

## The 5G-Autonomous Driving Connection

May 2017 — How do two of the biggest buzzwords in tech these days, 5G and autonomous driving, relate to each other? In the simplest terms, 5G will help deliver a safer, more convenient self-driving experience.

At [AutoMobility LA last year](#), [Brian Krzanich](#) called autonomous vehicles, effectively, mobile mini data centers. The vehicles themselves will generate and process massive amounts of data from on-board sensors, but will also take in large quantities of information from the network, including ultra-high resolution maps and near real-time information to help navigate and detect what's coming around the next corner or avoid upcoming traffic congestion. Today's communications systems were not designed to handle the massive capacity required to support millions of self-driving cars when they hit the road. That's where 5G comes in. It's expected to deliver more capacity, ultra-low latency, faster speeds and vehicle-to-vehicle (V2V) connectivity for the era of autonomous vehicles.

**More capacity.** With the increase in mobile traffic created by making everything smart and connected – including vehicles – networks need to transform to handle the additional connections. By leveraging innovations from cloud data centers, the network infrastructure is becoming agile, software-defined and flexible to enable the efficient and ultra-low latency connections needed for autonomous driving.

**Ultra-low latency.** Autonomous vehicles will need to act on near-instantaneous updates from around the corner or down the road—there's no time to send or receive data from a server hundreds of miles away when your car is platooning with 100 other vehicles at 80 mph down the highway. With 5G, networks will deploy computing resources at the very edge of the network in cellular base stations and towers that will deliver road status updates to connected cars in milliseconds.

**Faster speeds.** With millimeter wave spectrum and advances in wireless and antenna technology, 5G is expected to deliver multi-gigabit speeds for mobile usages. The industry expects 5G speeds to eventually be capable of up to 10 gigabits per second, over 600 times faster than today's fastest average LTE speeds in the U.S.<sup>1</sup> Self-driving vehicles will opportunistically connect to 5G cells when available and needed, then seamlessly fall back to 4G LTE to maintain network connectivity.

**Vehicle-to-vehicle connectivity.** 5G aims to deliver multiple models of connectivity – including direct vehicle-to-vehicle connections as well as vehicle-to-infrastructure or vehicle-to-network connectivity. This flexibility in 5G design comprehends the varied situations self-driving vehicles will encounter – in, around and between cities.

To support 5G and autonomous driving, Intel developed the [Intel® GO™ Automotive 5G Platform](#), the industry's first 5G-ready platform and a complete scalable end-to-end system for autonomous driving. Available since February 2017, this platform allows automakers to develop and test a broad range of use cases, such as sensor data uploads from the vehicle for machine learning, ultra-high resolution map downloads in real time, and over-the-air firmware and software updates, as well as applications ahead of the broad 5G rollout in 2020 and beyond.

<sup>1</sup>OpenSignal State of Mobile Networks report, August 2016. <https://opensignal.com/reports/2017/02/usa/state-of-the-mobile-network/>

[10 Gbps = 10000Mbps as compared to ~16Mbps which was reported as the fastest average LTE in the U.S. in this report, making a 5G modem up to 625 times faster.]

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