



CNS 1646019 | October 1, 2016 – September 30, 2021

CPS: Synergy: Connected Testbeds for Connected Vehicles

Tulga Ersal (PI, U of Michigan) Mingyan Liu (Co-PI, U of Michigan) Anna Stefanopoulou (Co-PI, U of Michigan)

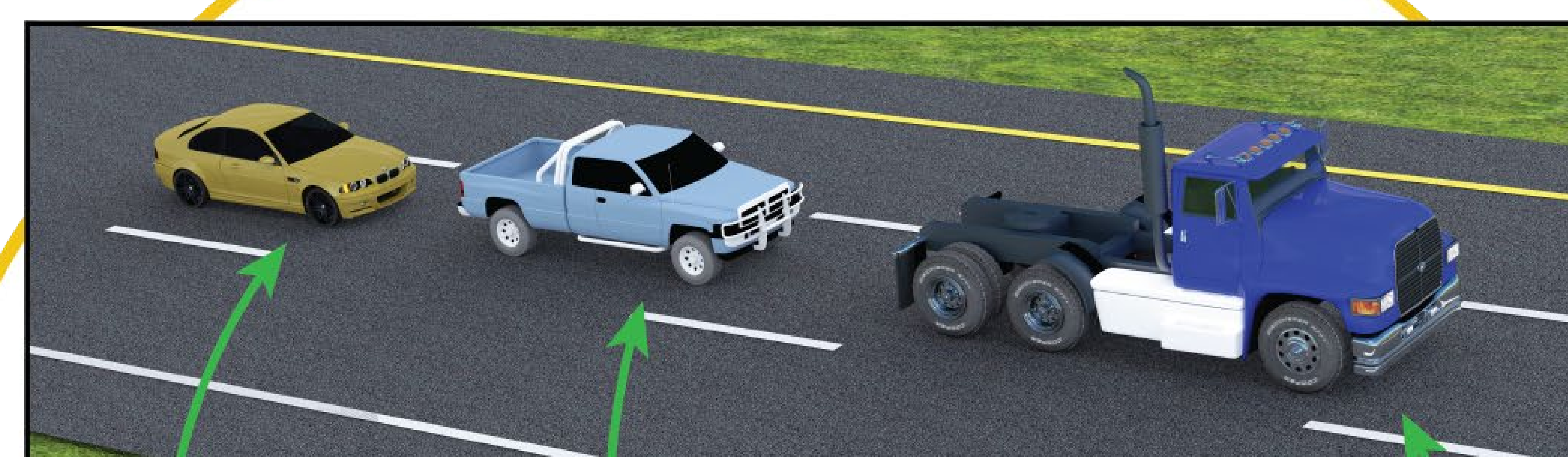
Challenge:

Develop an affordable, repeatable, scalable, and high-fidelity solution for cyber-physical evaluation of powertrain technologies for connected automated vehicles

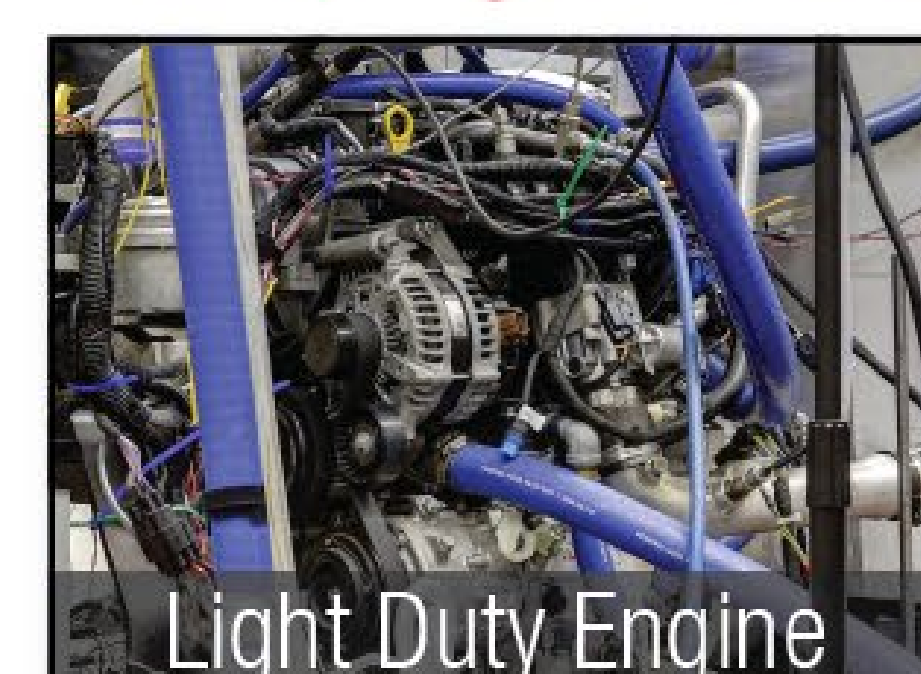
Solution:

