

Volkswagen Group of America Electronics Research Lab

The Volkswagen Group of America Electronics Research Lab is developing the electronics you will use tomorrow, today.

What do the engineers at the Volkswagen Group of America Electronics Research Lab (VWREL) do? They create the car electronics you didn't even know you wanted!

But if you were to ask Cameron Christie, Senior Engineer at the Electronics Research Lab, he would say: "The Electronics Research Lab is the only North American R&D center for the Volkswagen Group. We are like the 'think tank' or 'skunk works' of the organization, developing forward-thinking technologies for Volkswagen brands including Audi, Bugatti and Lamborghini.

"We basically come up with ideas for new features that might be relevant, and then build up a prototype or some sort of demo. We have two half-yearly presentations, where we take everything we've done and present it to the Volkswagen executives in Germany. If the ideas are well received, they are transferred into series production or integrated into existing modules. But if they are not, it's pretty much the end of the concept," said Cameron.

You might already have some of the VWREL's innovations in your car. For example if you have a Volkswagen iPod adaptor or you've used the Nav Companion from the vwlabs.com website, then you've already experienced products that were first conceived and developed at the Electronics Research Lab.

Designing for the future

The Volkswagen Group of America Electronics Research Lab has developed some exciting and forward-thinking concepts. But if you think you'll get a sneak peek at some of the electronics coming your way, you're out of luck. Cameron was only able to talk about some of the lab's more mature projects.

"We used Altium Designer for Stanley, our entry in the Defense Advanced Research Projects Agency (DARPA) Grand Challenge. "

"Stanley is an autonomous Volkswagen Touareg we developed with the Stanford University Racing Team. It was essentially a team effort. We provided the car and developed all the hardware, and Stanford University did all the software development."

Stanley won the 2005 DARPA grand challenge, beating 22 other robot vehicles in the 132-mile course competition—without any human assistance—cruising through the Mojave Desert to complete the course in under seven hours. As a result of the stunning victory, Stanley won US \$2,000,000 in prize money.

The VWREL also developed Junior, an autonomous VW Passat developed for the 2007 DARPA Urban Challenge. In this challenge, Junior had to drive autonomously in an urban environment with traffic, and perform complex maneuvers such as merge, pass, park and negotiate intersections completely unmanned.

"All the algorithms that controlled how much throttle, when to turn and when to stop were all running on a bank of PCs in the trunk of the car. These computers interfaced with the car through the CAN Bus, which is the car's communication hub. The vehicle's throttle, turn signals, gear selection, steering and brakes, are all controlled through this CAN Interface. So, in this project, we had to build a number of boards that interfaced the computers with the CAN Bus. "

The Urban Challenge was a huge success. Junior came a close second and won US\$1,000,000 in prize money.

In addition to Stanley and Junior, Cameron develops electronics for concept cars. In 2007, Cameron and the VWREL team developed electronics for the entertainment system in the Audi Cross Quattro Coupe concept car, showcased in the Los Angeles car show.

"We worked to develop a next generation entertainment system that used Google Earth, had Slacker radio support and integrated voice controls. For this project, we had to develop all the center console and steering wheel controls, which were custom-made for this show car. It was a tight design, the complex boards needed to correctly accommodate the various button locations.

"During this project I took advantage of Altium's unified libraries with supplier links, where you can place the part information on the schematic. I also benefited from the Altium's BOM generator. It just made things just that little bit easier."



Over time, our electronic designs have become more complex. They are denser, with more components and multiple board assemblies. At the Volkswagen Group of America Electronics Research Lab, we have always kept up-to-date with Altium software because it helps us to manage and even overcome this increasing complexity.

Cameron Christie

Senior Engineer,
Volkswagen Group of America
Electronics Research Lab



Electronics as an evolving industry

Cameron has been with the VWERL for more than two years now and has developed some varied and amazing electronics, some of which are mentioned above. So, when asked what has been the biggest challenge during his time at the VWERL, his response was, "Electronics are becoming more complex. The designs are denser, with more components and multiple board assemblies. If you can't fit everything on a single board, you have to use multiple boards, and then you have to manage the connections between those boards."

So, how does Cameron manage this rising complexity?

"I like to set up as many design rules as I can and let Altium do the work. This helps prevent errors. I also use Altium's query language system. It allows me to select components based on certain criteria, and then change the parameters of that group all at once. The query language system gives me greater control over which design objects I edit."

"Altium's unified environment also helps in linking schematic and board designs. The advantage is that all design changes made in one editor update a common database, so when changes are made in one domain, Altium Designer automatically updates all the related design files. The unified environment also means that I can use the 'rooms' feature, which lets me copy and reuse sections of the board. It's all the little things that add up and make the difference."

But it's also keeping up-to-date with software that makes a difference. Cameron mentions that the VWERL has always remained up-to-date on Altium software so that it can have the 'latest and greatest'. It makes it easier to develop the team's next-generation designs, because in the end, how can you make 'state-of-the-art' electronics when your tools aren't?

About Volkswagen Group of America – Electronics Research Lab

The VWERL was founded in 1998 as a small operation in Sunnyvale. Now located in Palo Alto, the VWERL has grown into a state-of-the-art R&D lab with more than 40 employees working on the next generation of car electronics. For more information on the Volkswagen of America Electronics Research Lab, visit www.vwerl.com

Altium's solutions implemented in the automotive electronics industry

About Altium

Altium Limited (ASX:ALU) provides world-leading unified design solutions that break down the barriers to innovation, and help organisations easily harness the latest devices and technologies, to create their next generation of electronic products.

Altium's solutions are unique because they unify the separate processes of electronics design, all within a single electronics design environment, working off a single data model, which links all the aspects of electronics product design into one process.

Founded in 1985, Altium has headquarters in Sydney, Australia, sales offices in the United States, Europe, Japan, China, and resellers in all other major markets. For more information, please visit www.altium.com