

## Exploring the Connectedness of Ad Hoc Mesh Networks in Rural Areas

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**Abstract :** Reaching a fully-connected network of mobile nodes in rural areas got a great attention between network researchers. This attention rose due to the complexity and high costs while setting up the needed infrastructures for these networks, in addition to the low transmission range these nodes has. Terranet technology, as an example, employs ad-hoc mesh network where each node has a transmission range not exceed one kilometer, this means that every two nodes are able to communicate with each other if they are just one kilometer far from each other, otherwise a third-party will play the role of the "relay". In Terranet, and as an idea to reduce network setup cost, every node in the network will be considered as a router that is responsible of forwarding data between other nodes which result in a decentralized collaborative environment. Most researches on Terranet presents the idea of how to encourage mobile nodes to become more cooperative by letting their devices in "ON" state as long as possible while accepting to play the role of relay (router). This research presents the issue of finding the percentage of nodes in ad-hoc mesh network within rural areas that should play the role of relay at every time slot, relating to what is the actual area coverage of nodes in order to have the network reach the fully-connectivity. Far from our knowledge, till now there is no current researches discussed this issue. The research is done by making an implementation that depends on building adjacency matrix as an indicator to the connectivity between network members. This matrix is continually updated until each value in it refers to the number of hubs that should be followed to reach from one node to another. After repeating the algorithm on different area sizes, different coverage percentages for each size, and different relay percentages for several times, results extracted shows that for area coverage less than 5% we need to have 40% of the nodes to be relays, where 10% percentage is enough for areas with node coverage greater than 5%.

**Keywords :** ad-hoc mesh networks, network connectivity, mobile ad-hoc networks, Terranet, adjacency matrix, simulator, wireless sensor networks, peer to peer networks, vehicular Ad hoc networks, relay

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