

NVIDIA Announces World's First Functionally Safe AI Self-Driving Platform

NVIDIA DRIVE Enables Automakers to Create Self-Driving Vehicles That Can Operate Safely Even When Faults Are Detected

CES -- NVIDIA today unveiled details of its functional safety architecture for [NVIDIA DRIVE™](#), its AI autonomous vehicle platform, which uses redundant and diverse functions to enable vehicles to operate safely, even in the event of faults related to the operator, environment or systems.

The NVIDIA DRIVE architecture enables automakers to build and deploy self-driving cars and trucks that are functionally safe and can be certified to international safety standards, such as ISO 26262.

"Safety is the most important feature of a self-driving car," said Jensen Huang, founder and chief executive officer of NVIDIA. "It is imperative that it operate safely, even when things go wrong. NVIDIA's investment into this functional safety platform is one of the most important ones we've ever made, and it provides a critical ingredient for automakers to bring self-driving cars to market."

NVIDIA DRIVE provides a holistic safety platform that includes process, technologies and simulation systems, as described below:

- **Process:** Sets out the steps for establishing a pervasive safety methodology for the design, management and documentation of the self-driving system.
- **Processor Design and Hardware Functionality:** Incorporates a diversity of processors to achieve fail operation capabilities. These include NVIDIA-designed IP related to NVIDIA Xavier™ covering CPU and GPU processors, deep learning accelerator, image processing ISP, computer vision PVA, and video processors - all at the highest quality and safety standards. Included are lockstep processing and error-correcting code on memory and buses, with built-in testing capabilities. The ASIL-C NVIDIA DRIVE Xavier processor and ASIL-D rated safety microcontroller with appropriate safety logic can achieve the highest system ASIL-D rating.
- **Software:** Integrates world-leading safety technology from key partners. NVIDIA DRIVE OS system software integrates BlackBerry QNX's 64-bit real-time operating system, which is ASIL-D safety certified, along with TTTech's MotionWise safety application framework, which encapsulates each application and isolates them from each other, while providing real-time computing capability. NVIDIA DRIVE OS offers full support of Adaptive AUTOSAR, the open-standard automotive system architecture and application framework. The NVIDIA toolchain, including the CUDA® compiler and TensorRT™, uses ISO 26262 Tool Classification Levels to ensure a safe and robust development environment.
- **Algorithms:** The NVIDIA DRIVE AV autonomous vehicle software stack performs functions like ego-motion, perception, localization and path planning. To realize fail operation capability, each functionality includes a redundancy and diversity strategy. For example, perception redundancy is achieved by fusing lidar, camera and radar. Deep learning and computer vision algorithms running on CPU, CUDA GPU, DLA and PVA enhance redundancy and diversity. The NVIDIA DRIVE AV stack is a full backup system to the self-driving stack developed by the automaker, enabling Level 5 autonomous vehicles to achieve the highest level of functional safety.
- **Virtual Reality Simulation:** A self-driving car is an extremely complex system with state-of-the-art technologies. Proving that the system does what it is designed to do -- captured by the term SoTIF, or safety of the intended functionality -- is a great challenge. And it must do so in a wide range of situations and weather conditions. Road testing is not sufficiently controllable, repeatable, exhaustive or fast, so a realistic simulation environment is essential. NVIDIA has created a virtual reality simulator, called NVIDIA AutoSIM, to test the DRIVE platform and simulate against rare conditions. Running on [NVIDIA DGX™ supercomputers](#), NVIDIA AutoSIM is repeatable for regression testing and will eventually simulate billions of miles.

Industry Partner Support

"The deep learning capabilities that NVIDIA provides combined with BlackBerry QNX's safety-critical real-time operating system are exactly what automakers want and need," said John Chen, executive chairman and CEO, BlackBerry. "Our partnership with NVIDIA will provide the automotive industry with a functionally safe AI self-driving platform that is secured to the highest standards."

"We are excited to team up with NVIDIA, the leader in automotive AI technologies, and to contribute our series-proven safety software framework MotionWise for autonomous systems in close partnership with our joint customers," said Georg Kopetz, CEO of TTTech. "This strategic world-class partnership will jointly bring a complete solution fast to market, ready for the high safety and security requirements for Level 2 to Level 5 - fully fail-operational autonomous systems."

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[NVIDIA](#)'s (NASDAQ:NVDA) invention of the GPU in 1999 sparked the growth of the PC gaming market, redefined modern computer graphics and revolutionized parallel computing. More recently, GPU deep learning ignited modern AI — the next era of computing — with the GPU acting as the brain of computers, robots and self-driving cars that can perceive and understand the world. More information at <http://nvidianews.nvidia.com/>.

Certain statements in this press release including, but not limited to, statements as to: the benefits, impact, performance, goals and abilities of NVIDIA DRIVE and its functional safety architecture; NVIDIA's investment to develop functional safety rigor into the NVIDIA DRIVE platform and its impact and benefit on the production of self-driving cars; and NVIDIA DRIVE's architecture integrating technology from BlackBerry and TTTech to enable the development of self-driving vehicles and the benefits, impact and abilities of such integration are forward-looking statements that are subject to risks and uncertainties that could cause results to be materially different than expectations. Important factors that could cause actual results to differ materially include: global economic conditions; our reliance on third parties to manufacture, assemble, package and test our products; the impact of technological development and competition; development of new products and technologies or enhancements to our existing product and technologies; market acceptance of our products or our partners' products; design, manufacturing or software defects; changes in consumer preferences or demands; changes in industry standards and interfaces; unexpected loss of performance of our products or technologies when integrated into systems; as well as other factors detailed from time to time in the reports NVIDIA files with the Securities and Exchange Commission, or SEC, including its Form 10-Q for the fiscal period ended October 29, 2017. Copies of reports filed with the SEC are posted on the company's website and are available from NVIDIA without charge. These forward-looking statements are not guarantees of future performance and speak only as of the date hereof, and, except as required by law, NVIDIA disclaims any obligation to update these forward-looking statements to reflect future events or

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