

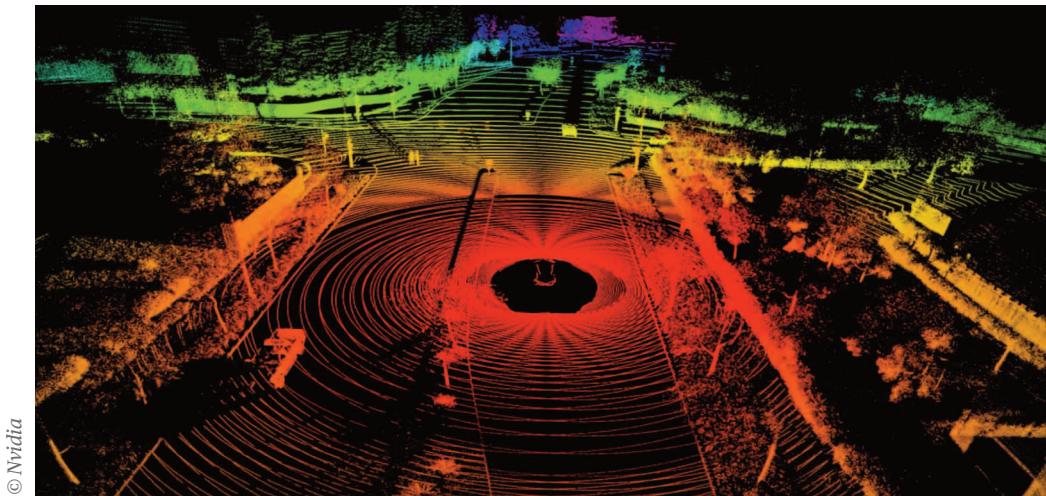
Nvidia's Omniverse is accelerating AV simulation tests

**How is Nvidia building its
hyper-realistic Omniverse?
Elle Farrell-Kingsley hears more**

The metaverse, defined by Nvidia as the 3D internet, is making waves across all industries—particularly automotive. Metaverse applications are diverse: from developers training artificial intelligence (AI) systems in virtual worlds to enterprises building digital twin simulations of their industrial processes.

However, Nvidia is proposing the Omniverse as a space for industry operations. The Omniverse is a metaverse populated by industrial digital twins and virtual autonomous robots, allowing a company to create 3D models and simulations in the virtual space with all the constraints and details of the real world. Specifically, the Omniverse highlights the company's approach to integrating industrial digital twins at scale using the universal scene description (USD) file format. USD, originally invented by Pixar Animation Studios, is an open and extensible ecosystem for describing, composing, simulating, and collaborating within 3D worlds.

Thanks to its design and features, USD is poised to be the open standard that enables the 3D evolution of the



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Nvidia's Omniverse is host to many leading automakers, manufacturers and suppliers

internet. “The Omniverse is a platform that we’ve created as a method for bringing people from all over the world together to work on a specific project,” says Danny Shapiro, Vice President of Automotive at Nvidia. “It allows people who use particular 3D software applications to keep using them within a larger, virtual space.”

This platform is facilitating the growth of autonomous vehicles (AVs) through its ability to produce lifelike simulations. However, doing so poses two challenges: generating a world with enough detail and realism to facilitate a realistic response from an AI driver, as well as creating simulations complex enough to cover all the scenarios in which the AI needs to be fully trained and tested.

Nvidia initially used game engines and software. However, due to a lack of detail and processing, it soon realised that these systems couldn't function to the standards required for a critical safety system for AVs.

“That’s why we had to build [Drive Sim](#) and the Omniverse from the ground up,” notes Shapiro.

A library of 3D

Nvidia’s solution is to digitise the world—creating 3D digital assets based on real-world objects, including roads, lands, kerbs, trees, signs and lights. In addition to creating its own assets, Nvidia is able to speed up production of the world’s digital twin by incorporating assets and innovations from other companies. External companies can upload existing design workflows and pipelines using what Nvidia calls Omniverse Connectors, which enable designers to collaborate using multiple applications such as Autodesk Revit and 3ds Max, McNeel Rhino, and Unreal Engine 5. Another application for leveraging completed work includes publicly available and highly detailed maps, which can automatically generate 3D models based on existing data.



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Furthermore, Nvidia is accessing drive videos, such as community uploaded dash cam footage, to accelerate the development of a hyper-realistic 3D world that can then be placed into the simulator. This is

Once the environment, assets, and scenario have been extracted, they are reassembled in Drive Sim to create a 3D simulation of the recorded scene or mixed with other assets to create an entirely new one.

