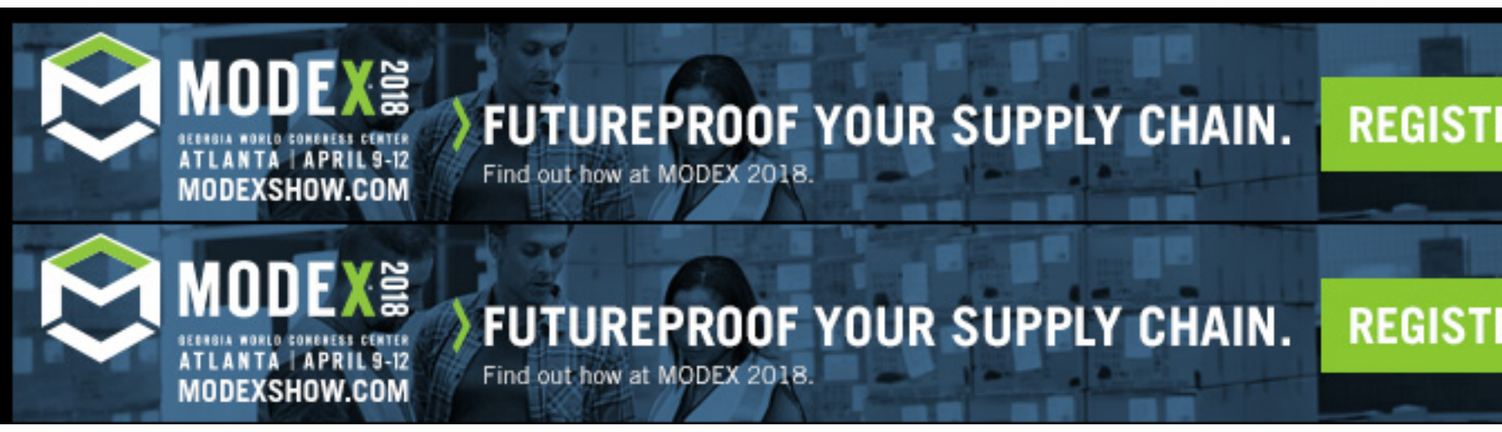

FEATURE NEWS

Melding Wi-Fi with Digital TV White Space to Meet Coverage, Capacity and Energy Efficiency Needs of Networks

By Ashok Bindra / September 02, 2010

To deliver free, high-speed broadband Internet service using a broad spectral range, including dormant broadcast TV channels, Rice University researchers have won a $1.8 million federal grant for one of the nation's first, real-world tests of wireless communications technology that melds Wi-Fi network with digital TV's white space. In essence, this five-year project calls for Rice and Houston nonprofit Technology For All (TFA) to add TV's white space to the wide spectrum Wi-Fi network they jointly operate in Houston's working-class East End neighborhood.

The TFA Wireless network, launched in 2004 with a grant from the National Science Foundation (NSF), today uses unlicensed frequencies ranging from 900 MHz to 5 GHz. The new grant, also from the NSF, allows researchers to take advantage of new federal rules that allow the use of licensed TV spectrum between 500 MHz to 700 MHz. The network will dynamically adapt its frequency usage to meet the coverage, capacity and energy-efficiency demands of both the network and clients.

In a statement, commented Rice's Edward Knightly, the principal investigator on the project, "Ideally, users shouldn't have to be concerned with which part of the spectrum they're using at a given time." "However, the use of white space should eliminate many of the problems related to Wi-Fi 'dead zones,' so the overall user experience should improve," added Knightly.

According to the researchers, white space has become a hot-button issue in recent years, with Congress and the FCC each debating whether to auction or make freely available the broadcast frequencies that were freed up by the 2008 switch from analog to digital TV broadcasting. Plus, said the researcher, the one payoff of the five-year NSF grant will be that all the information about the Rice/TFA tests -- how the equipment works, how much it costs to operate, how citizens use it, etc. -- will be freely available. That should make it easier for companies and municipalities to assess the cost of setting up and operating their wide-spectrum network, and it may also help regulators as they compare the pros and cons of auctioning off white-space bandwidth or freeing it for unlicensed, Wi-Fi-style development, noted Knightly.

Another part of this study will investigate how the new technology is used by individuals and groups that have previously been underserved by the Internet and cellular networks. For that, Rice social scientists will work closely with computer scientists and engineers.

Lin Zhong, assistant professor in electrical and computer engineering at Rice, has used the network to study cutting-edge smartphones, often by giving them to teenagers who live in the neighborhood. Zhong, a co-principal investigator on the new grant, said his group and Knightly's will study how the combination of white space and Wi-Fi can help users extend battery life and get improved reception."

Furthermore, Zhong said that the group will also explore the potential energy savings from powering down Wi-Fi nodes and covering large portions of the network with a small number of white-space transmitters during off-peak hours. "White space and Wi-Fi have quite complementary characteristics," Zhong continued. "While a Wi-Fi node can provide a

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higher data rate, a white-space node can cover a much larger area. The project will study how a dynamic network architecture can combine these strengths," asserted Zhong.

Ashok Bindra is a veteran writer and editor with more than 25 years of editorial experience covering RF/wireless technologies, semiconductors and power electronics. To read more of his articles, please visit his columnist page.

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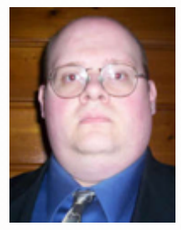

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