CAN *Newsletter Online*

AUTONOMOUS DRIVING

First self-driving truck on public roads

Waymo and Daimler Truck have developed a redundant SAE level-4 control platform. Based on the Freightliners Cascadia, the truck will be tested on public freeways in Texas and Arizona.

The Cascadia truck by Freightliner, a brand of Daimler Truck, uses a redundant control platform implementing redundant high-speed CAN networks (Source: Waymo)

In 2020, Daimler Truck and Waymo teamed up to develop a redundant truck control platform based on the Cascadia truck and the Waymo Driver software. The third partner in this project is Torc Robotics. Waymo specified a list of 1500 functional requirements, which Daimler's engineers needed to fulfill. The requirements covered ECU (electronic control unit) hardware and software as well as in-vehicle networks. There are redundant ECUs for braking, steering, and inertial vehicle positioning measuring. The CAN high-speed networks are also redundant as well as the power systems.

The truck is equipped with two electronic brake controllers to ensure that in case the primary controller fails, the secondary brings the vehicle safely to standstill. The redundant CAN networks provide a high-available ECU communication, which even works when one network fails. The installed electronic park brake features the capability to apply and release the truck's and the trailer's park brake by means of CAN-based messages. In case of malfunction, the brake system activates the brakes pneumatically. Of course, also the power supply is redundant to increase the availability of the ECUs. The steering ECUs are redundant, too. In case of an electronic or hydraulic failure, the backup servo motor receives the requested steering angle and takes over.

In an online editor briefing on August 23, Waymo and Daimler Truck North America, stated that the redundant ECUs also provide cybersecurity measures. Whenever a safety situation (primary ECU fails) or security issue (detection of security attack) occurs, the autonomous driving system starts a safety procedure to bring the vehicle to a safe stop by means of "minimal risk maneuver".

It is important that the CAN communication is highly available, so that no important data is lost. This is achieved by redundant network. The key ECUs have two independent CAN ports, which are protected by security measures.

The applied sensors are customized. The combination of lidar, camera, and radar devices are also redundant and complement each other. They provide so to speak an overlapping view of the surrounding scene. There are 5th-generation lidar sensors plus the lidars for near-range perception. The cameras can detect objects in a distance of 1 km. This enables a defensive autonomous driving, for example preemptive lane changing, when a vehicle stopped on a shoulder. The radars are working also in rain and fog. According to Waymo, the sensors and cameras can detect problems sooner that the human eye, in particular at night or in bad wheather.