- High-fidelity remote closed-loop access to powertrain testbeds over Internet
- Key innovations: A system-agnostic interface for high-fidelity integration despite network delays – A connected testbed prototype – New CAV management strategies

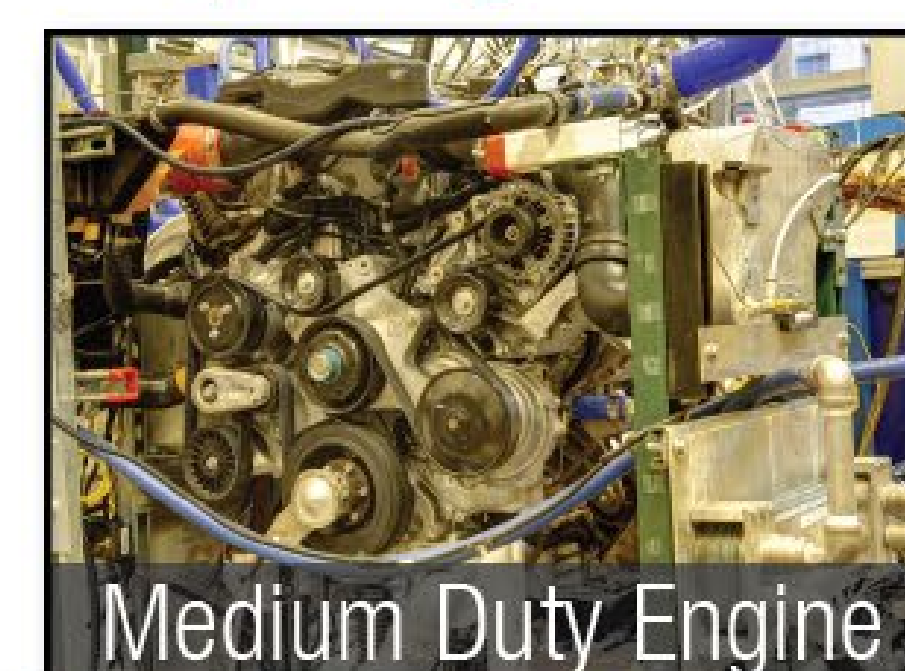
Vision



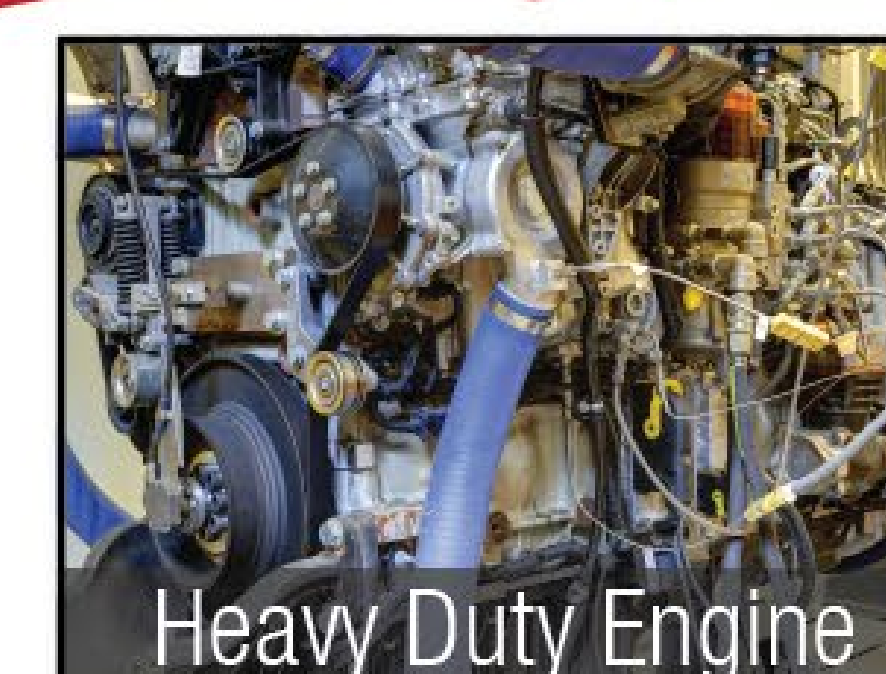
Connected Testbeds



Light Duty Engine



Medium Duty Engine



Heavy Duty Engine



Simulated vehicles in closed-loop with physical powertrains regardless of their location

Scientific Impact:

- 15 publications
- Prototype used in 2 DOD projects
- Being system-agnostic, our high-fidelity integration is applicable to hardware-in-the-loop testing of other CPS, e.g., earthquake engineering, robotics, manufacturing, aerospace, and power systems

Broader Impact:

- 5 PhDs (3 women), 2 Undergrads, 1 Post Doc
- A new graduate course module
- New research infrastructure
- Tech transfer to Ford, TuSimple, ORNL
- 2 technical workshops (100+ participants)
- 2 STEM teacher workshops (105 K-12 teachers)
- Presentation to Deputy Assistant Secretary for Transportation at DOE Office of EERE
- Presentation to Presidents Advisor Council at White House