Press Release

Scalable ECU Network in-the-Loop

- With NETWORK-LABCAR, ETAS creates new concepts for flexible Hardware-in-the-Loop testing of connected ECUs
- HiL testing systems for individual ECUs are easily connected to real-time-capable cluster and network HiLs
- NETWORK-LABCAR ensures manageable complexity and system costs of testing connected vehicle systems

Stuttgart, February 24, 2016 – The number and range of functions available in electronic control units (ECUs) distributed across all vehicle domains have seen a further sharp increase in recent years. Consequently, so has the amount of testing that needs to be done. After all, these functions need to be thoroughly tested and verified – and the trend toward greater connectivity is making these tests significantly more complex. Besides testing the individual components, engineers also have to look at the interaction among the ECUs. This calls for HiL systems that intelligently and flexibly connect tried and tested components.

To manage the increasing testing required in the time available, despite ever shrinking development cycles, and to maintain cost control over the long term, software testing is now being done long before the test vehicles are ready. One key to this is Hardware-in-the-Loop(HiL) testing. In recent years, ETAS has been continuously expanding the possibilities for this kind of virtual testing,

even beyond individual ECUs: NETWORK-LABCAR is one solution for testing highly connected ECUs in-the-loop. It gives developers the tools they need to efficiently and comprehensively perform the testing required to validate the highly complex network of electronic control units installed in today's vehicles, and to thoroughly verify the functional safety of those software-controlled vehicle systems," explains Mike Badalament, who is responsible for ETAS testing systems.

Component HiLs easily connected to network HiL

Complex vehicle functions in particular – from hybrid drives to adaptive chassis to active safety systems – increasingly rely on multiple ECUs. ETAS offers a way to test individual ECUs or clusters of relevant ECUs or, if needed, even the entire vehicle network. The data for this is transmitted between the component HiLs via Gigabit Ethernet synchronously and in real time. This process is crucial to ensuring realistic testing of the complex interplay of the ECUs, which is done by having a system setup with three separate network buses that are responsible for specific tasks: one bus is reserved for data exchange with a host PC running the LABCAR operating and automation software. A second bus ensures the synchronization of the respective integrated component HiLs, while a third one ensures real-time communication in the network.

The new NETWORK-LABCAR solution is based on the latest versions of the LABCAR-OPERATOR software and the LABCAR-RTPC (Real-Time PC) simulation target. The latter turns a PC into a high-performance simulation target that computes highly complex models with cycle times under 0.5 ms and satisfies tough real-time requirements. Any number of RTPCs can be integrated into the new ETAS system.

Flexible, modular concept

The ability to combine powerful simulation targets, real-time communication, and the synchronization of a scalable number of domain-specific HiLs using the Precision Time Protocol (PTP) defined in the IEEE 1588 standard gives development departments a high degree of flexibility.

They can gradually expand the network HiL as desired simply by merging individual component HiLs, thus approximating the growing system complexity. This systematically modular approach also allows users to switch from the overall network view to the individual view of the relevant connected component HiLs at any time. They can integrate software tested in other projects, or earlier software versions of their own project. This "blurred transition" option is unique on the market.

"NETWORK-LABCAR is the result of the systematic development of our LABCAR family of test solutions," explains Badalament. "Our solutions now range from the inexpensive and compact DESK-LABCAR system, which enables real-time, desktop HiL testing in early development phases, to the NETWORK-LABCAR full-vehicle HiL." ETAS also offers a large selection of simulation models, for instance for internal-combustion and electric engines, powertrains, fuel cells, and complete vehicles. In addition, users can access ETAS' know-how and get advice from our experts on configuring the HiL solutions.

Full cost control

The use of standardized technology that has been tried and tested in the automotive environment and the systematic focus on scalability make NETWORK-LABCAR a future-proof solution that continually finds appropriate answers to the growing complexity of connected vehicles. This ensures that not only complexity remains manageable, but also development costs. For instance, virtualized tests can be carried out in parallel at different locations 24/7. And because correcting software errors becomes more costly the closer you move to production launch, the more realistic the scenarios are in which early software tests are conducted, the lower the likelihood will be of finding errors in late development stages that would then require a lot of time and money to remedy. Furthermore, ETAS systematically works to develop the most affordable solution for the customer. Now, when setting up the network HiLs, standardized Ethernet switches can be used in place of expensive shared memory boards – without sacrificing performance in HiL simulation. In addition, LABCAR can help to protect the budget by using standardized, cost-effective PTP-capable network cards in the RTPCs, which ETAS did when realizing the precise time synchronization of the simulation targets. The decision to do so was based on our numerous years of experience in developing HiL solutions. More and more car,

truck, and mobile machinery manufacturers rely on ETAS testing equipment to test and verify the reliability of their vehicles' electronic systems, whether in internal-combustion, hybrid, or battery-electric powertrains, in the chassis, or in the interior. To intelligently connect these vehicle systems, intelligent and connected testing environments had to be developed. That is what ETAS now offers with its NETWORK-LABCAR.

Captions:

Picture 1: Three buses connect the HiL systems to the ETAS NETWORK-LABCAR.

Picture 2: The standardized interfaces of the ETAS NETWORK-LABCAR offer flexibility and lower costs.

ETAS GmbH

ETAS provides innovative solutions for the development of embedded systems for the automotive industry and other sectors of the embedded industry. As a systems provider, ETAS supplies a multifaceted portfolio that covers the range from integrated tools and tool solutions to engineering services, consulting, training, and support. Security solutions in the area of embedded systems are offered by the ETAS subsidiary ESCRYPT. Established in 1994, ETAS GmbH is a 100-percent subsidiary of the Bosch Group, with international subsidiaries and sales offices in 12 countries in Europe, North and South America, and Asia.

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