

SAFER DRIVING

Drawing on HPC as a service, a joint venture of Volvo Cars and Veoneer is accelerating the advent of driver-assistance and autonomous-driving technologies.



Z E N U I T Y

Make it real.

Zenuity | Automotive | Sweden

Business needs

Zenuity needed a high-performance computing solution to accelerate the development of world-class driver-assistance and autonomous-driving technologies.

Solutions at a glance

- Dell EMC Isilon, Unity and Data Domain storage systems
- Dell EMC PowerEdge™ servers
- NVIDIA® Tesla™ V100 Tensor Core GPUs
- Dell EMC Networking
- RSA security offerings
- Dell EMC VxRail™
- Virtustream cloud services
- Dell Technologies consulting and deployment services
- VMware®
- VMware Horizon

Business results

- Gained an end-to-end HPC solution
- Increased business speed and agility with managed services
- Sharpened the focus on software development

Each month, Zenuity's developers generate about

4.4 petabytes

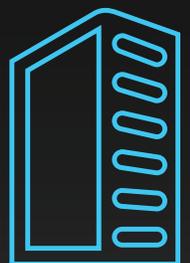
of data



The company's developers run about

50 simulations

per hour



Putting safety first

A commitment to protecting and caring for people, and to saving lives, is at the heart of Volvo Cars' philosophy. Staying true to that commitment, the company has invented some of the most important breakthroughs in the history of car safety — including the three-point safety belt — saving more than a million lives in the process.¹ And there's always more to come, as Volvo Cars continually works to deliver new technologies that will make future vehicles even safer.

That's the case with Volvo Cars' investment in Zenuity, a joint venture of Volvo Cars and Veoneer, a wholly owned subsidiary of Autoliv, Inc., a global leader in automotive safety systems. Launched in 2017, Zenuity is developing advanced driver-assist systems (ADAS) and autonomous-driving (AD) technologies that promise to take vehicle safety systems to a new level.²

Zenuity, which is headquartered in Gothenburg, Sweden, was born with safety in mind, according to Martta Lystila, senior director for Zenuity new technologies and leader of the company's Silicon Valley tech hub. "Zenuity is really based on safety and that mindset," she says. "It's combining technology out of two automotive giants in Sweden that have a huge history in safety — Volvo Cars and Autoliv. Safety is the main reason we are in this business."

A look under the hood

It takes a rich mix of systems and technologies to put ADAS and AD vehicles on the road. The ingredients in the mix include a robust software stack, machine learning technologies, data storage systems, sensors and cameras, high-performance computing (HPC) systems, high-speed communications links, global positioning systems and much more.

Zenuity is focused on the software side of the problem. It delivers a complete software stack, including algorithms for computer vision, sensor fusion, decision making and vehicle control, along with applications that run in the cloud. The computer-vision algorithms are a particularly tough part of the problem. They must be trained to process visual inputs the way a human does, so they can recognize cars, people, signs, lane markers and everything else that comes into view on a roadway.

"The training part can be pretty hard," Lystila says. "There are a lot of providers out there that are focused mainly on training and annotating the picture data, the video data. *This*

¹ Volvo Cars, "[Vision 2020: Aiming for zero](#)," accessed May 21, 2018.

² Autoliv news release, "[Autoliv and Volvo Cars Autonomous Driving Joint Venture Zenuity Starts Operations](#)," April 18, 2017.

is a car. This is a human being. This is a tree. This is a traffic cone. And some of these companies do it frame by frame. You can imagine how much manual labor goes into that. And that's one of the biggest problems for anyone within the automated driving community."

Zenuity is expected to have its first driver-assistance products available for sale by 2019, with autonomous-driving technologies following shortly thereafter.³ To help meet these ambitious goals, Zenuity needs a lot of HPC power, including NVIDIA Tesla V100 Tensor Core GPUs, under the hood. It found this engine in the Dell Technologies portfolio, via an end-to-end solution based on Dell EMC infrastructure, RSA security offerings and Virtustream cloud services.

