TRANSFORMATIVE TECHNOLOGY

How 5G Will Revolutionize Your Morning Commute

The growing 5G network has the potential to impact urban environments like New York City in a number of ways, such as ensuring the safety of self-driving cars and automating real-time traffic reports.

June 26, 2019 | 5 min read

By Anne Miller, Contributor

Self-driving cars could not safely operate in Manhattan right now for a number of reasons, but one in particular is putting on the brakes: Today's wireless network can't support them. It's annoying for a phone call to drop on a busy city street; it's downright dangerous for an autonomous car's system to take more than a second to connect to the algorithms that judge if an oncoming vehicle poses a threat.

Ensuring the safety of self-driving cars is just one way the small but growing 5G network has the potential to impact the urban environment, says Christopher Levendos, who is in charge of network engineering and operations for Crown Castle, a firm that is planning, designing, building, and operating fiber optic networks around the country.

Consider the apps many of us use in our daily lives, he says. "There's an opportunity to enhance all of those actions," he says of the 5G network. "More information can be streamed faster in multiple directions. More devices that you have will have an opportunity to go online."

Using city traffic as an example can help explain the implications of why so many people are excited about the possibilities of a 5G network.

A 5G Primer

Most of our phones today use the LTE and 4G networks, which operate above our heads, their signals emanating from atop tall buildings and towers — a broad umbrella that can travel long distances.

But those networks only have so much bandwidth, and experts like Levendos say they can see a time when that network has been maxed out. These networks also have limits in terms of how they can dial into locations in real time. Take cell phone triangulation. Levendos says around 80 percent of 9-1-1 calls originate from cell phones, and while it's possible to pinpoint which cell tower is closest to the caller, that tower can still be several city blocks away.

A 5G network, by comparison, exists closer to the ground, connected to building roofs and street lamps. The signal doesn't extend as far as a 4G signal, but has more bandwidth and can target smaller areas. That 9-1-1 dispatcher can now pinpoint a caller's location within a few feet on a 5G network, and the caller who needs help is less likely to be cut off.

> "Today, the location of emergency calls made with cell phones is narrowed by the closest cell tower, which could be several blocks away. With 5G, that 9-1-1 dispatcher can pinpoint a caller's location within a few feet.

Share

Such scenarios can feel a bit Big Brother, but Levendos predicts that, as services grow, so will the laws and protections on using them. At the same time, the ubiquitousness of the Internet of Things (IoT) is increasing, and something needs to change to accommodate all that wireless bandwidth.

"We need to think about communication devices not just being the devices that people are holding in their hands," Levendro says. "They can be both static and mobile machines, and pieces of infrastructure. When we're talking about IoT, that's what we're talking about. As those items increase, you need to add networks that are able to absorb all of that information."

> "We need to think about communication devices not just being the devices that people are holding in their hands…When we're talking about IoT, that's what we're talking about. As those items increase, you need to add networks that are able to absorb all of that information."—Christopher Levendos, vice president, network engineering and operations, Crown Castle

Share

One way those "things" are expected to make large informational demands on networks, especially in urban areas, relates to self-driving cars.

On an integrated city-wide 5G network, driving through an urban center means continual connections thanks to the lower but stronger umbrella of service closer to the street — think the nodes on street lights.

If all this seems too hypothetical, there's another transportation-5G conversation urban planners are having now: congestion pricing, a traffic abatement and money-making policy will have its first U.S. rollout in 2021 in New York City.

Congestion Pricing

Congestion pricing is the concept of charging drivers to access certain areas of a city at specific times, with the goal of reducing gridlock and putting more funds in city coffers. The ability to track traffic data down to the level of the individual car and the minute, and then process all of that data quickly, could rely on 5G networks.

Congestion pricing is a controversial move, as small businesses in the New York City area, many of whom operate on slim margins already, complain that they would suffer more fees for deliveries. Taxi drivers fear further hampering of a business already reeling from the advent of

car sharing apps and businesses. But New York also has a subway system growing more crowded, in need of more fixes, and in dire need of more money.

Right now, traffic monitors can assess the heaviest traffic times, says Chris Jones, senior vice president and chief planner of the Regional Plan Association, a non-profit that focuses on planning and research in the larger New York State metropolitan area. But what if the city could track vehicular usage on every corner by the second or minute? What if tolls were changed according to hourly usage? What if an algorithm could make more precise predictions of real-time traffic congestion and set toll rates around that? What if a system could communicate with every driver to keep them abreast of toll changes as they happen?

That's what a 5G network could allow the city to do by offering more detailed, of-the-minute tracking for better automated feedback.

The COSMOS in West Harlem

Dipankar Raychaudhuri, a professor in the department of Electrical and Computer Engineering and director of the Wireless Information Network Lab (WINLAB) at Rutgers University, where he specializes in wireless technology, takes the vehicular discussion a step forward.

He and a team from other universities are pioneering a program through a National Science Foundation grant, to create a one-mile-by-one-mile 5G network in West Harlem that includes a nearby cloud system in a project called COSMOS.

"The network is very fast," he adds. "It can send the information very quickly to the cloud and then bring it back to the car. Today you wouldn't be able to do that."

> "The [5G] network is very fast. It can send the information very quickly to the cloud and then bring it back to the car."—Dipankar Raychaudhuri, wireless technology expert, Rutgers University

Share

For example, he says, to monitor congestion pricing, a camera might photograph a license plate. Plates on cars can be bent at odd angles, so software in a cloud has to process the photo to render the plate identifiable, link that plate to its owner, and then levy a toll appropriately, either by using an automated system like EZ Pass linked to the car, or by sending the owner a bill.

That could take two minutes to process, though, especially if the cloud servers are on the West Coast.

A 5G system with what Raychaudhuri calls an "edge cloud" could cut that processing time to less than 10 milliseconds. In this case, the edge cloud is a cloud server near the 5G system, which reduces the lag time necessitate by sending data to more distant servers. It's easy to see how that would be a boon for self-driving cars, too, helping real time feedback become more instantaneous.

Take a pedestrian standing behind a truck at an intersection. That person could step into traffic in an instant. A 5G system with cameras and edge computing at an intersection could view, analyze, and send a warning to a self-driving car almost instantaneously, so the car can process slowing down or otherwise prepping to react to the person standing just out of view.

Today, all of that remains hypothetical. But the networks that Levendos, Raychaudhuri, and others are designing and building are bringing those hypotheticals closer to reality.

YOU MAY ALSO LIKE

LEADERSHIP

Finding your vision with executive Deonte Thompson

May 18, 2023 | 4 min read

CLOUD COMPUTING

5 ways to help your organization snare the multicloud skills it requires

Jul 17, 2023 | 4 min read

CLOUD COMPUTING