Journal of Engineering Technology and Sciences
Volume 01, Issue 02, October 2024
www.jets.org.in

An Examination of the Energy Use Model for Internet Access In MANETs

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To Cite this Article
G.G.Raja Sekhar and K.P.Saroj Khan, "An Examination of The Energy Use Model for Internet Access In MANETs", Journal of Engineering Technology and Sciences, Vol. 01, Issue 02, October 2024, pp.31-33

Abstract: *There is no set network structure in multi-hop ad hoc wireless networks. Multiple nodes that connect via wireless links make up these networks, and because of their mobility, network topologies might change often. It is beneficial for these nodes to connect to the Internet via gateways in order to improve communication. To find accessible gateways, a gateway discovery protocol must be used. However, a major problem is the short battery life, particularly for mobile nodes. This study looks at two important topics: energy consumption in relation to the number of gateways and node mobility patterns, and internet connectivity between a mobile ad hoc network with many hops and the Internet. According on our research, adding more gates to the advertisement Ad hoc network significantly improves mobile node power efficiency, which lowers the possibility of disconnection brought on by nodal network separation. This is illustrated by simulating different network density situations and mobility patterns.*

Keywords*: Power, Gateway, Mobile Ad Hoc Network (MANET), Ad hoc On-Demand Distance Vector (AODV), Transmission Range*

I. Introduction

Considerable progress has been made since the advent of cellular networks. Nowadays, people anticipate being able to connect at any time and from any location, and these networks have worked well in both routine situations and emergency situations. Wireless networks are becoming more and more prevalent as technology becomes less expensive and complicated. Nevertheless, customers still look for more in spite of the benefits and convenience they provide. The majority of mobile devices connected to wireless networks have short battery lives, which limits how long they can be used. Longer battery life is ideal, but it may not always be realistic, affordable, or practical to achieve. Reducing energy usage is a major goal in many multi-hop ad hoc networking settings, particularly when individual nodes are battery-powered. This has grown more and more important for the newest mobile device generations, including laptops, PDAs, as well as smartphones.

While computation and storage capacities have increased tremendously, battery energy density has only progressively improved. Because of this, a lot of wireless devices now use a lot of power to run sophisticated multimedia apps, which results in a short operating time between charges. Furthermore, radio interfaces frequently utilise more energy during communication than the processor does. Managing total energy transfer, which includes energy expenditure for each packet during subsequent retransmissions, is an efficient strategy for safe and energy-efficient communications. Both the maximum and minimum energy levels of the nodes are affected by the number of gateways and the mobility patterns of mobile nodes, which in turn affect the energy needed to guide the nodes towards their intended external goals. Important conclusions can be made by looking at the connection between mobile node accessibility patterns and gateway count.

II. Internet Access for Mobile Ad-Hoc Networks

Connecting to the Internet is frequently more convenient, even though Mobile Ad-Hoc Networks (MANETs) are useful in circumstances like emergencies, military activities, floods, or distant places. By serving as the link between the MANET and the Internet, gateways enable mobile nodes in the network to locate and establish a connection with an Internet host. Effective gateway finding is necessary for this. MANETs can communicate more easily thanks to the development of ad hoc routing protocols. The routing protocol needs to be modified to include this bridging capability in order to link a mobile device in a MANET to a fixed device on a wired network. To facilitate smooth communication between the two networks, gateways must be knowledgeable about both the TCP/IP suite and the MANET protocol stack. All data must pass through the gateway. This configuration enables for maintaining complete mobility while maintaining external connectivity. To improve collaboration between ad hoc networks and the Internet, two primary strategies have been put forth. The first method finds gateways by using proactive flooding techniques from nodes across the MANET. Despite providing dependable communication, this approach has a high overhead, especially since not all nodes need external connectivity.