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We want to ensure AVs are safe. It's our number one priority

Shapiro is careful to note that after virtual testing in the Omniverse, real-world testing will still be required to prove the simulation's accuracy. "The two go together, but simulation allows automakers to accelerate their AV development timeline," he emphasises.

Powering Data

facilitated through the Neural Reconstruction Engine, a new toolset for the Drive Sim platform that uses multiple AI networks to turn recorded 2D video data into a dynamic, 3D digital twin environment.

Notably, the Omniverse is not just creating a simulated environment: it is also producing synthetic sensor data (information generated in simulations as an alternative to real-world data). Typically created using algorithms, synthetic sensor data can be deployed to train machine learning models. "We're testing it in the cloud," says Shapiro. "The synthetic data goes into the computer, runs the software, and then the computer tries to drive the simulated car." This process is called hardware-in-the-loop.

All of this data requires a large amount of computing power, which Nvidia processes using a supercomputer, powered by the Nvidia Drive Orin system-on-a-chip. The Orin delivers 254 trillion operations per second and is the central computer for SAE Level 2 systems to Level 5 AVs. The next generation, the Nvidia Drive Thor, was unveiled in September 2022 and boasts up to 2,000 teraflops of performance, or 2,000 times a trillion operations per second. Available for automakers' 2025 models, Nvidia states it will accelerate production roadmaps by bringing higher performance and advanced features to market in the same timeline.

However, as vehicles continue to advance and require more processing power, Shapiro reveals that Nvidia is investigating the use of quantum computing. "Looking forward, it's clear that accelerated computing is needed," he says. "We have many tools for the development of quantum, but we believe that's still quite a way out."

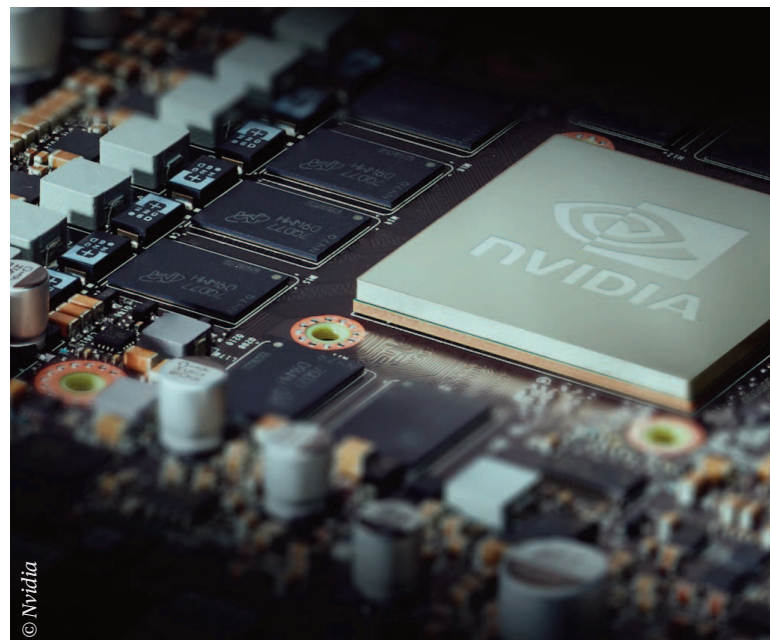
Next gen of safe AVs

"We want to ensure AVs are safe. It's our number one priority," he continues. "Safety is measured on how well the vehicles drive: how frequently or infrequently they have incidents."

According to the World Health Organisation, 1.3 million people die every year due to traffic collisions. Meanwhile, the National Highway Traffic Safety Administration found that human error accounts for anywhere between 94% and 96% of all auto incidents. "We believe AVs

can drastically reduce those numbers," says Shapiro.

In addition to testing, the Omniverse will allow automakers to make progress in production. Mercedes, for example, announced at CES 2023 that it will be using the platform to design and plan its manufacturing and assembly facilities. By tapping into Omniverse technologies, the automaker can create feedback loops to reduce waste, decrease energy consumption and continuously enhance quality.



At a time when automotive companies are racing to produce the next generation of safe AVs, the development of virtual testing simulators could prove pivotal in increasing safety and efficiency. As the likes of Volvo, Mercedes and more incorporate Nvidia's Omniverse, other key players such as Audi and [Epic Games](#) present their own metaverses—meaning that the race to develop the industry's most realistic digital twin is on.