SHARING SPECTRUM ON WIMAX NETWORKS

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Annotation: This article evaluates the efficiency of WiMAX networks that use spectrum sharing or work with relay nodes in their operation. To this end, UL transmission scenarios were simulated using spectrum sharing or relay nodes.

Key words: WiMAX, IEEE 802.16 networks, protocol, ALGOLINK connection.

Several coexisting, inconsistent mechanisms can be implemented in WiMAX systems. When the system starts up, the base station (BS) selects the appropriate operating channel. The choice of the channel should depend on the requirements for working in the given range. If the group contains specific spectrum users (SSUs), the BS must use a protocol called "DFS" dynamic frequency selection to try to find a channel that is free of the SSU. If the group does not contain an SSU (on IEEE 802.16 networks or not on IEEE 802.16 networks), the BS uses Dynamic Channel Selection (DCS) protocol to find the best channel to work with. In some control modes, it may be sufficient to be able to manually coordinate between operators for channel selection. If a group contains both SSUs and non-SSUs (IEEE 802.16 networks or other networks), then both DFS and DCS are used together. DFS is used to avoid interfering SSUs by releasing channels on which SSUs are detected, and DCS is also used to select the best channel from the available channel set to be freed up for DFS.

If necessary, the BS will continue to work with DFS and DCS, choosing the most appropriate channels based on the prevailing conditions and responding to measurements performed by the AU.

Statement of the research problem

In this section, the spectrum sharing model between two service providers is discussed. Service providers are expected to have mutually beneficial spectrum sharing arrangements (ie, a kind of roaming agreement). The reserved spectra will be shared under the following conditions: When the AC tries to communicate with the home base station and encounters a low quality of service that cannot offer efficient transmission, the AC can be offered to use the reserve bandwidth of the BS of the ALGOLINK connection, which may turn out to be in more favorable conditions from the point of view of distribution conditions. When one operator's network is congested, traffic can be directed through another network (in our case, ALGOLINK BS) to reduce the likelihood of blocking.

Results and analysis

This article evaluates the efficiency of WiMAX networks that use spectrum sharing or work with relay nodes in their operation. To this end, UL transmission scenarios were simulated using spectrum sharing or relay nodes. The efficiency analysis assumes that the coverage area is divided into 10 parts, each 1000 meters deep, as the distance from the base station increases. For every new 1000m of coverage area, 1000 users are generated, randomly distributed in this area. In this study, the transmitted data was analyzed. Graphs showing simulation results in terms of transmission power, blocking probability, and throughput under various scenarios are central to the analysis in this chapter. When assessing the effect on transmission power, the goal was to develop an algorithm for choosing between a forward link and a relay link for each variant of the relative spatial arrangement of stations in adjacent service areas, using the power of the transmitted signal loss as a metric. The ALGOLINK connection chosen as the optimal one is determined by the minimum required transmit power.

To estimate the probability of blocking on a connection, ALGOLINK (representing the largest savings in transmitter power) is compared with the probability of blocking for a shared spectrum connection. To assess the throughput, the line capacity of an ALGOLINK connection is compared with the capacity of the direct connection (normal transmission connection) and the spectrum sharing connection. The quality of service of a system is measured by assessing the probability of a connection being blocked. Taking into account the developed algorithm, the degree of system maintenance is estimated in accordance with the load and available channels. The proposed approach to solving the problem of spectrum sharing is implemented as follows. First, it is assumed that two WiMAX service providers can have a common spectrum that will be used at any point in time when either one of them reaches the blocking probability threshold. Then the operator can direct some of its traffic through the shared frequency resource.

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