Evaluating IEEE 802.16 Broadband Wireless as a Communications Infrastructure for Public Safety Activities

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Abstract

Public safety wireless networks traditionally have been agency-owned land mobile radio (LMR) networks. However advances in technology are giving agencies new and more powerful options. Future 3G/3G+/4G public networks will be able to provide broadband access sufficient to support voice, video and data to desired coverage levels throughout a state. However, excessive reliance on these systems is unwise. Because their complex infrastructure relies extensively on both the electric power and wired telephone grids, they are highly vulnerable to man-made and natural disasters. In emergency situations, voice and data services provided by public network providers are likely to be overloaded or damaged and therefore unusable.

In contrast, broadband wireless access systems such as 802.16 (also known as WiMAX) can provide a low-cost, wireless metropolitan area network (MAN) infrastructure with capabilities that equal or surpass those of 3G/3G+/4G public wireless networks. WiMAX networks can be deployed for temporary or permanent use and can be much more easily isolated from large-scale failures in the electric power or telephone grids. In the proposed research, in partnership with local public safety agencies, we investigate the use of WiMAX in public safety operations.

Our research has two primary thrusts. The first is to deploy fixed-base and portable WiMAX testbeds in which 802.16 equipment will be deployed and tested. We will investigate the coverage capabilities of such networks and, working with Clemson University's police and fire departments and with the local municipal police department, we will provide a proof-of-concept demonstrating how 802.16 can be utilized by public safety organizations.

The second thrust of our research is to continue our performance modeling and analysis of the 802.16 MAC protocol. This component of the research leverages an 802.16 network-compatible simulation tool that we have developed by running a set of experiments that would be difficult to do in the testbed. For example, we will investigate how well WiMAX scales to support many VoIP and video flows or how configuration parameters can be used to tune performance under heavy loads.

One product of the proposed project is an operational 802.16 network that can be used for test and evaluation purposes by state or national agencies. A second deliverable will be a publicly available document that describes 'best practices' surrounding the use of WiMAX. The guide will include feedback from the local public safety organizations that have evaluated the network.