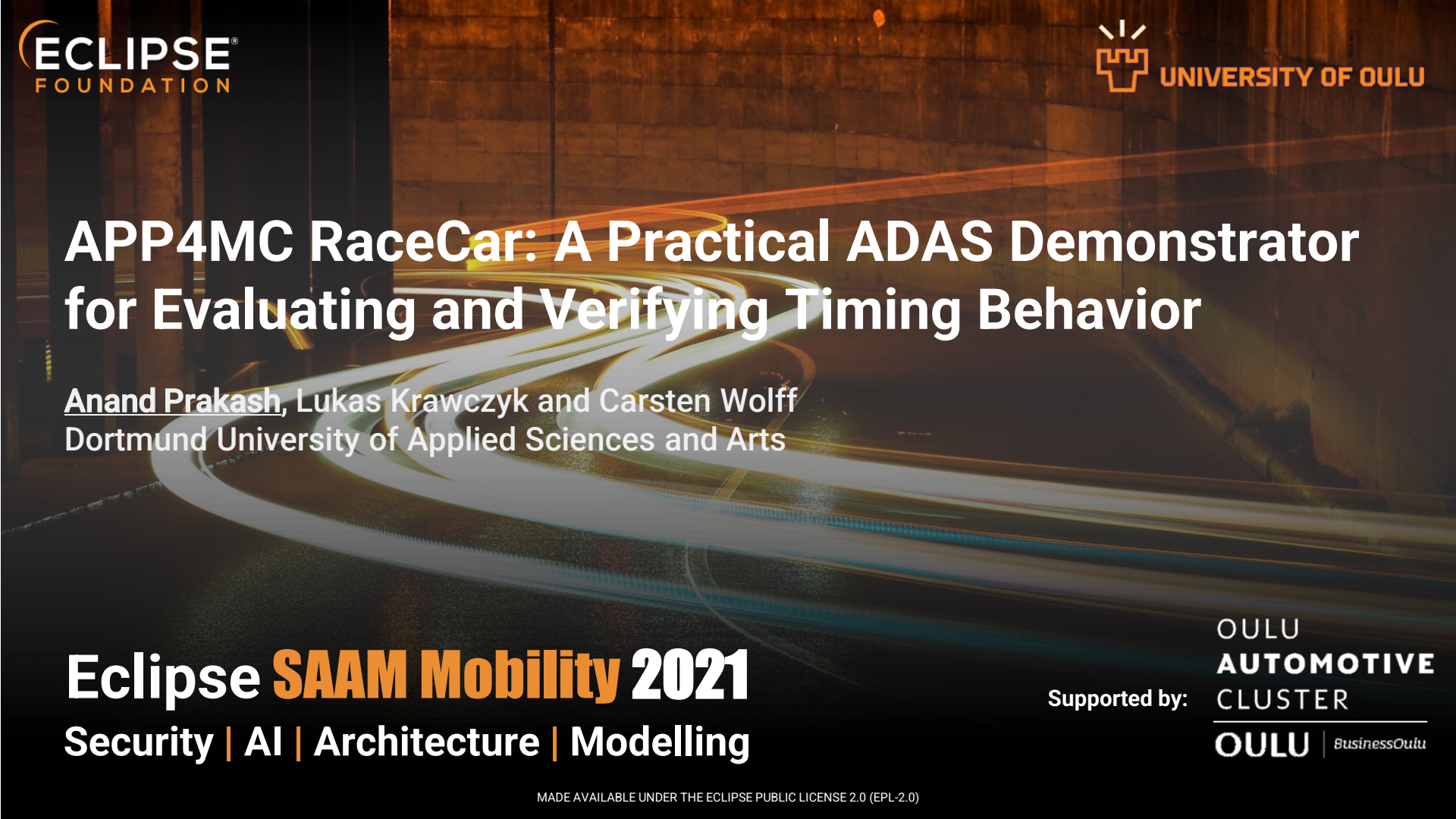

APP4MC RaceCar: A Practical ADAS Demonstrator for Evaluating and Verifying Timing Behavior

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Dortmund University of Applied Sciences and Arts

Eclipse SAAM Mobility 2021
Security | AI | Architecture | Modelling

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Agenda

- Introduction
- Motivation
- APP4MC RaceCar – A model based demonstrator
- Timing Analysis
- Conclusion and Outlook

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Introduction

- Increasing complexity.
- More computational demand.
- Safety-critical.
- Constrained end-to-end latency.
- Feasible deployment required.

