In November 2018 the Chief Editor of the AUTOMOTIVE ELECTRONICS KOREA magazine, Bum Jin Yun, talked about this to Georg Zimmermann, director of Vector’s Process Tools business unit and responsible for the model-based E/E engineering solution PREEvision:

> Vector celebrated its 30th anniversary this year. Has a new vision and mission been declared on this occasion?

Vector is part of the innovations in automotive embedded system development for over 30 years now. Our final mission is to help our customers perform complex development tasks as simple as possible. This has not changed and is still true even in our 30th year. To achieve this mission, we offer a comprehensive portfolio of tools, software and services, and work closely with our customers to meet their needs. This is the reason why our products contain rich automotive know-how and experience.

> What is the secret to the success of Vector’s tools?

Vector as a German company benefits from Germany’s strong automotive industry and excellent automotive engineering skills. However, with the automotive megatrends we see a convergence of automotive and IT technologies. The technologies of the future are also being actively researched in the US and Asia. The secret to our success is the accumulated experience gained by our long-lasting and deep relationships with these leading companies from all over the world. Another factor, in my opinion, is also the independence of the Vector organization. Most companies must maximize their shareholders’ value, so long-term investments are often difficult to realize. Also, dependencies
to founders or shareholders may have a negative impact on good corporate management. Because Vector is an independent company, secured by a foundation structure, we collaborate with OEMs and suppliers without restrictions, and run our business with a long-term perspective.

> What changes do you see in the market and your customers?

One of the long-term trends in the automotive industry is that software drives innovation and that E/E system development becomes increasingly complex. With this trend, the role of the software engineer becomes of central focus. Additionally, the vehicle is opening up and is now embedded into its environment, infrastructure and cloud services. Indeed, the boundaries of traditional vehicle engineering are disappearing, which needs to be reflected. To develop future systems, collaboration within and across disciplines becomes even more critical. Collaboration is necessary for and between ‘traditional’ and service oriented architecture (SOA) design, requirements management, communication design, safety related system design, AUTOSAR (Classic and Adaptive) system and software design, wire harness development and testing. We are talking about more than 1,000 engineers. For this trend, we as Vector are responding with PREEvision, where engineers work and collaborate efficiently in a single development environment for automotive E/E systems.

> Where do you see challenges to traditional development methodologies?

In the past, the debate over top-down and bottom-up development methodologies was dominant. But what really matters is to ensure consistency and traceability in the whole development process. In other words, it is important for engineers to consistently develop systems and refine and trace them to engineering artifacts, which perfectly fit together. The methodology for this is model-based engineering. Another important change is the trend towards functional design. Automotive development must start with functional design, not its implementation as software or hardware. In the past, development centered around implementation, to the extent that companies were even organized according to controller or hardware development. Now, however, we are moving towards functional-oriented design with organizational structures changing accordingly.

> Are you saying that organizations change from a domain to a function oriented structure?

For smaller OEMs I see the domain-based organizational structure disappearing. They are comparatively small and can change organizations relatively easily. On the other hand, large OEMs still maintain their domain-centric organizations and I do not expect this to change soon. However, for them I see that the ‘electronic center’ where all E/E related development was pooled, is disappearing. The role of E/E development has increased and it is now performed in the various domain organizations.

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**Challenges in E/E development: From a fragmented tool landscape to an integrated solution.**

**Tool Landscape Approach:**
- Multiple Tools and Interfaces
- Requirements Management
- Functional Safety
- Architecture Design
- Hardware Topology
- Software Design
- Communication Design
- Project Management
- Test Management
- Wiring Harness Design

**Integrated Tool Approach:**
- PREEvision E/E Engineering Environment
- Requirements
- Functional Safety
- Architecture Design
- Logical Function
- Software/Service Architecture
- Hardware Architecture
- Wiring Harness
- Tests
- Changes, Defects & Releases
- Functional Safety

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"Challenges in E/E Development: From a fragmented tool landscape to an integrated solution."
Does PREEvision also cover the ALM area?
I think the application purpose is different from application lifecycle management tools. PREEvision first and foremost is an engineering tool for electric/electronic as well as software development and not a dedicated lifecycle management tool. However, for efficient engineering and collaboration there are several management functions, which from a tool standpoint would fully cover the ALM area.

