ENHANCING THE AD-HOC MESH NETWORKS INFRASTRUCTURE IN RURAL AREAS: ADAPTIVE APPROACH

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ABSTRACT

Rural areas all over the world continue to be poorly covered and are not considered as an achievable business case by telecommunication operators. This is due to high implementation costs compared to the profit. The growth in telecommunications, as well as new mobile technology has expanded the gap between rural and urban areas in networks' infrastructure. To solve this issue, this research uses ad-hoc mesh networks, where each node has a transmission range of one kilometer, which means it needs a third party to play the role of relay if the distance is more than one kilometer. Findings of this research suggest that if the area coverage is less than or equal to 5%, the number of relay nodes reduces by 50%, whereas if the reduction in relay nodes is 8.5% when the area coverage is more than 5%, then the second assumption is more precise and effective.

Keywords: *Ad-Hoc Mesh Networks, Connectedness, Terranet, Adjacency Matrix, Adaptive Threshold*

1. INTRODUCTION

The idea of this research project comes as a continuation of previous research which was done by Natoureah, Melhem, and Obeidat(1), which discovered the percentage of enhancement in the number of nodes that should play the role of a relay in a network. The area coverage (i.e. the geographic area where the station can communicate) is less than or equal to 5%, requires 40% of the nodes to play as a relay, but only needs 10% of the nodes to act as a relay if the area coverage is larger than 5%. The assumption of the previous research (i.e. which have done by Natoureah, Melhem, and Obeidat, 2010) was with a fixed points threshold regardless of the area size. Whereas, this research uses ad-hoc mesh networks, where each node has a transmission range of one kilometer, it needs a third party to play the role of the relay if the distance is more than one kilometer. This research focuses on the coverage area, it intended to find the percentage of enhancement reached concerning the number of nodes should act as a relay in ad-hoc mesh network

The concept of decentralized communication has been applied to networks without a base station (2). Each node within the network only needs to

transmit as far as the next node. Terranet technology is one of the decentralized networks where the nodes can only transmit for a kilometer. Therefore, some nodes should

act as a router to forward data from nearby nodes to nodes that are further away (i.e. more than one kilometer). When a Terranet phone is switched on, it begins search for other phones within the effective range. Once it finds other devices, they connect to each other. However, if an actual number is dialed, the handset checks a person being called within the range of any handset in the network to complete the call.

The concept of Terranet technology is based on a combination of new technologies such as wireless sensor networks (WAS), peer-to-peer (P2P) networks, mobile ad-hoc networks (MANET), and vehicular ad-hoc networks (1, 3) . These technologies are based on a decentralized communication concept.

A wireless sensor network (WSN) can be defined as "a wireless network containing spatially distributed autonomous machines using sensors to monitor physical or environmental conditions" (4). A WSN system includes a gateway that offers wireless connectivity back to the