Volvo and Epic Games partner for pioneering real-time 3D HMI

Volvo Cars is harnessing Epic Games visualisation tool to reshape infotainment in an increasingly automated driving experience. By Elle Farrell-Kingsley

Continuously developed since its launch in the 1998 first-person shooter game Unreal, Epic Games' Unreal Engine is a visualisation tool capable of supporting a wide range of applications. In Volvo's case, it will provide hyper-realistic 4k graphics for the infotainment systems in new electric vehicles (EVs). Volvo Cars is the first European carmaker to use the Unreal Engine to develop a Human Machine Interface (HMI). More specifically, it will initially focus on the Driver Information Module (DIM), one of the displays inside the cabin that provides the driver with relevant information and infotainment features which could help develop vehicle autonomy.

The first Volvo model to feature this technology will debut later in 2022, marking the first of a new generation of all-electric models as Volvo shifts to an EV-exclusive line-up by 2030. Epic Games' Director of Automotive, Heiko Wenczel, outlines the upcoming models' key features, including complete multi-user scalability, high-speed two-way cloud communication and integrated data security systems.

In the making

Brought to global attention following the success of the cross-platform video game Fortnite, Epic Games' Unreal Engine already operates across many industries outside video games, including human sciences, architecture, training, and film. "There is no limitation to using real-time visualisation," Wenczel tells *Automotive World*. Indeed, the Unreal Engine has found broad applicability within the automotive industry, such as hyper-realistic test drives and rapid virtual prototyping. However, Volvo marks its first use of an infotainment system with a European vehicle manufacturer.

The collaboration began with a discussion regarding HMI and general design, Wenczel explains. From there, the focus became clear. "We're exploring how to present information to the driver in an interesting way," adds Volvo Cars Head of User Experience, Thomas Stovicek. "We're at a point where we have connectivity, more powerful computers, better

The Unreal Engine software working on Volvo's next EV

displays, electrification, and several sensors and assisted driving tech."

Unreal to real

Epic's Wenczel outlines the next stage of this partnership and applies the learnings from its gaming success. "Developing these AAA, high-powered games for the mobile phone world was an important step in bringing users together and providing exciting and engaging experiences," he notes. The car is the next step. "As a platform, it offers a huge range of opportunities, especially now more powerful hardware is affordable and more sensors, and data allow a richer user experience." Much sharper renderings, richer colours and brand-new 3D animations are only the first steps as Volvo Cars' developers continue to push the graphics envelope.

There are several regulations in place to ensure these engaging experiences don't become too distracting–Wenczel notes that a significant part of this collaboration will address the density of information and the flexibility of presenting the sensor data in a more visually digestible way for the user. "People read information spatially. In context, they read movement and animation, so the Unreal Engine helps make that high quality and responsiveness." Many video games are complex and require quick response times from the player. In professional eSports situations, players need information quickly, at the right time, and in a non-distracting way: "If you don't have a responsive system, it's more likely users won't be able to react in time." In a car, there is also the additional challenge of stresses and delays in cognitive processing that can be caused if the representations are out of sync with what the driver sees through the vehicle's windows.

A new feature that's been launched with the Unreal Engine 5 is Nanite, which gives developers the ability to create games and experiences with significant geometric detail. Developers can directly import film-quality source art comprised of millions of polygons–anything from ZBrush sculpts to photogrammetry scans–and place them millions of times, all while maintaining a real-time frame rate and without any noticeable loss of fidelity.

> "If you compare simulation technology with gaming technology, there's not much difference

Latency can cause stress to drivers, who must match two perceptions of the same thing–what the driver sees and what the car is telling them. Consequently, latency can keep the driver's eye off the road for longer as they accommodate this difference, which is why Nanite's hyper-realistic real-time frame rate is vital. One interesting about videogame platforms is that they are designed to execute this at a relatively low cost, using compact computer hardware. This capability means Volvo can integrate the Unreal system in the HMI without thermal, packaging or cost issues.

Simulation to automation?

Unreal Engine is already widely used in vehicle engineering. "If you compare simulation technology with gaming technology, there's not much difference in requirements regarding how it's displayed. It's about speed and how technology interacts with data," says Wenczel. However, this collaboration isn't just about bringing game-quality graphics into cars: "It's about new ways of using visual communications to explain new technologies and bring the outside world safely into the vehicle," explains Stovicek.

Stovicek notes one particular focal point for the team: "We are focusing on how to present data from the many external sensors in an engaging way to make the driving experience as safe as possible," he says. "As cars move towards higher levels of autonomous assistance, visualising what the vehicle is seeing, and its decisions will be an important way to build driver confidence."

Could gaming technology help autonomy?

Lessons learned by delivering highly responsive information could also improve assisted driving. One significant development from Volvo and Epic is the system of considering screen-use cases for different users of the car.

"Passengers and drivers are different," Wenczel says. "We want to find out what will happen as autonomy increases. Different screens would be used in varying situations." Examples include watching films, TV, or playing games to entertain non-driving passengers. Whereas in assisted driving mode, the driver could receive critical information, such as wrong-way drivers, incoming traffic, and other alerts. One important question for the team moving forward, Wenczel notes, is how to most effectively use the windscreen as a display area to bring the necessary information from all the car's sensors.

> "No longer will it be one driver driving all the time in the future

However, as the race to L5 autonomy continues, the typical driver's role will dramatically change. "No longer will it be one driver driving all the time in the future," he notes, meaning that with the development of AV, the 'driver' could sit back and rely on the entertainment system. Utilising multi-screens in the car is crucial to Wenczel, who highlights the essential development consideration that must be asked: "How are you going to control and ensure a consistent experience that's good for the customer?"

Coupling the Unreal Engine with the computing power of the third-generation Snapdragon Cockpit Platforms, Volvo claims the infotainment system in its new models will be twice as fast as its predecessor, with graphics up to ten times faster.

For Volvo, it's a time of many firsts, and deploying the Unreal Engine in Volvo's new range of all-electric cars is a promising beginning to the partnership. At the same time, it is also the first European car infotainment system to use high-tech gaming software without distracting the driver–a move that may speed up the development of connected cars and autonomous driving.