In an innovative twist, Dell Technologies is delivering Zenuity's HPC solution as a service, with everything managed by Dell EMC and Virtustream, two of the seven Dell Technologies brands. This HPC-as-a-service model helps Zenuity reduce operational risk, avoid IT complexity and accelerate time to value.

This new approach to consuming HPC resources gives Zenuity a great deal of agility in its quest to cut the time required to bring innovative ADAS and AD technologies to the open market. Drawing on proven Dell EMC infrastructure accessed as a service, Zenuity has what it needs to store and analyze petabytes of data quickly and easily, manage the rapid growth of unstructured data and overcome some of the challenges of increasingly stringent compliance requirements.

Really-big data

To develop leading-edge ADAS and AD technologies, Zenuity's development team must capture, analyze and store enormous

³ Volvo Cars news release, "[Volvo Cars and Autoliv announce the launch of Zenuity](#)," January 03, 2017.

To leverage the right storage for the right need, Zenuity uses a rich mix of infrastructure offerings from Dell EMC:

- Dell EMC Unity all-flash arrays for its performance-hungry virtual environment
- Dell EMC Isilon network-attached storage for storing streaming video and other sensory data
- Dell EMC Data Domain systems for backup and recovery
- Dell EMC PowerEdge C series servers for complex computation, simulations and DevOps

amounts of data — “double-digit petabytes,” Lystila says.

“At Zenuity, we focus on systems development,” notes Robert Tapper, the company’s IT operations manager. “And since we’re creating autonomous driving and advanced driver assist systems, we create large amounts of data that we need to store and process. Currently we’re generating about 4.4 petabytes every month.”

This data is sent to a Dell EMC data center on the Internet backbone in Amsterdam, the site that hosts Zenuity’s HPC solution. About 25 percent of the data is used for simulations, typically to verify code. As a general rule, the development team runs about 50 simulations per hour, and simulations run within 24 hours of data collection.

“The software then needs to be tested and verified to make sure that it does what it’s supposed to do, and that it has been optimized for the best performance,” Tapper says. “We spin these automated tests up on large virtual machines in the HPC environment.”

Zenuity’s software developers access the data via virtual desktop infrastructure (VDI) based on VMware hypervisors. Developers in Sweden, Germany, Ukraine, Egypt, the United States and elsewhere can access the same centralized datasets at the same time via their Linux or Windows VDI desktops.

Maintaining speed and agility

To maintain its speed and agility, the Zenuity team focuses sharply on its mission — developing software for developing world-class driver-assistance and autonomous-driving technologies — rather than operating IT infrastructure. That’s why the company decided to buy HPC as a managed service, rather than building its own environment.

Zenuity’s entire end-to-end solution is managed by Virtustream, an enterprise-class cloud service and software provider trusted by enterprises worldwide to migrate and run their mission-critical applications in the cloud.

“Our core focus should be to develop the code,” Tapper says. “We think that other people are probably better at building and operating HPC solutions. So we were looking at not just the storage and compute, but also the virtualization platform above it, including user access through VDI, Active Directory and more.”

Zenuity found all of that and more in its end-to-end HPC solution managed by Virtustream.

“It’s literally an end-to-end solution,” Tapper says. “Virtustream manages everything from shipping drives from the cars to the extraction of the data into the data center. They support the VDI desktops and all the users, all the daily stuff. Virtustream has been a very good partner for us. They have a lot of experience when it comes to solutions like this. It’s a very good solution.”

“It’s really about anything that can gain us more speed and agility,” Lystila adds. “It’s about anything that keeps us focused on what we can do well, which is developing software for AD and ADAS, and not worrying about the IT infrastructure. With Dell EMC, it’s been actually amazing to see that a corporation with that kind of tradition and that kind of size can support us with that speed and agility.”

Ultimately, Zenuity is really a software startup in terms of how it operates, Lystila adds. “Granted, we have about 500 people already on board, so it’s not a tiny startup, but it’s still a speedy and very agile organization. And that’s how we intend to stay.”



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