International Journal of Technology Research and Management
ISSN (Online): 2348-9006
Vol 3 Issue 5 May 2016

A Review of Various Routing Techniques in MANET

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Abstract: *Nodes are connected wirelessly in mobile ad hoc network (MANET). Thus connectivity becomes a difficulty in such network. The topology of such network is outlined by its routing strategy. Routing algorithms are responsible for searching routes between source and destination, under independent mobility environment. Additionally, in such kind of network organization performance is an important issue. The route of network is suffering from the mobility due to which the network is suffering from path break problems. Routing plays a big role in MANETs. In recent years, numerous routing protocols with distinctive feature have been newly proposed. In order to provide a comprehensive understanding of these routing protocols designed for MANETs and pave the way for the any analysis, a survey of the routing protocols is discussed in detail in this paper.*

Keywords: *Mobile ad-hoc network (MANET), Genetic Algorithm, Routing, QoS.*

1. INTRODUCTION

Mobile Ad-hoc Network (MANET) is a group of mobile nodes that are communicating in infrastructure less network. These nodes are connected with the wireless links and following the independent mobility patterns. Therefore, the network node uses the cooperative communication. The routing algorithm is based on the concept of routing issues in such network and making enhancement on the traditional routing techniques. This section of document provides the overview of the study domain.

MANET is a new generation technology. In this network not any kind of infrastructure is available therefore nodes are not connected through a wired link, and able to move any direction independently, therefore mobility is a primary characteristic of network. Due to this property of MANET involves a wide verity of the applications such as the military applications, during natural disasters and others. But technically handling and managing the mobility is a complex issue in MANET.

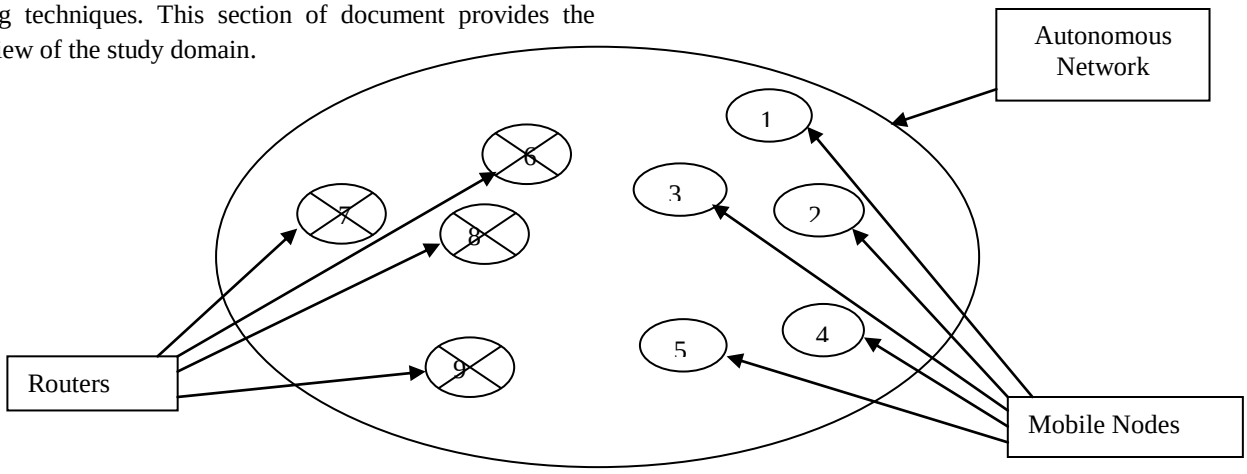

Figure 1: Mobile Ad-hoc Network (MANET)

2. LITERATURE REVIEW

In this paper[1] authors studied performance of the three widely used MANET routing protocols (DSDV, AODV and DSR) with respect to set (RPGM) and unit (RW, GM and MG) mobility models. They developed a set of simulation scripts for the NS2 simulation environment merged with the Bonn Motion scenario generation tools. According to authors simulation results have show that the comparative ranking of routing protocols may vary depending on mobility model. The comparative ranking also depends on the node speed as the existence of the mobility implies frequent link failures and each routing protocol reacts differently during link failures. As per authors analysis proactive protocol DSDV experiences the mainly constant performance with all mobility models. This protocol performs best with entity models that have lower level of uncertainty (GM and particularly MG). AODV performs best with the group model RPGM. With entity models, AODV experiences the top routing overhead with the raising of node speed, but has acceptable average delays.

