



# Ready for AUTOSAR Adaptive

ETAS offers comprehensive solutions for the upcoming standard

The AUTOSAR Adaptive standard lays the foundation for integrating functions into central vehicle computers and ushers in major changes in ECU development. ETAS' RTA-VRTE platform software framework and ISOLAR-A\_ADAPTIVE architecture design tool offer developers the solutions they need to discover the world of new E/E architectures.

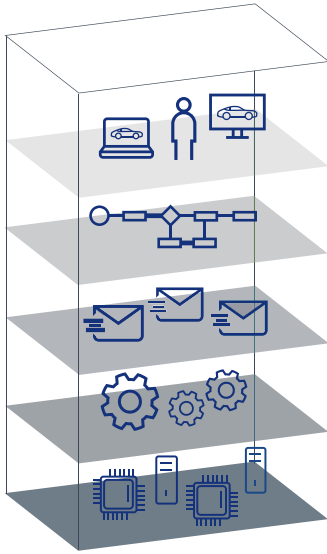
The AUTOSAR Adaptive Platform and the introduction of powerful, microprocessor ( $\mu$ P)-based vehicle computers (VCs) will bring about fundamental changes to both software and development processes. These changes will also extend to the platform software and development tools. ETAS is working with Robert Bosch GmbH to develop the RTA-VRTE platform software framework, which is already being used by customers around the world (see page 15).

For customers who want to start their journey now, ETAS offers an AUTOSAR Adaptive Early Access Program (EAP). It includes the RTA-VRTE software and components of the ISOLAR-A\_ADAPTIVE software development kit (SDK) as

well as consulting and training, giving ETAS customers access to a wealth of experience to help them get started in this new world.

## The RTA-VRTE platform software framework

The RTA-VRTE platform software framework includes all the important middleware elements for  $\mu$ P-based vehicle computers (Fig. 1). Levels 1 and 2 include infrastructure software for the relevant hardware and for a POSIX-compliant operating system. Since, unlike conventional ECUs,  $\mu$ P-based vehicle computers allocate resources to applications dynamically, the AUTOSAR Adaptive Platform's execution manager also controls CPU time and memory access in level 2.



Application Services	Functions/Applications
Layer 5 Vehicle-dependent Platform Services	Services managing the ECU grid of the vehicle
Layer 4 ECU-dependent Platform Services	Services managing one specific ECU
Layer 3 Communication Middleware (Service-oriented)	Manages control and data flow between SW components
Layer 2 OS-dependent Infrastructure SW	SW that complements the actual OS kernel (aka scheduler) and abstracts OS-specific properties toward higher layers
Layer 1 HW-dependent Infrastructure SW	SW that interacts directly with HW and abstracts it toward higher layers
Hardware	Microcontroller ( $\mu\text{C}$ ), microprocessor ( $\mu\text{P}$ ), virtual machine (VM)

Figure 1: The RTA-VRTE layer model supports key software functions and requirements.

Applications must also recognize other software in the system and communicate with it. The communication middleware in level 3 provides this capability independently of the protocol. This is a core component of RTA-VRTE, managing and controlling the interactions between the levels and ensuring smooth operation of the encapsulated software, including the ECU and vehicle-dependent platform services on levels 4 and 5.

### Architecture design with ISOLAR-A\_ADAPTIVE

ISOLAR-A has established itself the world over as a tool for creating software architectures based on the AUTOSAR Classic Platform. Because it is based on Eclipse, this tool can easily be integrated into existing development environments, and Eclipse plug-ins also allow ISOLAR-A to be combined with development environments, such as Doors, Subversion, and Git.

ISOLAR-A\_ADAPTIVE is the latest addition to the ISOLAR tool family. It lets users develop and integrate application software for RTA-VRTE. ISOLAR-A\_ADAPTIVE supports software developers in configuring AUTOSAR Adaptive applications, be it configuring applications, generating Service Manifests, generating Proxies/Skeletons, providing Service Instances, or configuring Service Detection with SOME/IP.

### Ready to go!

The RTA-VRTE Early Access Program (EAP) offers a complete software development kit (SDK) for the AUTOSAR Adaptive Platform. The SDK is delivered as a Virtualbox™\* image pre-installed with all tools, together with a set of preconfigured, virtual vehicle computers with RTA-VRTE. It lets users familiarize themselves with the new architecture, run their own prototypes, and debug software. The EAP also includes comprehensive training and consulting.

For maximum flexibility, and in order to prepare for mixed ECU-VC architectures with classic and adaptive AUTOSAR components, the EAP can be configured with ETAS ISOLAR-EVE (sold separately), the virtualization solution for AUTOSAR Classic ECUs. Future enhancements to RTA-VRTE will then provide services that have not (yet) been defined by AUTOSAR but that are vital for developing, debugging, and securing adaptive AUTOSAR applications, such as firewalls or gateway management solutions in the security environment, and connections to measurement and calibration systems.

This gives early starters access to the multitude of software and functions they need in order to develop reliable, functionally safe, and comprehensive adaptive software. It provides a solid foundation on which they can already begin to adopt the processes for future automotive software development.

\* Virtualbox™ is a virtualization solution for PCs from Oracle.