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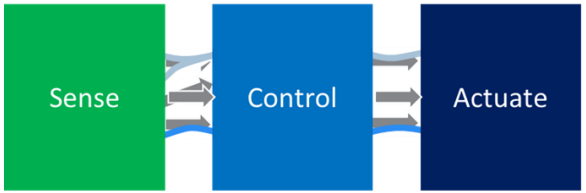
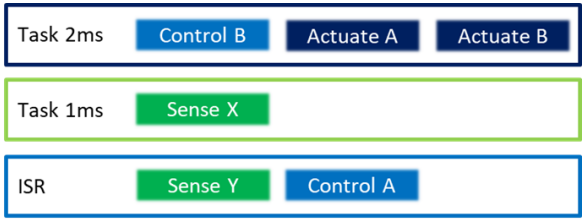
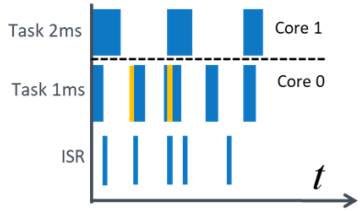
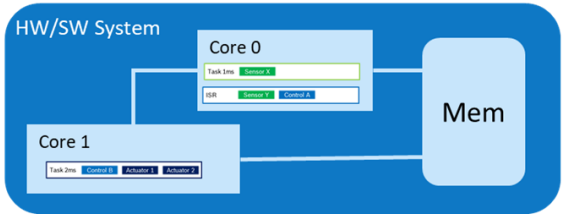
Motivation









Max Latencies: 3.3 ms, 2.3ms
Core Utilizations, …

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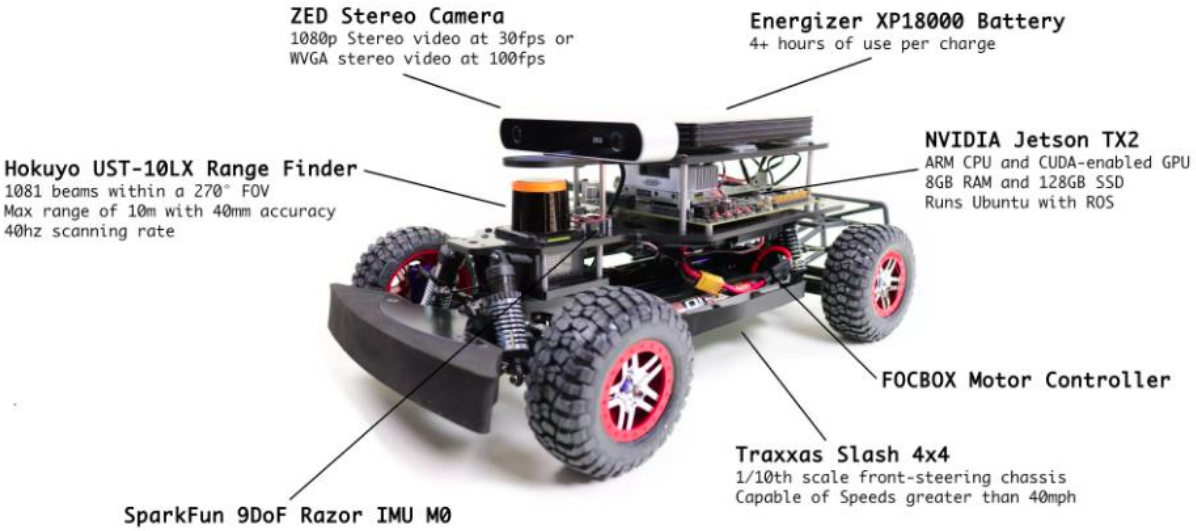
Motivation



