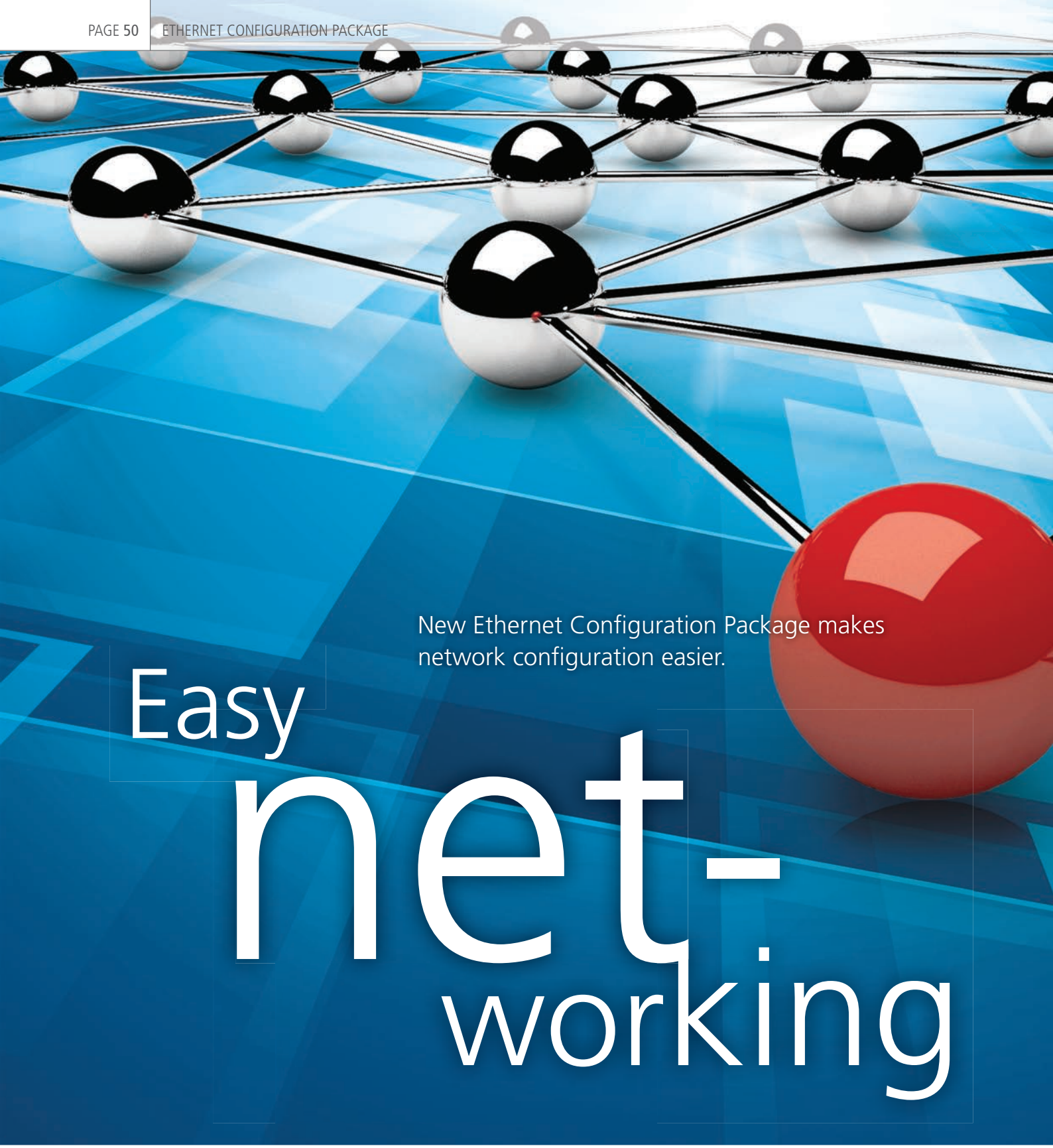
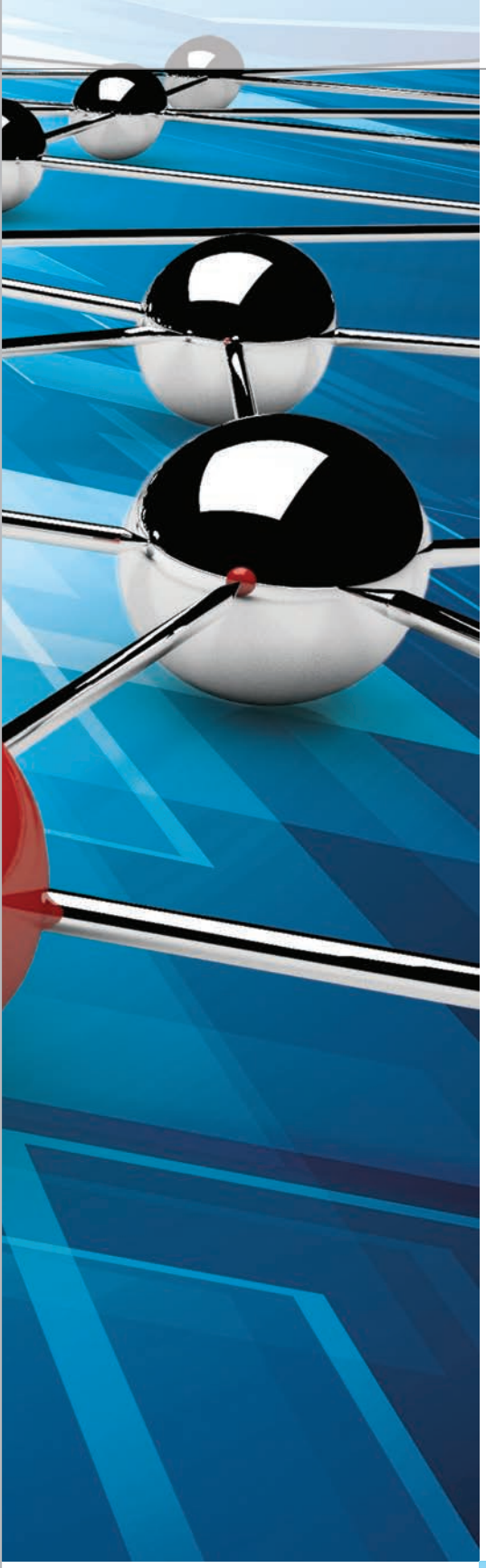


