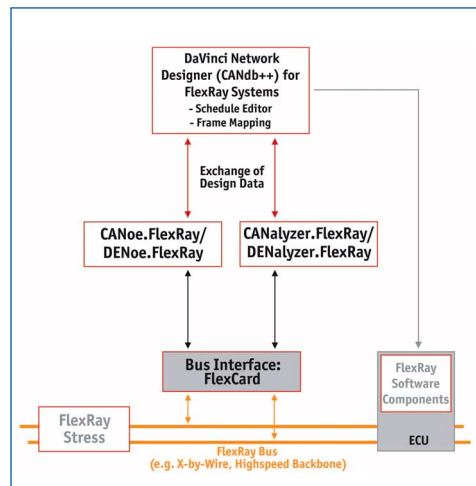


Analysis tool and bus interface for FlexRay networks

by Markus Fischer, Vector Informatik

VECTOR INFORMATIK SUPPLIES TOOLS FOR AN OPTIMIZED ANALYSIS OF FLEXRAY NETWORKS. THESE ARE THE FLEXRAY OPTION OF THE WORLDWIDE-USED CANOE DEVELOPMENT TOOL AND FLEXCARD, A COMPACT BUS INTERFACE.



Vector's tool chain for the FlexRay development

FlexRay is a flexible and scalable high-speed data bus. The FlexRay Consortium was formed in 2000 as an initiative of BMW and Daimler-Chrysler. Its goal was to establish FlexRay as the standard data bus for safety-critical applications such as X-by-Wire systems with distributed automatic control algorithms. The use of FlexRay as a communications backbone with CAN or LIN as sub-bus structures is another planned application area. Since its inception practically all significant automotive OEMs and suppliers have joined the consortium. Vector expects the first FlexRay-based data network to go into production in about two years.

In comparison to CAN (maximum of 1 Mbit/s), FlexRay offers a significantly higher data rate at 10 Mbit/s. Fixed, predefined transmission times during time-controlled operation and event-controlled data transmission in the remaining time slot offer a high level of flexibility and safety. Also flexible is the network structure: the user can choose between a classic bus topology and a star topology. The two channels of the FlexRay data bus permit redundant data transmission or data transmission that is configured for more bandwidth. A supplemental monitoring mechanism (Bus Guardian) prevents malfunctions by only granting bus access for sending a message at predefined times for each node.

Vector Informatik has been active as a development partner in the FlexRay Consortium since the year 2000. Just two years later Vector was the first supplier to offer FlexRay analysis tools in Version 3.1 of its CANoe and CANalyzer products. Initially, providing suitable interfaces to the FlexRay bus was a special challenge. At first a service module based on a small Power-PC was used. Then with CANoe and CANalyzer 4.1 the more powerful xModule could be used. The FlexCard introduced just recently by Vector supports FlexRay applications with the latest controller from Motorola.

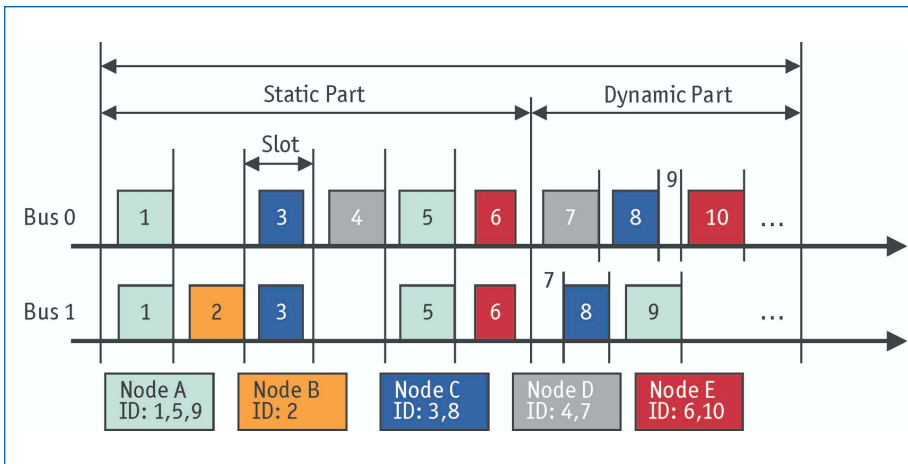
FlexCard has two software-configurable physical layers with a RS485 transceiver on the standard layer, and a TJA 1080 transceiver on the specific layer. The 32-bit CARDBUS interface and plug-and-play installation ensure that work will progress quickly. Development and standardization of the FlexRay protocol has already led to several iterations of FPGA-based controller implementations. As one of only a few suppliers Vector is participating in this development with analysis interfaces.

