A MOBILE WIMAX MODULE FOR NS-3

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Mobile WiMAX (Worldwide Interoperability for Microwave Access) has made major strides over the past year and is rapidly proving itself as a leading solution for broadband wireless service. The Mobile WiMAX air interface is based on the IEEE 802.16 standard and the IEEE 802.16e Amendment. WiMAX defines the MAC (Medium Access Control) and the physical layer for the broadband wireless access networks.

ns-3 is a new network simulator intended as a replacement of ns-2. It introduces major enhancements over its predecessor and has all the capabilities of becoming the leading network simulator in near future. The current release of ns-3 supports a number of modules including CSMA, Point-to-Point, 802.11 WiFi, TCP, UDP and IPv4.

In this paper we propose a Mobile WiMAX module for ns-3 with Point-to-Multipoint (PMP) mode and the OFDM physical layer.

Our module is based on the IEEE 802.16e standard and ns-3 version 3.2. The code[1] is available under the GNU General Public License. It implements the Point-to-Multipoint (PMP) topology and the OFDM physical layer with TDD mode and aims to provide standard compliant implementation of the standard supporting QoS scheduling services, bandwidth management and OFDM PHY layer. The design of the module is fully object-oriented facilitating modularity, re-usability, scalability and maintenance of software. The proposed module is mainly composed of three layers: The Convergence Sublayer (CS), the MAC Common Part Sublayer (CPS) and the PHY layer. The module is built in C++ with more than 36 classes. the Class *WimaxNetDevice* represents the MAC layer of WiMAX network device. It extends the *NetDevice* class of ns-3 API that provides abstraction of a network device. *WimaxNetDevice* is further extended by *BaseStationNetDevice* and *SubscriberStationNetDevice* classes defining MAC layers of BS and SS, respectively. Besides these main classes, the key functions of MAC layer are distributed to several other classes including *LinkManager*, *Scheduler*, *ConnectionManager* and *BandwidthManager*. The WiMAX PHY module provides two different physical layers. The first one (*SimpleWiMAXPhy*) is a basic PHY implementation which simply forward bursts received by the MAC layer ignoring any underlying PHY layer details. The second one (*OfdmWimaxPhy*) is the OFDM PHY layer based on the Wireless MAN-OFDM specification. This class deals with channel coding block, it converts the packet bursts to bit-streams then splits them into smaller FEC blocks.

As a future work we intend to implement a convergence sub-layer for IP over IEEE 802.16 applications and updating scheduler with more efficient algorithms.

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[1]The code is available at the following URL: http://code.nsnam.org/iamine/ns-3-wimax/.