Making cars more **intelligent**

Air suspension ECU with FlexRay

Customer:

Supplier based in Southern Germany

Brief

An existing electronic control unit for an **air suspension system** needed to be connected to FlexRay for fitment in a **FlexRay demo car**. Data from a central passenger vehicle sensor field, which the ECU requires to control the actuators for the air suspension system, is distributed via FlexRay. In addition, status messages from the ECU must be distributed to other nodes via FlexRay.

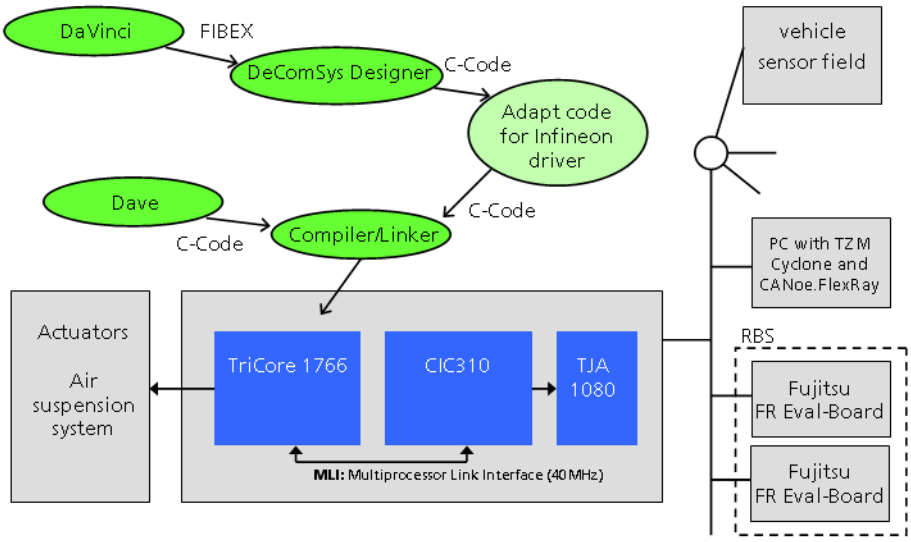
Our job was to **put hardware** adapted for FlexRay **into operation**, to use cluster parameters and ensure **secure communication via FlexRay**.

Solution

The most important point was to select the right **FlexRay driver**. This would ensure reliable communication via FlexRay and support **parameterization of the FlexRay cluster** via the vehicle manufacturer's tool chain.

As the FlexRay communications controller (CIC310) was not integrated into the microcontroller being used, a high-performance **connection** had to be realized **via the MLI**.

To be able to test the system before installation in the passenger vehicle, a **rest bus simulation** was set up with two FlexRay evaluation boards which act as start-up nodes and supply the necessary sensor data.



Technologies

FlexRay, FIBEX, FlexRay configuration tools, µC programming, Lauterbach Tools, MLI, Tricore, CIC310, CANoe.FlexRay

Length of project

Approx. 1 man-year

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On the project to connect the air suspension ECU to FlexRay, we were the right partner for the supplier due to our knowledge of FlexRay but also because our colleagues were working on the FlexRay demo car at the vehicle manufacturer at the same time.

As a result, we were largely able to integrate the ECU into the vehicle manufacturer's FlexRay cluster independently and on schedule.

At the start of the project, hardware needed to be put into operation with simple means and the functionality of the FlexRay controller and transceiver tested to ensure it was error-free. The MLI (Multiprocessor Link Interface) was also configured to enable maximum data rates for communication between the microcontroller (Tricore TC1766 from Infineon) and the FlexRay communications controller (CIC310 from Infineon).

FIBEX format

For planning vehicle networking, FlexRay tools were ultimately deployed which not only cover the communications matrix in the vehicle but also contain communications parameters for the bus systems. The FIBEX format was specified by ASAM for exchanging this data between different tools. Networking structures with FlexRay, CAN, LIN and MOST can now be defined via FIBEX. However, there are manufacturer-specific enhancements which are not interpreted in the same way by all tools.

As a result of the fact that the vehicle manufacturer uses Vector DaVinci and the supplier uses the DeComSys Designer (now part of ElektroBit tresos Tools), the versions of the tools needed to be aligned to each other so that the vehicle manufacturer's FIBEX format could be used in the supplier's tool chain.

Adapting the driver

The tools for configuring FlexRay clusters allow parameter sets or C code for individual FlexRay nodes to be exported. Typically both competing IP cores (ERay from Bosch and MFR from Freescale) are supported.

Because the FlexRay driver used could not be used without adjusting the tool chain's C code, a manual step was necessary after exporting to set the register sets and puffer settings for the FlexRay controller at the right places in the code.

Connection to ECU software and testing

In the final stage, the existing ECU software needs an interface to hold the passenger vehicle's sensor data and also to send messages via FlexRay.

Prior to delivery to the vehicle manufacturer, the ECU was tested using a rest bus simulation that basically consisted of two Fujitsu FlexRay boards. When configured as start-up nodes, these set up stable communication and send test sensor data to the slots which will subsequently contain real data.

In this way, it was possible to show that the ECU functioned correctly within the FlexRay cluster.

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