Making vehicle engineering more visible

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Creation of vehicles with autonomous systems and sophisticated electronic functions make tough demands on engineers. Complex specifications and other critical documentation can fill thousands of pages with information that engineers and development teams need to understand and act on. A group of Swedish engineers was tasked with creating a facilitating platform that can reduce document processing and, above all, simplify collaborations in complex industrial projects. The result was the research project Synligare (literally "more visible" in Swedish).

The Synligare project was started in the autumn of 2013 by a group of Swedish engineers all of whom are in some way connected with the Swedish automotive industry. They have seen up-close how the demand for and expectations on tomorrow's green, safe and connected vehicles have grown in complexity. This in turn has placed greater importance on the efficiency of the collaboration between OEMs and suppliers with specialist expertise. The problem was partly rooted in the requirements and specification documents that the collaborations were based on.

It is precisely the complexity and the critical safety functions in today's sophisticated vehicles that made the team aware of the need for renewal. We all know that electronics and software are essential to today's vehicles. Henrik Lönn at Advanced Technology and Research, Volvo Group, has observed this trend for many years.
"Automotive systems are becoming more complex to develop and put together. To solve this we have developed an approach that makes the development of embedded systems more efficient and makes it simpler to ensure safe, correct functionality. You could compare it to using text-based software such as Word and Excel for describing your systems and then switching to using drawings and systematic methods instead," says Lönn.

When you consider that an electronic function in a commercial vehicle can have more than 1,000 PDF pages of specifications, you soon realise the need for more efficient alternatives. In-vehicle functions have risen exponentially in number in the last few years, also in terms of lines of data code. According to Henrik Lönn, the project's focus was to apply a standardised representation of information and making it more visible (hence the name) with the help of efficient views. The team has succeeded by working with diagrams, tables and the automatic presentation of specifications and various metrics.
"These metrics tell me what proportion of requirements I have allocated to components, for example, or how many of my sub-functions I have connected to a control unit. Its benefit lies in our ability to follow more clearly the development boundary, and you can use other metrics to assess the complexity of the construction. And working with the models as a base it is possible to evaluate different product characteristics such as fuel consumption or error probability. Simply put, you can assess how good the final product will be," he says.

For the project to succeed, it was vital for the team to collaborate well from day one. By being able to combine different areas of knowledge and expertise, it has been possible to identify and develop

a number of concepts that simplify the day-to-day work. Urban Ingelsson, by day Embedded Systems Engineer at Semcon, has devoted a lot of time and energy to the project.
"The main purpose of this project was to make complexity more manageable and facilitate the collaboration between companies and different engineers. I believe we have succeeded," he says.

Urban Ingelsson maintains that one of the main gains of the project's results is that they significantly accelerate the collaboration between the vehicle manufacturer and the supplier, without the risk of elements being lost due to prioritisation or carelessness. Henrik Lönn agrees and adds:
"The point with using a representation standard that different tools can understand is that you avoid inputting the same data twice. With a single standard, an engineer is able to understand a colleague's actions or drawings despite working with different tools or in diverging areas of expertise."

The project will officially end in spring 2016 and a final seminar is scheduled in May. The collaborative parties are delighted with the results they have achieved. While Synligare tool prototypes have yet to reach a degree of maturity to qualify as sharp tools, the parties involved nevertheless hope that the modelling language will continue to be developed and disseminated so that more tools can be developed for operational tool suppliers. In practical terms, the project is currently merging with other parallel research projects to aid its continued development.

But we have almost certainly not heard, or seen, the last of the Synligare project.

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Facts - How it works:

Synligare has used the EAST-ADL architecture description language as its departure point for developing methods for information exchange, views and metrics. EAST-ADL is a structured information model for describing logical and physical system architecture, requirements, safety information, variability, etc. It is a complement to AUTOSAR, the automotive industry's de facto standard for describing and configuring software.
EAST-ADL represents vehicle systems by what they do (features), how they do it (functions) and with what (mapping to hardware such as control units, sensors and actuators). In its description format, AUTOSAR defines the concrete software components and details of the platform configuration.
With EAST-ADL's well-defined meta model, information elements can be type-marked and thereby form the basis of views and metrics for specific needs, by quickly identifying and retrieving the correct information.
By being type-marked, the information acquires the same meaning for tools and individuals who exchange system information. This simplifies collaboration and enhances efficiency.