Management of Complex Automotive Communication Networks

T Weber
DaimlerChrysler AG, DE

Abstract

Automakers are still facing an increasing complexity in vehicle requirements with regard to their EE systems. This complexity is not only caused by innovations, which are being provided for tomorrow’s drivers, but is also due to system requirements regarding EE Architecture cost, managing software updates und diagnostics concepts.

One way to conquer this challenge is the use of standards in the field of basic technology. Ongoing activities such as Autosar, FlexRay, HIS (Herstellerinitiative Software – OEM initiative software) and more, underline the car industry’s contribution to create and establish these standards.

Another way – more linked to OEM’s internal processes – is to undertake a deeper analysis of Architecture work. Here at first, a profound description is essential. This tool-based description is the basis for a more detailed analysis. Two options should be focussed upon: expert reviews and automatically calculated metrics in the tool, such as cost, weight or even more sophisticated metrics for feasibility. With this technique, iteration by iteration the EE Architecture reaches more profound stability and will meet the functional and non-functional requirements far better.
One big question for today’s Architecture developers is the design of Gateways. Gateways are an essential part of communication networks. They separate different bus systems in order to reduce overall bus load and to separate different domains. The challenge for Gateways is still increasing according to the Bandwidth Scaling Law, which states that the bandwidth of communication is increasing exponentially just as the power of in-car microcontrollers is. This leads to an increase in routing tasks. Future requirements will request even higher bandwidth buses – such as FlexRay or Ethernet. With conventional technologies – the use of microcontrollers for Gateways – severe performance disadvantages have to taken into account by the architect, which leads to a suboptimal solution. To overcome this issue new technologies have to be evaluated. Reconfigurable hardware is considered a possible alternative with higher performance.