MIT RaceCar[1]

[1]https://racecar.mit.edu/platform

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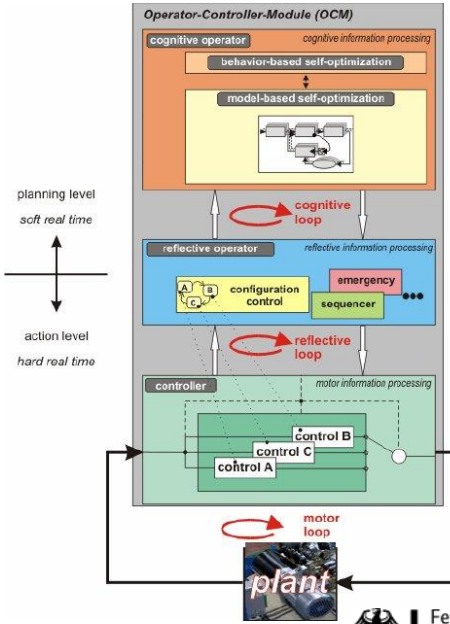
APP4MC RaceCar : A model-based ADAS demonstrator

- System designed based on OCM Model.
- Heterogeneous Architecture.
- Real-time capable (RT-Linux, ChibiRTOS).
- ADAS application is coarsely based on Waters Challenge 2019.
- System trace generation in real-time using the BTF tracing framework integrated with the ADAS application.

Operator-Controller Model[2]



[2]Schulz, B & Pottharst, A & Froehleke, N. & Böcker, Joachim. (2021). Modeling of Influences affecting a Linear-Drive-System.

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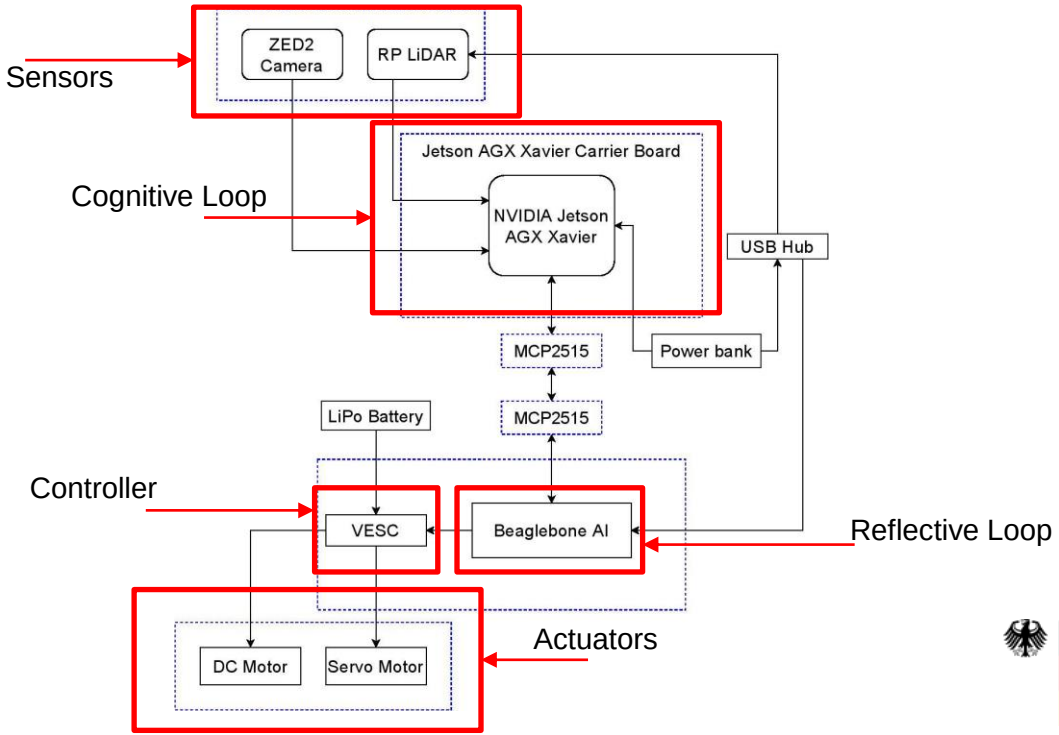
APP4MC RaceCar – System Architecture