I would like to ask you about the model consistency challenge. Can the model be trusted?
There is a German proverb, ‘A picture says more than a thousand words.’ And I believe a model can deliver content more accurately than a thousand pictures. Model-based development by far outperforms document-based development in terms of consistency. Of course, there may be human errors in the modeling process, but I think there is currently no other way to guarantee more consistency than with model-based development. However, to ensure consistency a robust data model is required. Let me give you one example. When drawing a line in a document, the meaning of this line is not defined. The line can be interpreted as a communication, wiring, or simply a logical connection. In other words, without a data model defining the exact meaning (semantics), the interpretation of even a simply drawn line depends on the receiver. Furthermore, to enable a tool to understand a model and perform operations on it, such as automatic consistency checks, in fact a robust data model is a prerequisite and therefore at the core of model-based development. With the help of leading automotive OEMs and suppliers, PREEvision’s data model has evolved over the last 15 years to become a de-facto automotive industry standard. In summary, model-based engineering is a very good methodology for ensuring consistency, traceability, and reliability, and with PREEvision you get the data model, so that your models can be trusted.

Are their customer or region-specific differences in using PREEvision?
To start with, PREEvision’s product vision is to provide an integrated model-based E/E engineering backbone. By backbone, from a technical point of view, we understand the comprehensive development and management of requirements, functions, software, and hardware in a single engineering environment. Simply speaking it is the idea to become the ‘SAP in the field of automotive E/E development’. In this regard there are not many differences across customers and regions. In the meantime, most of our customers agree on the need for a model-based integrated E/E engineering backbone. Differences only exist on the idea how to introduce the backbone idea to the organization. Going to a backbone in one single step is generally not viable as customers have invested in various tools and processes in the past, which cannot be replaced easily. As a result, customers are adopting PREEvision according to

PREEvision use cases in the V-model.
their most important needs and uses cases first and gradually introduce the backbone idea by extending their uses cases for PREEvision. Taking our Asian customers as an example, PREEvision has been introduced primarily as an E/E architectural development and evaluation tool, as well as a network design tool. Starting from this basis, extension to functional safety and verification use cases is often seen. For other customers and regions, the introduction of use cases may differ. As a conclusion, we see agreement in the market on PREEvision’s backbone vision, but there are differences between customers and regions as to how to materialize this vision.

> Can you comment on Vector’s toolchain strategy?

From a toolchain perspective, we naturally focus on the Vector toolchain first. Our organization consists of several business units, which in some ways can be seen as companies within a company. In my business unit ‘Process Tools’, we are developing the PREEvision solution, and in the ‘Embedded Software’ business unit, Vector’s AUTOSAR solution is developed. In the past, these solutions were developed separately, but we are facing a growing demand from our customers to provide a comprehensive toolchain for their engineering needs. Taking our AUTOSAR toolchain as an example, PREEvision is used for the system design. For the ECU software component design DaVinci Developer and for the basic software and runtime environment configuration DaVinci Configurator Pro are available. And finally, CANoe is used for ECU testing. Vector is investing heavily to provide a seamless toolchain. For example, more than 10 servers are performing automated tests every night to verify our AUTOSAR toolchain. In other words, the individual tools included in our toolchain are continuously tested for their compatibility with each other. And not to forget, all our Vector tools also offer compatibility with third-party tools by supporting relevant standard interfaces of the automotive industry.

> PREEvision has a long history. What is the sales trend?
The number of users (licenses) has reached approximately 6,000 users at 100 customers since Vector developed PREEvision into an integrated model-based E/E engineering solution. We are exponentially growing and for this year we expect an annual sales growth over 50%.

The Vector AUTOSAR toolchain in overview.
Can you share some information about your key success stories?

Let me introduce some of the recent success stories for our backbone approach: First, there is a southeast German premium OEM, where PREEvision has been used for a long time in the architecture development. Five years ago, the ‘architecture master’ developed in PREEvision went live and since then all vehicles of this customer are being developed out of this architecture. In contrast, a strong competitor, a southwest German premium OEM, has recently replaced its existing requirements management solution in the body domain. The reason for this big change is that this customer sees a replacement of its document-based supplier specifications by models as a necessary step towards a consistent and data-driven future. To complete my selection of automotive OEMs: At a big German group OEM currently more than 200 software engineers develop its next-generation functional architecture in PREEvision, and at the biggest Japanese OEM PREEvision has been selected to replace its homegrown platform communication design tool to prepare for AUTOSAR. Finally, I would like to close with a look at a very special backbone success story with an North American agricultural machinery manufacturer. Its products are really software on wheels. This customer previously developed and produced its agricultural machines completely inhouse, without suppliers, even to the extent that development tools were homegrown. However, with the decision for the AUTOSAR standard for its software development, commercial off-the-shelf-tools have been introduced and today, more than 600 software engineers around the globe collaborate on our PREEvision solution.

Thank you for the interview, Mr. Zimmermann!