WHAT IS IT?

An innovation software architecture that helps unleash the efficient use of parallel and heterogeneous processor architectures for automotive and railway systems, by bridging the gap between model driven engineering and HPC parallel programming models.

WHY AMPERE?

It provides solutions for system integrators and end-users who need to incorporate energy-efficiency and parallel computing into their cyber physical systems.

The AMPERE SW architecture includes:

1. Two Domain Specific Modeling Languages (DSML), i.e., Capella and Amalthea, that facilitate the description of the functional and non-functional behaviour of the system, independently of the underlying platform. The DSMLs have been extended with new features to better describe its parallel nature and its non-functional requirements.

2. A set of synthesis tools integrated within the APP4MC framework capable of automatically transforming the DSML describing the system to parallel source code supporting:
   - OpenMP parallel programming model and dynamic partial reconfiguration FPGA bitstreams
   - ROS and MicroROS frameworks to communicate between hypervisor partitions
   - Specific adaptions towards different middleware’s and operation systems
     - Internal Autosar Adaptive code generation
     - ROS2, microRos, ErikoOS and Linux adapters are open-sourced
   - SLG.Commons:
     - Contains central synthetic code elements common for all transformers, are open-sourced
   - Generic transformation framework which provides infrastructure for building M2M transformations.
Reduction of 30% on the software development costs, while providing the required performance and energy budget imposed by system up to 3x of performance speed-up and a system utilization of 100% for the two AMPERE use cases, guaranteeing the fulfilment of the non-functional requirements

**Key Achievements:**

- Reduction of 30% on the software development costs, while providing the required performance and energy budget imposed by system
- Up to 3x of performance speed-up and a system utilization of 100% for the two AMPERE use cases, guaranteeing the fulfilment of the non-functional requirements
- Provide extensions for automotive and railway DSMLs to better capture requirements
- New extensions to the OpenMP parallel programming framework targeting cyber-physical systems

**AMPERE Use-Cases**

- **Predictive Cruise Control**
  - Extends Adaptive Cruise Control with data from the electronic horizon to improve fuel efficiency
  - Showcases the increased composition and integration capabilities of the AMPERE framework

- **Obstacle Detection and Avoidance System (ODAS)**
  - ADAS functionalities (i.e., obstacle detection and collision avoidance based on data coming from tam sensors and AI analytics)