New Ethernet Configuration Package makes network configuration easier.

Easy net-working

With the new Ethernet Configuration Package, dSPACE is the first provider to enable service-based communication in Ethernet ECU networks in real-time systems.



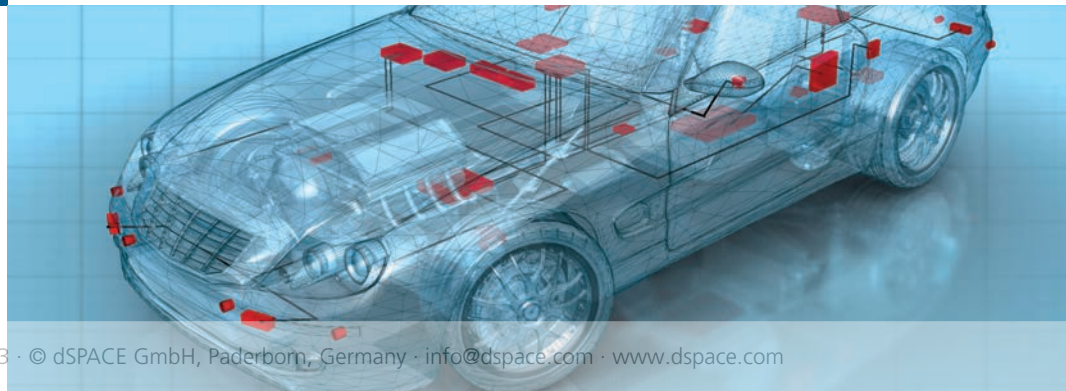
Why Automotive Ethernet?

Following FlexRay's successful introduction into vehicles just a few years ago, Ethernet is now about to go into production use as an automotive communication bus. With its flexible layer model, high bandwidth and cost-effective, independent implementations, Ethernet has numerous potential uses in vehicles. Ethernet networks will therefore play a decisive role in modern driver assistance systems, new comfort and entertainment functions, ECU flashing, and other functions. Because the Ethernet networks have often been optimized for automotive use, development is also focusing on many other aspects of the communication system. For example, the OPEN Alliance Special Interest Group (OPEN Alliance SIG), which dSPACE is also a member of, is promoting the widespread introduction of Ethernet-based networks with single pair, unshielded twisted cables. Activities in the fields of ASAM MCD-2-NET (FIBEX) and AUTOSAR include ones aiming to standardize communication descriptions and harmonize middleware layers. There is already a broad base of users and interested parties who are planning to introduce automotive Ethernet. dSPACE supports these customers with the new Ethernet Configuration Package.

