# NVIDIA Introduces DRIVE AutoPilot, World's First Commercially Available Level 2+ Automated Driving System

**Continental, ZF Announce L2+ Solutions Based on NVIDIA DRIVE for Production in 2020**

CES -- NVIDIA today announced the world's first commercially available Level 2+ automated driving system, NVIDIA DRIVE™ AutoPilot, which integrates multiple breakthrough AI technologies that will enable supervised self-driving vehicles to go into production by next year.

At CES 2019, leading automotive suppliers Continental and ZF announced Level 2+ self-driving solutions based on NVIDIA DRIVE, with production starting in 2020.

As a Level 2+ self-driving solution, NVIDIA DRIVE AutoPilot uniquely provides both world-class autonomous driving perception and a cockpit rich in AI capabilities. Vehicle manufacturers can use it to bring to market sophisticated automated driving features -- as well as intelligent cockpit assistance and visualization capabilities -- that far surpass today's ADAS offerings in performance, functionality and road safety.

"A full-featured, Level 2+ system requires significantly more computational horsepower and sophisticated software than what is on the road today," said Rob Csongor, vice president of Autonomous Machines at NVIDIA. "NVIDIA DRIVE AutoPilot provides these, making it possible for carmakers to quickly deploy advanced autonomous solutions by 2020 and to scale this solution to higher levels of autonomy faster."

DRIVE AutoPilot integrates for the first time high-performance NVIDIA Xavier™ system-on-a-chip (SoC) processors and the latest NVIDIA DRIVE Software to process many deep neural networks (DNNs) for perception as well as complete surround camera sensor data from outside the vehicle and inside the cabin. This combination enables full self-driving autopilot capabilities, including highway merge, lane change, lane splits and personal mapping. Inside the cabin, features include driver monitoring, AI copilot capabilities and advanced in-cabin visualization of the vehicle's computer vision system.

DRIVE AutoPilot is part of the open, flexible NVIDIA DRIVE platform, which is being used by hundreds of companies worldwide to build autonomous vehicle solutions that increase road safety while reducing driver fatigue and stress on long drives or in stop-and-go traffic. The new Level 2+ system complements the NVIDIA DRIVE AGX Pegasus system that provides Level 5 capabilities for robotaxis.

DRIVE AutoPilot addresses the limitations of existing Level 2 ADAS systems, which a recent Insurance Institute for Highway Safety study showed offer inconsistent vehicle detections and poor ability to stay within lanes on curvy or hilly roads, resulting in a high occurrence of system disengagements where the driver abruptly had to take control.[1]

"Lane keeping and adaptive cruise control systems on the market today are simply not living up to the expectations of consumers," said Dominique Bonte, vice president of Automotive Research at ABI Research. "The high-performance AI solutions from NVIDIA will deliver more effective active safety and more reliable automated driving systems in the near future."

Xavier SoC: Processing at 30 Teraops a Second
Central to NVIDIA DRIVE AutoPilot is the Xavier SoC, which delivers 30 trillion operations per second of processing capability. Architected for safety, Xavier has been designed for redundancy and diversity, with six types of processors and 9 billion transistors that enable it to process vast amounts of data in real time.

Xavier is the world's first automotive-grade processor for autonomous driving and is in production today. Global safety experts have assessed its architecture and development process as suitable for building a safe product.

AI Inside and Out
The DRIVE AutoPilot software stack integrates DRIVE AV software for handling challenges outside the vehicle, as well as DRIVE IX software for tasks inside the car.

DRIVE AV uses surround sensors for full, 360-degree perception and features highly accurate localization and path-planning capabilities. These enable supervised self-driving on the highway, from on-ramp to off-ramp. Going beyond basic adaptive cruise control, lane keeping and automatic emergency braking, its surround perception capabilities handle situations where lanes split or merge, and safely perform lane changes.

DRIVE AV also includes a diverse and redundant set of advanced DNN technologies that enable the vehicle to perceive a wide range of objects and driving situations, including DriveNet, SignNet, LaneNet, OpenRoadNet and WaitNet. This sophisticated AI software understands where other vehicles are, reads lane markings, detects pedestrians and cyclists, distinguishes different types of lights and their colors, recognizes traffic signs and understands complex scenes.

In addition to providing precise localization to the world's HD maps for vehicle positioning on the road, DRIVE AutoPilot offers a new personal mapping feature called "My Route," which remembers where you have driven and can create a self-driving route even if no HD map is available.