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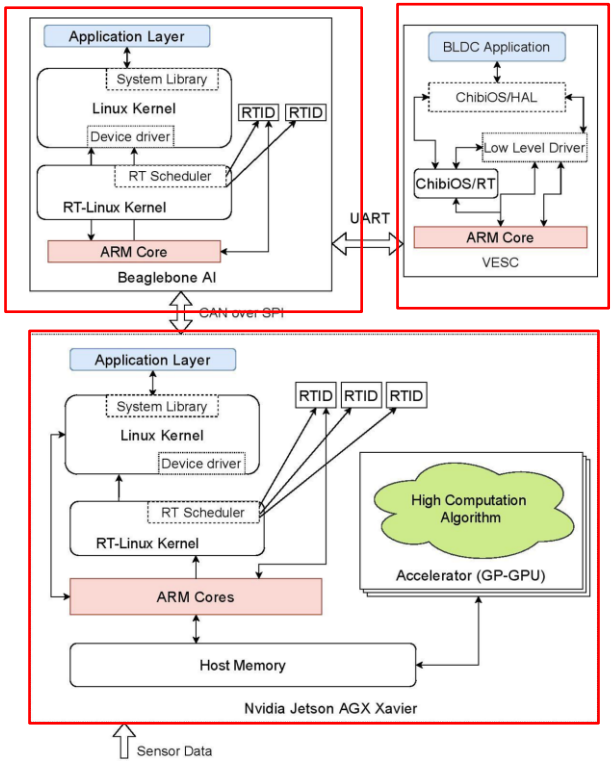
APP4MC RaceCar – Application Stack



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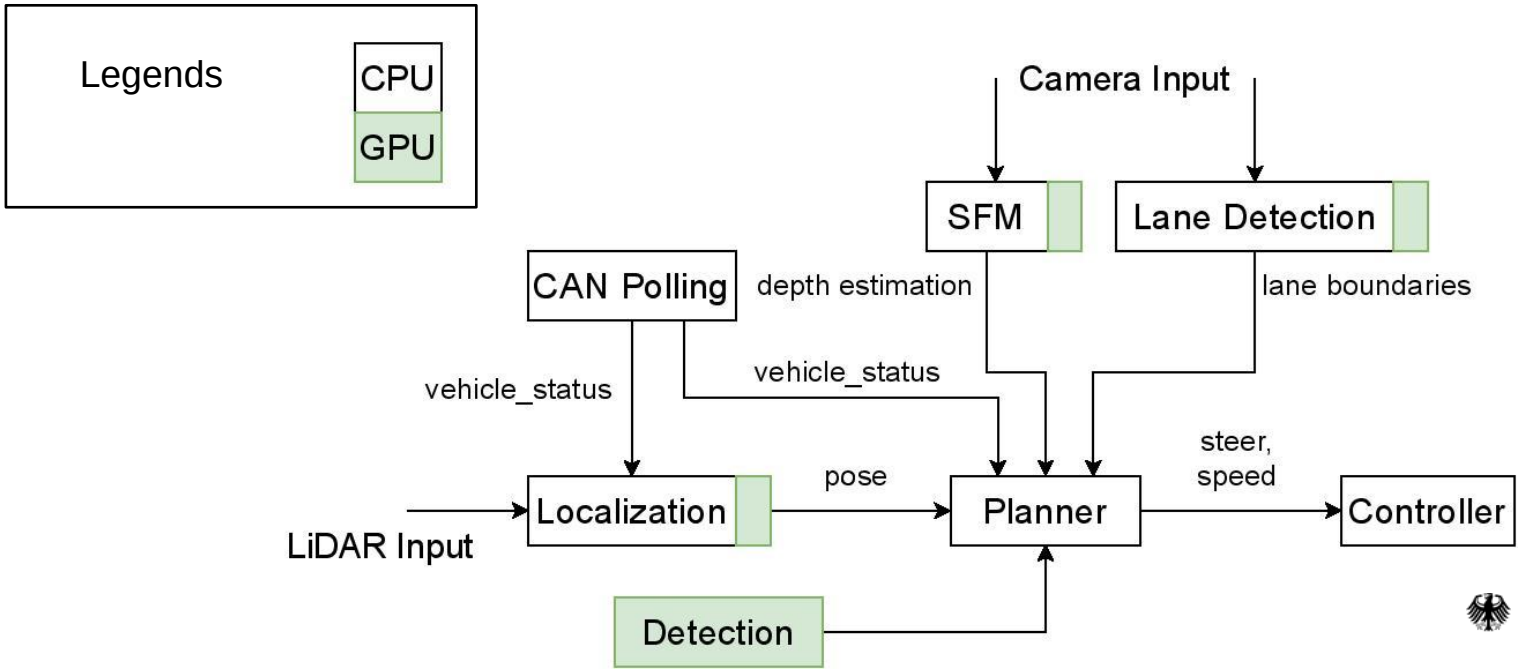
APP4MC RaceCar : ADAS Architecture Abstraction



