



NVIDIA DRIVE CONSTELLATION VIRTUAL REALITY AUTONOMOUS VEHICLE VALIDATION PLATFORM

Autonomous vehicle developers must test their self-driving technology on billions of miles and encounter a near-infinite range of scenarios to statistically prove it drives safer than humans. The only way to achieve this scale is to include data center solutions in the testing and validation process.

NVIDIA DRIVE Constellation™ is an open, scalable, autonomous vehicle validation platform that enables a virtual test fleet in the data center. Each node is comprised of a powerful GPU server directly coupled with another server hosting the on-board AI computer of an autonomous vehicle.

DRIVE CONSTELLATION ENABLES TWO KEY WORKLOADS FOR VALIDATION:

- > **Simulation:** NVIDIA DRIVE Sim™ software simulates a virtual world and generates sensor output from a virtual car driving in the environment. The simulated sensor data is then sent to the target vehicle hardware in the second server, which processes the data and sends driving decisions back to the first server.
- > **Replay:** Previously recorded sensor data is played back using the servers' GPUs, making it possible to validate the performance of the perception networks against human-annotated data.

DRIVE CONSTELLATION IS THE ONLY HARDWARE-IN-THE-LOOP PLATFORM THAT COMBINES THE FOLLOWING FEATURES:

- > **Bit accurate:** Includes the exact same target ECU and software stack that operates inside an autonomous vehicle. As a real-time, hardware-in-the-loop solution, it's the closest representation of a vehicle driving in the real world for validation at scale.
- > **Cloud workflow:** Performs autonomous driving tests in a seamless end-to-end workflow. Users can remotely access DRIVE Constellation and submit simulation scenarios to the vehicle test fleet in the cloud, then visualize the tests and evaluate the results faster.
- > **Scalable:** Designed to be deployed at scale in data centers, with racks of units running a variety of tests in parallel. More importantly, each mile driven in DRIVE Constellation contains events of interest, accomplishing months or years of testing in a fraction of the time.

VIRTUAL VALIDATION AT SCALE

Simulation

DRIVE Constellation enables millions of miles to be driven in virtual environments across a broad range of scenarios—from routine driving to rare or even dangerous situations—with greater efficiency, cost-effectiveness, and safety than what's possible in the real world.

- > **Rare and dangerous scenarios:** Simulates edge cases and hazardous situations that autonomous vehicles could encounter in the real world, from severe weather, to difficult lighting, to risky maneuvers by surrounding vehicles.
- > **Hardware-in-the-loop:** Feeds simulated scenarios from DRIVE Sim to the vehicle's target hardware running the autonomous driving software stack, making it possible to test and validate the same software and hardware system that will operate in the autonomous vehicle.
- > **Open platform:** Enables users and ecosystem partners to integrate environment models, vehicle models, sensor models, and traffic scenarios into DRIVE Sim. As a platform, DRIVE Constellation can generate comprehensive, diverse, and complex testing environments for every use case and Operational Design Domain.

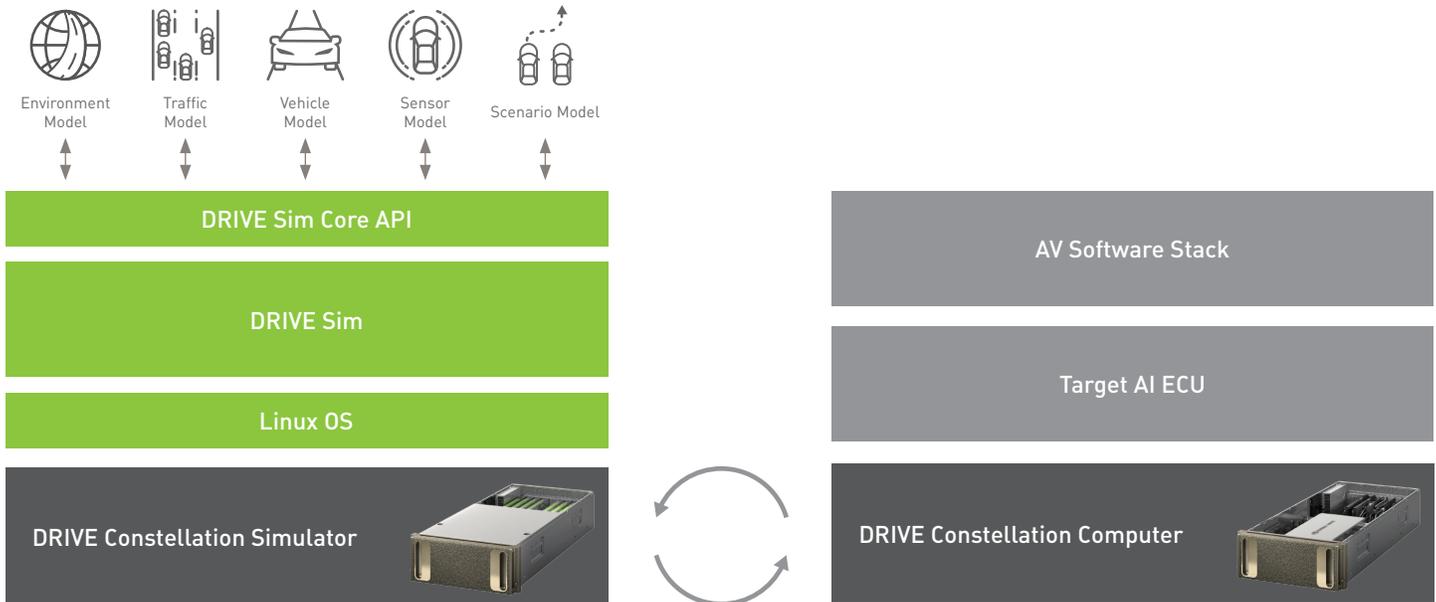


DRIVE Constellation enables a virtual test fleet to validate many different test scenarios simultaneously.

Replay

DRIVE Constellation systems enable data processing for replay to occur at unprecedented speeds, validating both software on its own and software running on the vehicle's target hardware.

- > **Streamlined development:** Replay is a powerful tool for regression testing during the development process at the component and system levels.
- > **Faster validation:** Software-based replay can run at 2X to 3X actual driving speeds.
- > **Reduce storage costs:** Replay on Constellation allows use of the hardware-based ISP (image signal processor), which removes the need for intermediate storage of pre-processed data and can reduce overall storage needs by as much as 85%.



The DRIVE Constellation Simulator runs NVIDIA DRIVE Sim software, which simulates a virtual world and generates sensor output from a virtual car. The simulated sensor data is then sent to the target vehicle hardware in the DRIVE Constellation Computer, which processes the data and sends driving decisions back to the simulator.

To learn more about NVIDIA DRIVE Constellation, visit www.nvidia.com/constellation