

System Level Simulator for proving Energy Efficiency algorithms

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This R&D (research and development) project describes purpose, structure, working principles and modeling results of uplink, broadband, wireless, data transmission system level simulator that based on IEEE 802.16 standard. Standard IEEE 802.16 specifies physical and MAC layers of OSI model. It describes many different mechanisms of these two layers, but it does not specify what mechanisms system should choose for efficient work. Thereby, the use of SLS gets such opportunities as:

1. It gives opportunity to estimate characteristics of existing algorithms, described in IEEE 802.16, it helps in developing and setting the WIMAX engineery.
2. Also, SLS gives opportunity to make substantiated decision about adding in standard new mechanisms (based on modeling results).

SLS gives possibility to modeling and evaluating processes of SS (subscriber stations) and BS (base stations) interaction in uplink network based on IEEE 802.16 standard.

The main target of the present research is the design and development of uplink SLS for wireless broadband systems based on the IEEE 802.16 standard. The research consists of three main components: Analyze IEEE 802.16 network architecture and the standards modeling scenarios, Design and develop SLS program, Obtain and evaluate modeling results.

All SLS mechanisms described in such documents as: evaluation methodology by WIMAX forum, evaluation methodology document by IEEE. Evaluation methodology specifies typical modeling scenarios and algorithms.

SLS based on WIMAX architecture that consists of set of SS and BS. All network area divided into cells, each cell refers to one BS. Interaction between SS and SS provides by radio channel that divide into uplink (from SS to BS) and downlink (from BS to SS) subchannel. Media access channel is fulfilled by OFDMA technology which allows dividing media channel between SS into frequency and time scale. Duration of SS and BS interaction separates on 5 ms segments called frames.

Most of SS in networks based on IEEE 802.16 are mobile and that's why they have limited power budgets. Therefore, to decrease the consumption of battery charge SS should effectively manage transmit power. In uplink it is possible for an SS to use energy efficiency scheduling and power control algorithms.

SLS work divides into several blocks, which corresponds to significant modeling stage. Part of this blocks described in documents, mentioned above, another part of the blocks redefined. The output result values of SLS processing are: throughput, power consumption, energy efficiency of SS system.