

Expanding Wi-Fi beyond our current bandwidth

By Shelby Webb | October 26, 2016 | Updated: November 3, 2016 3:16pm



Photo: Yi-Chin Lee, Staff



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Dr. Edward Knightly poses for a photo at Rice University Thursday, Oct. 6, 2016, in Houston. (Yi-Chin Lee / Houston Chronicle)

Electrical engineer Edward Knightly wants to connect the world. Since 2004, he has worked with the Houston nonprofit Technology For All to bring free, high-speed Internet and Wi-Fi to the working-class East End neighborhood. That program serves more than 4,000 users and is used as a test bed for Knightly's team to test new wireless transmission techniques to increase Internet speed. In October, Knightly was awarded a three-year federal grant to develop wireless technology capable of transmitting 1 Terabit of information per second - enough bandwidth to stream about 200,000 high definition movies simultaneously.

Q: What sort of progress have you been making in terms of speeding up and expanding wireless Internet access?

A: We're asking the question about what wireless can do better in the future. So one of the things Wi-

Fi has done fabulously is allow high-speed connections in homes and offices and campuses at a very low cost for the infrastructure, but what it hasn't been able to do is go far distances and penetrate well through walls and trees, so we're developing Wi-Fi for new spectral ranges such as using TV spectral bands. That way we're able to make it go further than it's capable of doing today.

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Q: What could the future of wireless internet look like with all the advances in speed and coverage?

A: One of the things we do as wireless researchers is we never try to predict the next application. Because what we found is that once the bandwidth becomes available and the ecosystem is there, then application developers will create new uses for that bandwidth we weren't able to foresee at that time. But we're planning to do some high-resolution environmental sensing in the network to monitor gas quality and pollutant quality in the Pecan Park area. That neighborhood in particular is close to chemical plants and refineries, so we want to monitor air quality in the neighborhood and have early alarms if any leaks or any other dangerous situations arise. Some of our collaborators designed advanced sensors, and we're connecting them using super Wi-Fi to our network so the sensors can be read anywhere on the Internet in real time to get the exact pollutant concentration block by block - not just the average for all of Houston. It should be online in probably one or two years.

Q: How long before we start seeing speeds of 1 Terabit per second?

A: It's a gradual process to go from a Terabit per second over a very short distance for a short period of time to making it more and more practical. My collaborator is developing new transmission technology, so as he advances the core way of sending out pulses at really high speeds, I will work with him to build it into a network and communicate with multiple users at the same time.

Text, edited and condensed, by Shelby Webb. Photos by Yi-Chin Lee / Houston Chronicle



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