The ITEA 2 AMALTHEA project is developing a consistent, open and expandable tool platform for automotive embedded-system engineering based on model-driven methodology. Specific features will include support for multi-core systems combined with AUTOSAR compatibility and product-line engineering. The resulting tool platform will be distributed under an Eclipse public license.

Driver-assistance functions and pollution control in modern cars are performed increasingly by embedded software systems. This has required a continuous increase in computing power while also meeting demands for reduced energy and lower costs. Multi-core technology is therefore being used increasingly in automotive electronic control units (ECUs) to handle such needs.

However, software-intensive and embedded automotive systems pose new challenges to development environments. There is an increasing demand for complexity, performance and reliability for the development results. Tools are expected to offer compliance to industry standards, transparency, auditability, performance and usability.

PARALLEL-PROCESSING ENVIRONMENTS
One of the biggest challenges for automotive systems – particularly for ECUs – is the shift to parallel-processing platforms. ECU software development processes have to be extended to support multi-core platforms and to cover the high number of variants up to the production line.

However, existing applications cannot benefit immediately from multi-core ECUs as they are not designed to run on such architectures. In addition, applications and systems have to be migrated into AUTOSAR – the open and standardised architecture for automotive software, jointly developed in Europe by automobile manufacturers, suppliers and tool developers and being adopted globally. New development environments are needed to meet these trends.

Moreover, as automotive systems are always produced with a high number of variants, many companies have adapted a product-line approach which is poorly supported by current development environments. AMALTHEA is therefore developing a new tool platform which takes all these aspects into account and provides comprehensive support for product-line engineering from requirements engineering to product configuration.
The AMALTHEA platform will support:
- Development of software for multi-core systems;
- Handling of large volumes of data;
- Configuration of automotive software systems;
- Code generation for target hardware systems;
- Interfaces to multi-core timing simulation and software partitioning tools;
- Test management and test generation tools based on established standards;
- A continuous tool chain; and
- Compliance with standards.

The tool platform will support a method for parallelisation of the software in embedded systems so that an optimised mapping of software components to cores is possible. In addition to the parallelisation of the software components, the communication of the components and the dependencies between the components can be simulated.

The architecture of the tool chain and the platform is shown in the picture below.

COVERING ALL DEVELOPMENT ASPECTS

The AMALTHEA tool platform will support all aspects of the development cycle. While addressing the automotive domain predominantly, it will be extensible to telecommunications to deal with such systems in their native environment and integrated into a car. It will also be possible to simulate parallel systems and support debugging of multi-core systems. Configuration tools for product lines and multi-core variants will also be included in the tool chain.

Requirements management for safety aspects will also be possible to support the safety-critical nature of most automotive ECUs. The tool chain will include data-description tools and editors as well as support for visualisation tools, graphical editors and hardware-software co-design.

Support will also be provided for verification and validation of the systems with provision of optimal multi-core real-time scheduling and formal validation of timing requirements. The result will be an open tool platform. This will be available both as open source under the Eclipse public license and for integration with existing or new tools either on a company-specific basis or with commercially available tools.

EUROPEAN BUSINESS OPPORTUNITIES

Car making is a major European industry with global supply chains. The major impact of this ITEA 2 project will be a reduction in development costs and the building of a de-facto standard development environment platform. Costs will be reduced by sharing effort for developing and maintaining the tools.

Moreover, there will be new business opportunities created around the tool platform – such as services for adoption of the platform and integration of existing or newly developed extensions. The availability of an open-source development environment with specific features for the automotive domain such as AUTOSAR compatibility will also open up the automotive market for newcomers and speed the development of new functions for cleaner, safer and more comfortable vehicles.