

Planning of Relay Station Locations in IEEE 802.16 (WiMAX) Networks

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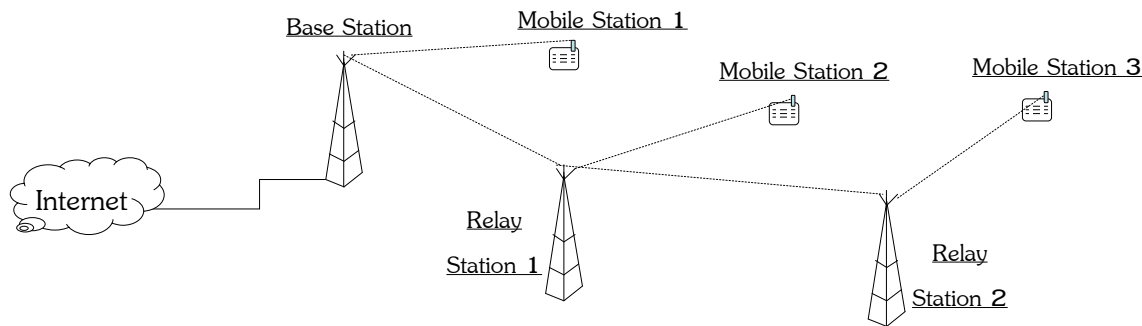
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Introduction

Broadband wireless networks have received a lot of research and development in the last few years. This network technology offers data rates in the 100s of Mbps with a range of tens of miles. The IEEE have developed the 802.16 standards, also called WiMAX, to provide specifications for these networks. Currently, there are over 500 deployments of WiMAX in over 140 countries with millions of subscribers. One of the standards, IEEE 802.16j, specifies the use of Relay Stations (RS) in the WiMAX network architecture. RSs are considered to be a simplified version of the Base Station (BS).

Architecture with Relay Stations (RS)

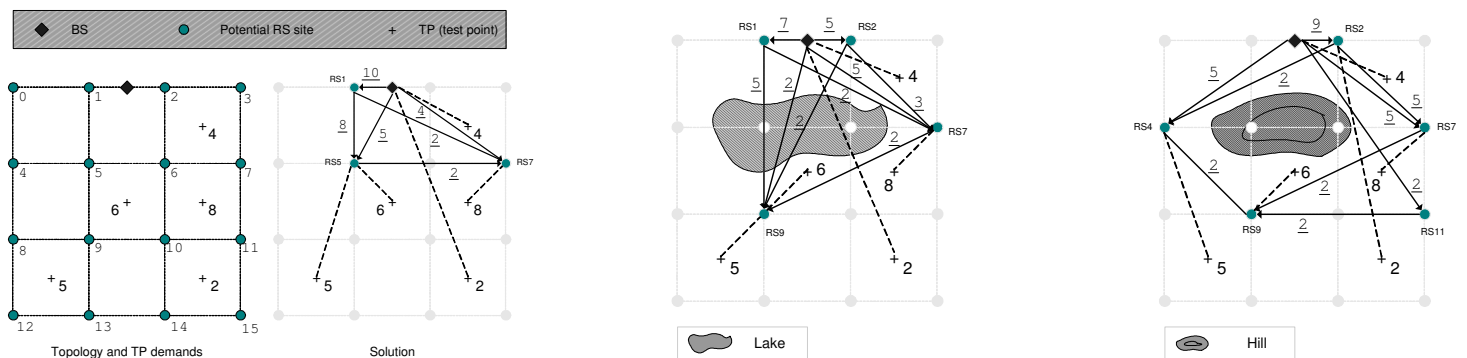
A BS is typically connected to the wired network. However, an RS connects to the end users and relays the data in wireless to the BS. Thus, the RSs can be placed in the network to extend the range of a BS or to increase its data rate. In our work, we consider the problem of placing several RSs to increase the range of a BS.



Planning Problem

The goal of our solution is to cover all the users in the coverage area and satisfy their bandwidth requirements. Also, our solution aims at minimizing the number of RSs used. We formulate this problem by optimization through a Mixed Integer Linear Program (MILP).

Numerical Results



Test Points (TP) represent the users' demand in Mbps. The solution satisfies all the users. The sum of traffic incoming at a node is equal to the outgoing sum.

The lake obstacle cancels RS sites 5 and 6. Thus, we now need 4 RSs instead of 3 RSs in the first case.

The mountain obstacle also blocks links traversing it. Thus, we now need 5 RSs instead of 3 or 4 RSs before.