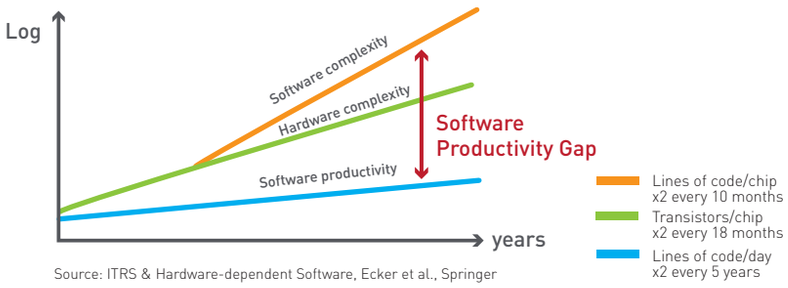
WHAT IS IT?

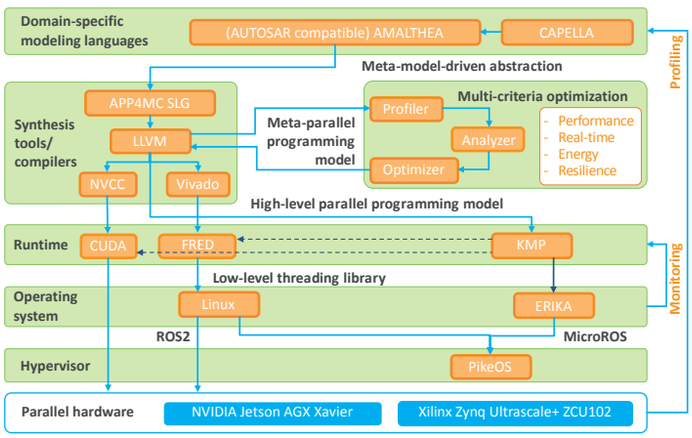
An innovation software architecture that helps unleash the efficient use of parallel and heterogenous processor architectures for automotive and railway systems, by bridging the gap between model driven engineering and HPC parallel programming models

AMPERE capitalises on the newest energy-efficient and parallel heterogenous platforms and includes non-functional requirements imposed by the system

AMPERE provides a modular solution which allows system integrators and end-users to use the components and tools they need to cope with the performance requirements of the most advanced systems



Source: ITRS & Hardware-dependent Software, Ecker et al., Springer



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 from BOSCH allows to automatically transform the DSML to parallel source code optimized for the underlying platform, combined with a multi-criteria optimization tool to guarantee the fulfillment of non-functional requirements.

3 **An extended OpenMP programming language** optimized to support very fine-grain parallelism and Redundant execution to enhance system resiliency, by taking benefit of the parallel capabilities the underlying platform.

4 **A hypervisor and operating systems** to provide safety and security mechanisms, while supporting the OpenMP parallel execution model.

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

Predictice cruise control

AMPERE partner, BOSCH harnesses AMPERE technology to explore parallelization methods that leverage the better performance unlocked by heterogenous Systems-On-Chip with hardware accelerators. This has been demonstrated for a predictive cruise-control application that paves the way for energy-efficient driving by configuring the drying strategy based on data analytics and AI.

Obstacle Detection and Avoidance System (ODAS)

Ground Transportation Italia's Obstacle Detection and Avoidance System uses complex sensors, tracking algorithms and machine learning processes to reduce accidents and to improve passenger safety. This system demonstrates and evaluates the performance capabilities and fulfilment of non-functional requirements of AMPERE technology.