With CANoe 5.1 a comprehensive software tool for the simulation and analysis of a FlexRay network is at the user's disposal. CANoe.FlexRay 5.1 supports the current

Motorola controller implementation and essentially offers the same functional features as analogous products used in the development of CAN networks. Vector Informatik is intentionally offering a full range of functional features at an early stage, so that the user will have a user-friendly tool available even during the introductory phase of the FlexRay data bus. This is also why the advantageous and familiar "look and feel" of Vector tool user interfaces was implemented throughout.

The CANoe user can either generate a network using one of the familiar FlexRay design tools or obtain it from their customer – generally an automotive OEM – as a complete specification. These data can then be imported into a CANdb database. From there it is very easy to download the controller configuration to the FlexCard and thereby to the analysis system.

The CANoe and FlexCard combination allows messages to be sent and received, node functions to be simulated, and rest-of-bus simulations to be performed. Thanks to CANoe's multibus capability FlexRay networks can be tested together with CAN, LIN or MOST data buses trouble-free. This functionality is especially important if the new standard is used as the backbone for an entire data bus architecture.



High level of flexibility and safety by time-controlled operation and event-controlled data transmission

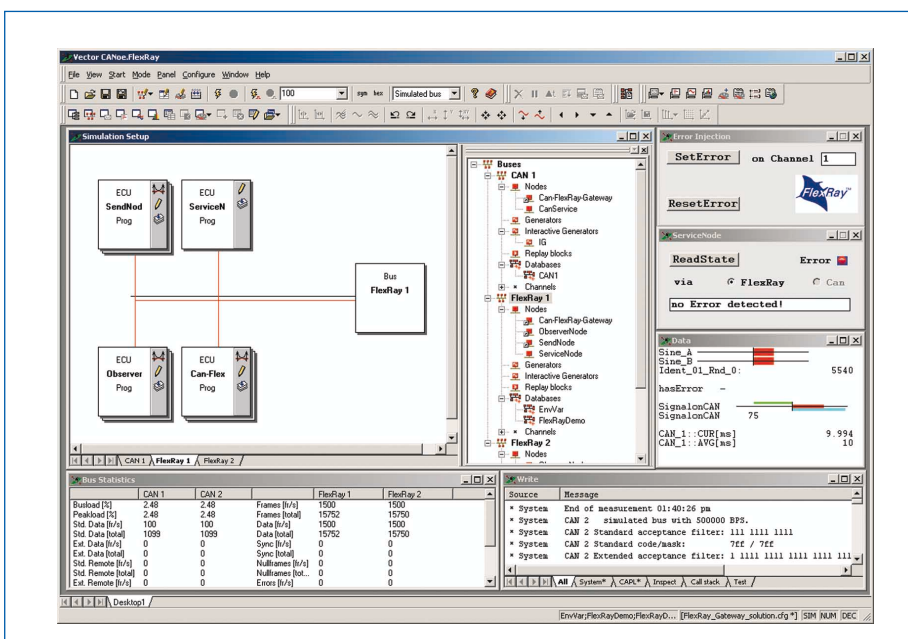
Vector has expanded message representation in the trace window for FlexRay. Besides the usual symbolic representation the user also gets typical FlexRay-specific information, such as slot status and cycle counter. Also new is the cycle-based display of the network management vector that is necessary for FlexRay applications.

The Fieldbus Exchange Format (FIBEX) contains a standardized description of a network. It simplifies data transport substantially, both between different development tools and between project partners. Data management in particular can be very tedious, because of the large number of suppliers and data priorities. CANoe.FlexRay 5.1 supports the Field Bus Exchange Format which is based on the XML standard. Supplemental project-specific information can be added, and the data are then "fed" into the user's bus analysis tools, code

generators for drivers, or test procedures.

Representing another building block of Vector's system strategy for FlexRay are the embedded software components for data communication between controllers. Developed to conform to the specification of the AUTOSAR consortium, they simplify integration of complex software systems by standardization and decoupling from the application logic. Furthermore, the software architecture that was chosen makes adaptation to different microcontrollers easy.

In the near future Vector will integrate additional functions in CANoe to better support time-controlled systems. From the hardware interface and embedded software components to the comprehensive development and analysis tool for FlexRay networks – everything from a single competent source. ■



Simulation and analysis of a FlexRay network with CANoe.FlexRay 5.1