> *…if the vehicle is using a mixture of engine, wheel brakes and retarder… it is necessary to know precisely how these systems are interacting during panic braking or for smooth speed reduction or for stability control.*

As electrical components become more integrated into the vehicle's chassis, standardization for safety purposes becomes all the more important. In preparation for our international conference on *Advanced Chassis & Safety Architecture, Automotive IQ* spoke with Henrik Lönn, Research Engineer with Volvo Group Trucks Technology to learn about an FP7 Project called MAENAD which he is coordinating.

Automotive IQ

Could you give us some background on yourself and how you came to work for Volvo?

Henrik Lönn: I had a PhD working at Chalmers University on automotive safety-critical systems and then I started at Volvo with various prototype systems and then gradually also on modeling and development methodology. I am coordinating the FP7 project "MAENAD", so today I am speaking to you in that role.

Automotive IQ

How long have you worked with Volvo?

H.L.: I started in 1999.

Automotive IQ

Could you explain what chassis and safety architecture means to you in the context of your work?

H.L.: Being primarily involved now in modeling and analysis of architectures, chassis architecture is very safety related and therefore the ones very relevant to have proper models and analysis of. The further aspect is that they are very complex so if you have several chassis sections that are interacting you have to be very careful about what is the interface, what is the responsibility of corresponding systems and what is the complete vehicle behavior when you put them together.

Automotive IQ

Could you give maybe an example of how this could affect the end-user, for example?

H.L.: If you have a chassis system, for example braking, and if the vehicle is using a mixture of engine, wheel brakes and retarder, the end user would not want to know which of these three systems are used. In order to hide that and make it comfortable and high performance braking, it is necessary to know precisely how these systems are interacting during panic braking or for smooth speed reduction or for stability control.

Choosing the safest combination of braking systems to achieve the fastest stop possible?

H.L.: Yes, and this requires careful characterization which means modeling of each of the systems and the proper integration of those both from the functional perspective and also from the safety perspective, considering what can go wrong in each of the systems and what effect does it have on the complete vehicle.

I understand you're working toward standardization and software and you're working on something called EAST-ADL. Could you explain what that is please?

H.L.: It's a standardized language or template for representing the systems. The idea is that even if you're using different tools and if you're working with different development process that you should be able to save your work, export it into an EAST-ADL model and then anyone in the industry should understand. This was a requirement, this was a control function at the detailed level or it was a sketch of my control function on an abstract level. There is a common vocabulary among the stakeholders.

Someone who is supplying a particular part of the system can go in and understand the rest of the system, not just the part that they're specifically working on then?

H.L.: Yes. Also, if an OEM receives an updated specification from the supplier, or during the quotation process come with a proposed system structure, in each of these occasions he doesn't have to understand the tool or the specific specification style of the supplier. They have already agreed on using the same approach. That relates very much to how standardization is done for the software components and the software architecture because anyone who receives the software component according to the AUTOSAR standard he is immediately able to understand and use the information.

W.H.: So this is something that would build on AUTOSAR then?

H.L.: It is the abstract aspects of AUTOSAR components. If you see AUTOSAR as the definition of the software component then the EAST-ADL will bring safety information, the features and functions that the software components realize the requirements, verification information, and a few more things. AUTOSAR has two aspects from a standardization point of view. One is the in-vehicle software platform and the other is the modeling of the software and I'm now referring to the second aspect.

What do you see as the most challenging hurdle to overcome? Any why?

H.L.: In my context here of modeling approaches and trying to standardize those, one challenge is tooling. If we standardize a template or a language for embedded system modeling, many people could potentially use such a language but they need to have a tool to buy. But the tool vendor is not able to

make such a tool because he doesn't have a customer yet. So it's like the chicken and the egg. The customer can't use the concept because of a lack of tools and the tool vendor can't develop the tool because there is not a large customer base.

Automotive IQ

And that's where you guys as an OEM come in and are able to coordinate this?

H.L.: This is why we want to run these public-funded projects in order to mature the concept and to provide prototype tools that can serve as inspiration, if you like, for commercial tools.

Automotive IQ

Are you the primary partner on this project or are there a lot of other partners as well?

H.L.: There are several projects that are related to EAST-ADL. In the one project that I'm coordinating now, Fiat and Continental are the biggest automotive partners, aside from Volvo. Then we have tool vendors and research institutes in the consortium as well. This particular project is a European FP 7 project. There are also Artemis, ITEA and nationally funded projects on the subject.

Automotive IQ

There's been a lot of excitement and discussion about autonomous and semi-autonomous vehicles in the news lately. How do you see this progressing over the next several years and when do you feel that end users will actually be able to get into a car and buckle up and not have to put their hands on the wheel?

H.L.: It's not the responsibility in my current role. So I probably can't give you a meaningful quote on this. I understand the problem is the legislation. You are not allowed to take your hands off the wheel or foot off the brake. That's one aspect and the other is the safety implications. Do we have enough trust in the systems to allow the driver to look away? But at the same time, there have been prototype truck platooning and autonomous cars many years. The technical concepts are there but the legal and customer maturity is perhaps lagging.

Automotive IQ

Would some of the things you're working on in terms of standardization help to speed up the process toward autonomous vehicles…helping to perfect the technology and gain public trust?

H.L.: What we try to do is to support the ISO 26262 standard with a systematic way of representing the safety information and if you are able argue safety with better tools and better representation then, of course, the legislation and acceptance will be easier to convince.

Automotive IQ

Thank you for expanding on that even it is not directly part of your work. It's an interesting topic.

H.L.: I do think that the more autonomy you give to the vehicle, the more important it is to have proper modeling and analysis of the system. What we do is very much enabling technology for this.

Automotive IQ

Thanks for the interview. I really do appreciate it.