## Fully virtualized development processes

Partitioning the vehicle computer into strictly encapsulated virtual machines (VMs) also paves the way for highly parallelized, fully virtualized software development processes. As a multilayer platform, the RTA-VRTE is completely decoupled from the VC hardware used later – regardless of whether it comes from NXP, Renesas, Qualcomm, NVIDIA, or Intel. This lets developers familiarize themselves with the AUTOSAR Adaptive Platform on their PC by gaining practical experience with the RTA-VRTE software and ISOLAR-A\_ADAPTIVE tools.

The EAP offers preconfigured quick emulator (QEMU) virtual machines (VMs) for x86 64-bit and ARMv8 µP architectures. In the RTA-VRTE, they act as virtual ECUs that developers can run on a desktop PC. All VMs are connected via Ethernet and can thus communicate with each other and, using a Windows Network Bridge, with the outside world.

## It's all in the bag

ISOLAR-A\_ADAPTIVE, RTA-VRTE, and the EAP provide easy access to a fully virtualized development environment of the future that ETAS customers can already start using on their PCs today. Software development teams now have the opportunity to practice new communication structures, to overcome the previously strictly divided structures, and to establish agile development processes for VC software. Let the future begin!

## Authors

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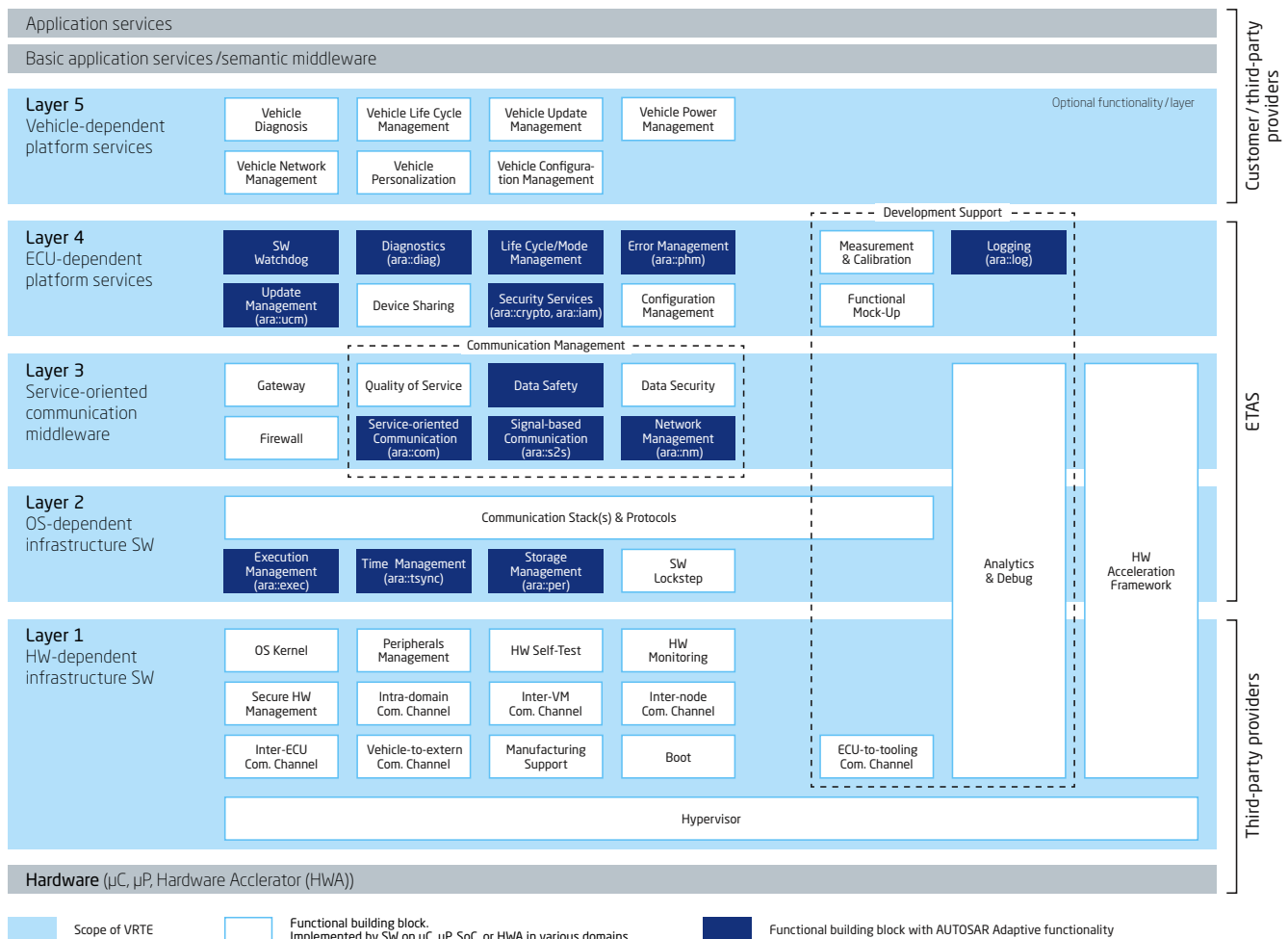


Figure 2: Detailed outline of the software components of the RTA-VRTE software framework.