Within the vehicle, DRIVE IX intelligent experience software enables occupant monitoring to detect distracted or drowsy drivers and provide alerts, or take corrective action if needed. It is also used to create intelligent user experiences, including the new ability for augmented reality. Displaying a visualization of the surrounding environment sensed by the vehicle, as well as planned route, instills trust in the system.

For next-generation user experiences in the vehicle, the AI capabilities of DRIVE IX can also be used to accelerate natural language processing, gaze tracking or gesture recognition.

Adopted by Industry Leaders
Continental is developing a scalable and affordable automated driving architecture that will bridge from Premium Assist to future automated functionalities. It uses Continental's portfolio of radar, lidar, camera and Automated Driving Control Unit technology powered by NVIDIA DRIVE.

"Today's driving experience with advanced driver assistance systems will be brought to the next level, creating a seamless transition from assisted to automated driving and defining a new standard," said Karl Haupt, head of the Advanced Driver Assistance Systems business unit at Continental. "Driving will become an active journey, keeping the driver responsible but reducing the driving task to supervision and relaxation."

ZF ProAI offers a unique modular hardware concept and open software architecture, utilizing NVIDIA DRIVE Xavier processors and DRIVE Software.

"Our aim is to provide the widest possible range of functions in the field of autonomous driving," explained Torsten Gollewski, head of ZF Advanced Engineering and general manager of ZF Zukunft Ventures GmbH. "The ZF ProAI product family offers an open platform for the customized integration of software algorithms - covering conventional functions as well as AI algorithms and software running on NVIDIA DRIVE."

NVIDIA DRIVE AutoPilot will be demonstrated at CES in NVIDIA booth 6306 in the North Hall of the Las Vegas Convention Center from Jan. 8-11.

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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/.

(1)  "IIHS examines driver assistance features in road, track tests," IIHS, Aug. 7, 2018.

Certain statements in this press release including, but not limited to, statements as to: NVIDIA DRIVE AutoPilot being the world's first commercially available Level 2+ automated driving system, and it integrating multiple breakthrough technologies that will enable self-driving vehicles to go into production by next year; Continental and ZF announcing self-driving solutions based on NVIDIA DRIVE, with production starting in 2020; the performance, benefits and abilities of NVIDIA DRIVE AutoPilot, including it providing world-class driving perception and AI capabilities, vehicle manufacturers' ability to use it to bring to market sophisticated automated driving features, intelligent cockpit assistance and visualization capabilities that surpass today's ADAS offerings, it integrating NVIDIA Xavier and the latest software to process DNNs and the features enabled by this technology both outside and inside vehicles, and it addressing the limitations of existing Level 2 ADAS systems; Level 2+ systems requiring more computational horsepower and sophisticated software than what is on the road today, and NVIDIA DRIVE AutoPilot providing these, making it possible for carmakers to quickly deploy advanced autonomous solutions by 2020 and to scale this solution to higher levels of autonomy faster; NVIDIA DRIVE being used by companies to build autonomous vehicle solutions that increase road safety, while reducing driver fatigue and stress on long drives or in traffic; the Level 2+ system complementing the NVIDIA DRIVE AGX Pegasus system; vehicle systems on the market today not living up to the expectations of consumers; AI solutions from NVIDIA delivering more effective active safety and more reliable automated driving systems in the near future; the performance and abilities Xavier SoC and its use in NVIDIA DRIVE AutoPilot; global safety experts assessing Xavier as suitable for building a safe product; DRIVE AutoPilot integrating DRIVE AV and DRIVE IX for handling challenges inside and outside the car and their benefits, abilities and performance, including localization and My Route, path-planning capabilities, self-driving on the highway, ability to handle lane changes and variations, and enabling perceptive technologies and capabilities, and use to monitor drivers, provide alerts, correct drivers, create intelligent user experiences, display visualization of surrounding environment and plan routes; DRIVE IX ability to be used to accelerate natural language processing, gaze tracking or gesture recognition; Continental developing a driving architecture to bridge from Premium Assist to future automated functionalities using its portfolio and NVIDIA DRIVE; today's driving experience being brought to the next level and it creating a transition from assisted to automated driving and defining a new standard; driving becoming an active journey, keeping the driver responsible but reducing the driving task to supervision and relaxation; and the demonstration of NVIDIA DRIVE AutoPilot 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 most recent reports NVIDIA files with the Securities and Exchange Commission, or SEC, including, but not limited to, its annual report on Form 10-K and quarterly reports on Form 10-Q. 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 circumstances.

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