Ultra-reliable internet will make the impossible possible

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Cars will coordinate on their own who yields to whom with tomorrow's ultra-reliable and massively widespread wireless Internet. Such is the prediction from Professor Petar Popovski of Aalborg University's Department of Electronic Systems who with an enviable new research grant from the European Research Council (ERC) will be working on the fundamental technology to enable this.

The funding of two million euros for the five-year project "WILLOW" is targeted to research in "lowband" communication. Petar Popovski describes it as the opposite of broadband. It's not about setting speed records with large amounts of data; it's about extremely reliable communication with small messages between an astronomical number of devices:

"My project deals with ultra-reliable connections between two cars that coordinate with each other before they reach a traffic intersection so that they don't collide. This is wireless communication at a low data rate but with very, very high reliability and low delay. Once the technology becomes available everywhere, it will create a breakthrough in entirely new services," according to Petar Popovski.

Resources shared in small pieces

The technical problem that scientists need to solve is not about providing more bandwidth. The challenge is to share bandwidth between many

more connected devices than now. This is easier said than done. Petar Popovski compares this with a bank that lends money:

"It's relatively easy to distribute a large amount of bandwidth among a few users. But today we cannot distribute the same bandwidth among a very large number of users. It's like when a customer goes to the bank and asks to borrow a million kroner. The bank can easily handle that. It's more difficult if you have a million people who would each like to borrow a single krone. Today we have 300-500 users who are connected to a mobile cell that in turn is connected to a base station. We envision that by 2020 we'll have 10,000-20,000 devices connected to the same base station," he says.

The Internet's third and fourth wave

The needs of devices are different and more limited than those of heavy Internet surfers. On the other hand, there are many more devices, so when cars, radiator thermostats, electricity meters, refrigerators and all sorts of other devices get connected to the net, it must be designed in a new way. A popular estimate is that by 2020 there will be 50 billion devices connected to the net.

"We talk about the "Internet of Things" as the Internet's third wave after the PC and the mobile phone. Now we take a lot of things from everyday life and connect them to the net in order to be able to create new services. Once we've made the connection to them ultra-reliable, I personally believe that it will be the beginning of the fourth wave, which will give us entirely new services. Exactly what I don't know. But once we make the option available to consumers and developers, there will be an outpouring of solutions," promises Petar Popovski.

He predicts that the new standards for reliable data communication over time can lead to applications that are hard to imagine today. Pilots on the

ground, for example:

"Let me give you an example of what ultra-reliable means. Today we have pilots on board planes. But with an extremely reliable and fast connection from the ground to the plane that is guaranteed to work 99.999 percent of the time, the pilot will not need to be on board in order to control the plane. We haven't reached the point where I would get on a plane without a pilot—and I should add that remote control of a plane is not necessarily lowband. But when we get that far, we'll also be able to redesign the way we do a lot of other things," explains the professor.

Provided by Aalborg University