dSPACE and Ethernet

For many years, dSPACE has been providing products and solutions for connecting Ethernet to real-time systems. Two examples are the DS1006 Processor Board for hardware-in-the-loop simulation and the MicroAutoBox for rapid control prototyping with blocksets designed for MATLAB®/Simulink®.
These products focus mainly on the User Datagram Protocol (UDP) and the Transmission Control Protocol / Internet Protocol (TCP/IP) via Ethernet. However, the current Ethernet/IP discussion is addressing the layers above UDP and TCP/IP and aims to implement service-based communication (figure 1). The serialization protocol SOME/IP for service-based communication and the service discovery protocol SOME/IP-SD are playing a key role here.
A version of the FIBEX standard called FIBEX 4, published by ASAM [www.asam.net] back in September 2011, meets the need to describe the additional elements required for service-based communication via Ethernet. The experience gathered from the initial application phase will lead to FIBEX 4.1, which is due to be released soon. FIBEX 4 is the first step towards a data exchange format for Ethernet-based in-vehicle communication networks. More

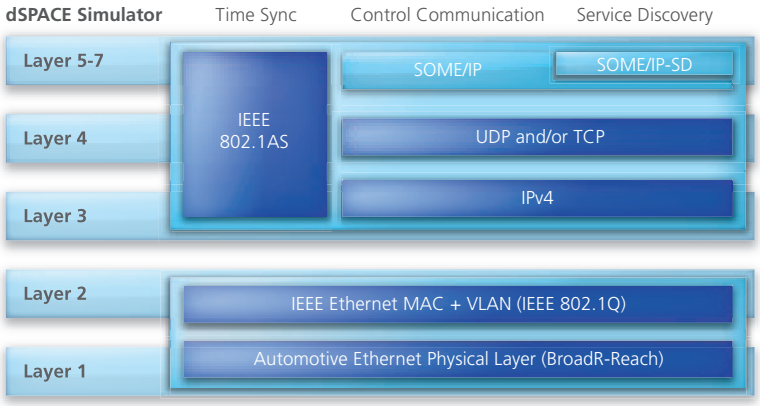
> Ethernet networks will therefore play a decisive role in modern driver assistance systems.



Ethernet Configuration Package

Features

- Enables the simulation of service-oriented, event-based Ethernet communication in real-time systems.
- Supports FIBEX 4 communication descriptions.
- Supports SOME/IP middleware.



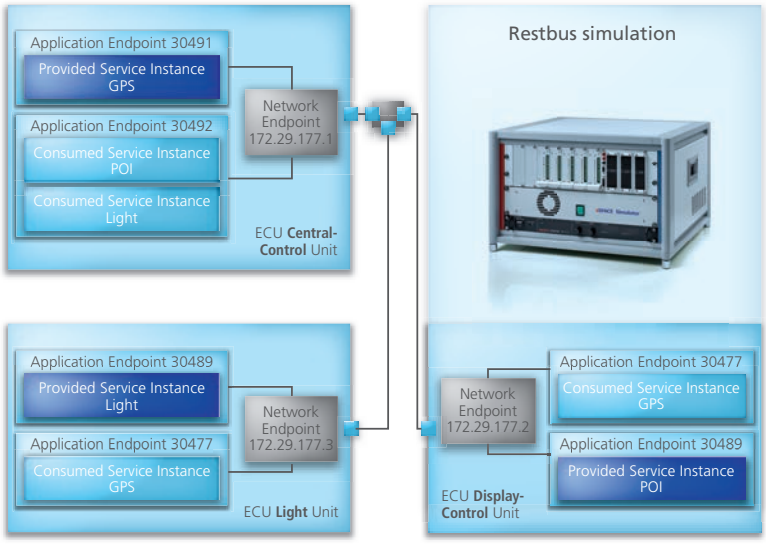
ISO/OSI layer model of service-based communication via Ethernet

communication descriptions for service-based communication via Ethernet will follow, especially ones for AUTOSAR. The main idea behind this IP- and service-based communication is explained below with excerpts from the FIBEX 4 format.