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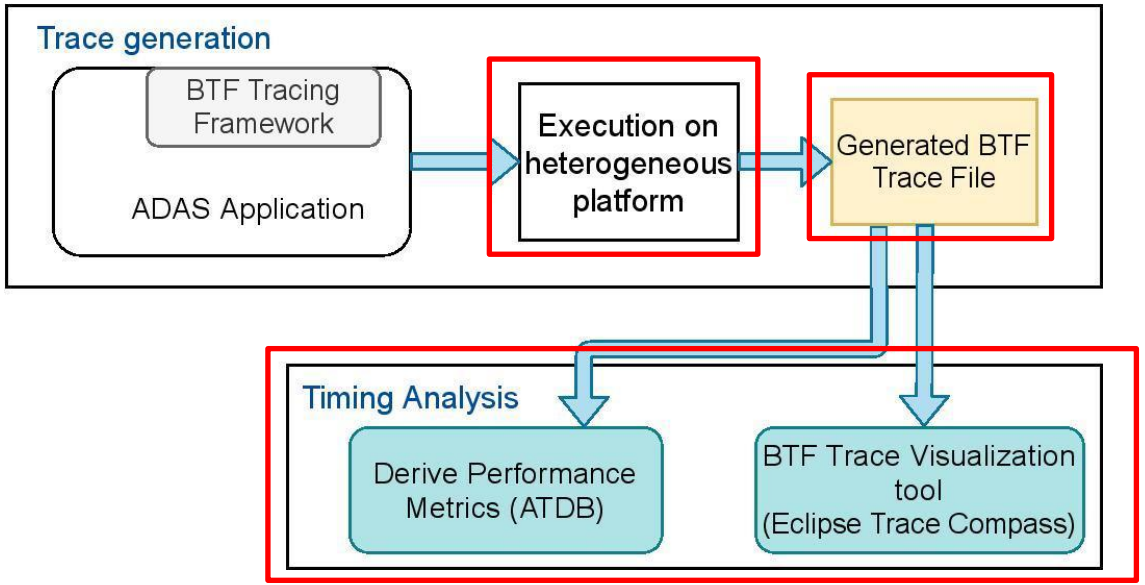
Timing Analysis



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Conclusion and Outlook

- An ADAS demonstrator:
  - With State-of-the-art sensing capabilities.
  - Enabled with high-end GP-GPUs.
  - With Real-time capability.
  - Enables runtime analysis in real-life scenario.

- Future Work
  - BTF Trace Framework implementation.
  - Derive Timing metrics for evaluating the timing behavior.
  - Benchmarking image processing and computer vision algorithms used in an ADAS.

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