Reactive systems are used in the second strategy, which enables mobile nodes to broadcast requests for gateways and nodes as necessary. Despite maintaining low-latency external connections, this approach has a detrimental effect on the systems needed for mobility and gateway monitoring. A hybrid strategy that blends proactive and reactive methods is suggested to reduce communication overhead. Within a certain number of hops, gateway discovery ads are flooded in this model. If a link is Nodes can use reactive techniques to request external agents if they are required outside of this range. By combining the best features of proactive and reactive approaches, this hybrid system guarantees high connectivity at affordable prices. When creating a MANET gateway discovery protocol, the addressing mechanism selection is essential. IPv6 and mobile IP are two widely used techniques. Mobile IP is easy to implement since it makes use of the TCP/IP protocol stack and the common IPv4 addressing scheme. To handle triangle routing problems and keep connections active during roaming, further frameworks are needed. Contrarily, IPv6 provides scalability and a uniform architecture, but successful communication between wired and wireless nodes requires modifications. We shall use IPv6 in this instance due to its improved scalability and functionality.

III. Energy Consumption Model for Internet Connectivity in MANETs

The more closely a simulation resembles real equipment, the more accurate the energy consumption calculations become. In order to accomplish this, the simulation environment and energy consumption model were created to offer a comprehensive analysis of protocol behaviour in addition to a trustworthy energy use estimate. The CMU Monarch Project's improved ns-2 simulation environment captures control and data communications while accurately simulating the IEEE 802.11 MAC layer. As a result, the energy consumption model incorporates experimental results about energy consumption on the wireless interface and is based on IEEE 802.11 rather than just electrical features like mode switching and signal responsiveness. Data transmission and reception, idle mode, and sleep mode are the four energy-consuming modes in which the network interface can function. The interface can stay in idle mode ready for sending or receiving, acting as the ad hoc server's default mode. Although sleep mode saves a lot of energy, the interface cannot send or receive until it wakes up. Mobile devices can optimise their sleep duration in a standard base station configuration by utilising buffering, scripting, and cell node connections.

Because there are no base stations in an ad-hoc system, nodes are unable to anticipate when they will receive traffic, which results in a default idle state. The model makes the assumption that the expenses related to comparable connection-layer processes are largely the same. If signal strength has an impact on the resources required for data reception, this assumption could not be accurate. Regretfully, wireless standards frequently do not contain information on power consumption for these modes. cards for network interfaces (NICs). Because the calculations are indirect, these numbers can vary greatly (from 5% to 10%). However, they offer important information about relative costs, which are essential for advanced study. Key features pertinent to our model are also highlighted by a thorough energy consumption model covered in earlier research. Transmission costs are important because, for example, when a sent call reaches more than four neighbouring nodes, the cost of delivering the packet as a whole exceeds the cost of transmission alone. This suggests alterations in the recipient's sensitivity and signal processing skills, which could lead to a rise in the relative costs of receiving. On the other hand, there are comparatively significant fixed expenses related to sending or receiving packets. The ongoing expense of sending or receiving a byte outweighs the additional expenses for smaller packets (e.g., point-to-point transmissions of 230 bytes or broadcasts of 130 bytes). Small packets such as "HELLO" or "ROUTE REQUEST," for instance, can use a lot of energy. It's also important to remember that throwing away a packet usually uses less energy than getting it. By determining that a packet is irrelevant to them, non-target nodes can enter sleep mode and save energy while the packet is being delivered, lowering their energy consumption during broad broadcasts.

IV. Conclusion

We thoroughly examined Internet access for portable ad hoc networks, assessing many scenarios before suggesting the implementation of reactive gateway discovery protocols in conjunction with IPv6 handling algorithms. By improving stability and scalability, this method makes it possible for the ad hoc network to function effectively. In order to determine important mobility features, such as geographic variables, transitory dependencies, and geographic limits (such Manhattan, Random Waypoint, Freeway, and Reference Point Group Mobility), this article will analyse and evaluate an ad hoc network. Every energy mobility trend is thoroughly investigated, providing insightful information for the creation and use of practical applications.

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