Service-Based Communication with FIBEX 4

Ethernet is specified in IEEE 802.3 and covers the first two layers of the ISO/OSI model. Because the network nodes share the physical transmission medium, collisions can occur. These can be avoided by point-to-point connections with switches as coupling elements. The fibex4ethernet schema extends the FIBEX topology with the elements that are needed for describing Ethernet in the data link and physical layers. Network endpoints and application endpoints were integrated into the fibex4it schema and elements for the IP and transport addresses (such as ports) were added. The FIBEX specification was extended by two basic concepts for communication via Ethernet. The first of these is typical signal-based communication like that used with CAN. This involves mapping protocol data units (PDUs) to Ethernet. The network and application endpoints for the PDUs are then modeled in FIBEX. Because Ethernet provides more features than just transmitting simple signals via UDP, etc., the second basic concept allows the specification of complex service interfaces that contain methods for describing communication on higher layers. Generic data types can be used for the parameters of the methods to transmit information that is more structured than with simple signals. The fibex4services schema contains the elements for modeling service-based communication. Underneath the application endpoints are the service interfaces that are instantiated as either provided services or consumed services.

Figure 1: Example of service-based ECU communication



Tool Support

The dSPACE Ethernet Configuration Package supports the simulation of

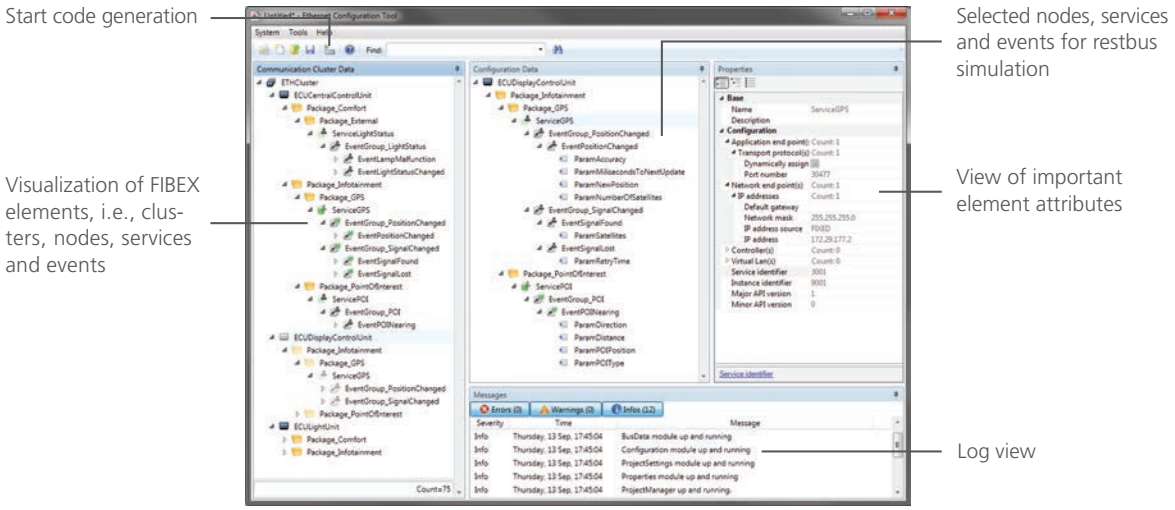


Figure 2: Ethernet Configuration Tool

service- and event-based communication as described in FIBEX 4. The first version of the dSPACE Ethernet Configuration Packages is available for systems with quad-core DS1006 Processor Boards. Like the dSPACE FlexRay support, the dSPACE Ethernet Configuration Package consists of two parts: One is the dSPACE Ethernet Configuration Tool for configuring a dSPACE system as a simulation node in a service-based Ethernet network. The other is the RTI Ethernet Configuration Blockset for modeling service-based communication in MATLAB/Simulink (figure 3).

The Ethernet Configuration Tool

A FIBEX 4 file can be imported and visualized with the dSPACE Ethernet Configuration Tool. FIBEX elements such as clusters, ECUs, services and events are represented in a clearly organized tree (figure 2). Users can select ECUs, services and events for the simulation simply by drag & drop. A structured view displays the most important attributes of the FIBEX elements. The selected services and events serve as inputs to automatic communication code generation. A transmission file is generated as a basis for service-based model frame generation in MATLAB/Simulink. The result is a Simulink interface model with preconfigured service and event blocks that build on the RTI Ethernet Configuration Blockset. The Simulink interface model provides subsystems for the simulated ECUs with the relevant service instance interfaces. With the help of the parameterized event blocks, users can design functions in the function model, for example, to try out the new communication via Ethernet/IP or to perform restbus simulation. The new dSPACE Ethernet Configuration Package is the first tool for restbus simulation on real-time systems for service-based in-vehicle Ethernet communication.

The latest version, Ethernet Configuration Package 1.1, was released in June and also supports dynamic service discovery. Further versions will follow. ■

Figure 3: Architecture of the Ethernet Configuration Package