The NoC (network on chip) design problem requires the production of a power and resource well-organized structural design that can support the communication necessities for the SoC (system on chip) with the desired performance. This paper presents a genetic algorithm-based automated design technique that manufactures an application specific NoC (network on chip) topology and routes the communication traces on the interconnection network. [2] The technique operates on the system-level floor plan of the system on chip (SoC) and accounts for the power utilization in the physical links in addition to the routers. The proposed method resolves a multi-objective problem of minimizing the power consumption and the router resources. Overall plan flow consists of two phases that is, system-level floor planning, and interconnection architecture generation. In the first phase, invoke an existing floor planner with an objective of minimizing a power-performance cost function. For the second phase, author presented a novel GA-based technique for application specific network on-chip interconnection network generation. It produces a Pareto arc of the result set, so that every position in the arc represents a tradeoff among power use and associated number of NoC routers.

In a survey of Multicast Routing Protocols for Mobile Ad-Hoc Networks [3], Authors says that multicasting can efficiently support a larger type of applications that are identify by a close degree of collaboration, typical for several MANETs. And also the design of the multicast routing protocols is driven by specific goals and needs based on various assumptions concerning the network properties or application areas. They present a comprehensive survey of the multicast routing protocols for MANETs. The classifications of the first routing selection principles can alter the task of a network designer to decide the multicast routing methods to be adopted at a given condition. Then, they believe there survey are very helpful to the research community and also serve as a great introductory material for somebody embarking on MANETs.

The static shortest path (SP) problem has been already define using intelligent optimization procedure such as genetic algorithms (GAs) , particle swarm optimization, artificial neural networks, etc.[4] However, with the advancement in wireless connections, all the time more movable (mobile) wireless network become visible for example wireless sensor networks, mobile networks [mobile ad hoc networks (MANETs)], etc. One of the most imperative uniqueness in mobile wireless networks is the dynamic topology, i.e. the network topology changes. Thus, the SP routing problem in MANETs turns out to be a dynamic optimization problem (DOP). Among approaches developed for GAs to deal with DOPs. In this paper, authors use GAs with immigrants and memory schemes to resolve the dynamic SP routing problem in MANETs.

The Sprouting problem aims to establish a multihop forwarding path from a source node to destination node and one important issue that acutely affects the performance of MANETs. Therefore, most SP routing algorithms in the literature consider only the fixed network topology. The aim of Immigrants scheme maintaining the diversity of population when introduce random individuals into the current population. The immigrants' schemes show their power in acyclic dynamic environments, while memory scheme's aim at storing useful information for possible reuse in a cyclic dynamic environment. A DSPRP (dynamic shortest path

routing problem) model is built up in this paper. The experimental results indicate that both immigrants and memory strategy raises the performance of GAs for the DSPRP and quickly adapt to environmental changes (i.e., the network topology modifications) and produce high-quality solutions after each change in MANETs.

With the increase requirement for real time services in Wireless Sensor Networks (WSNs), routing has appeared as an interesting issue. However present a few Qos (quality of service) assurance in antenna networks increase important challenges. [5] Designing of QoS routing protocols that optimize multiple objectives is computationally inflexible. High authority spread nodes be able to use as cluster heads in two tiered WSN and these relay nodes may form a network among themselves to route data towards the link. In this model, the QoS guarantee has determined mainly by these relay nodes. In this paper, author have developed a QoS based, power sensitive routing protocol into two-tiered wireless sensor networks from the perspective of multi-objective optimizations utilizing NSGAII (non dominated sorting genetic algorithm II). The proposed protocol efficiently optimizes the QoS parameter, consistency with ending holdup plus reduces regular power utilization of nodes; actually extend the duration of the network. According to author investigating the implementation of the approach in a distributed manner and rises the NSGA-II for determination the combined problem of routing and clustering. A solution based on NSGA-II is presented for energy efficient QoS routing in cluster based WSNs. Simulation outcome show that the presented protocol better network performance by escalating multiple QoS parameters and energy consumption.

In this paper[6] present a Genetic algorithm approach to determination the joint net gateway allotment, routing and scheduling crisis in wireless ad hoc network with the goal of minimizing the average packet delay. Author analyzes the performance of the projected Genetic algorithm by means that of simulations and compares answer that it provides to a hop count based gateway selection and routing solution. And additionally investigate the advantages that can be achieved by optimizing only the allocation of net gateways or the routing. it's exposed that Genetic algorithm give significantly higher performance in terms of delay and packet delivery ratio. The suitableness of GAs to the present problem was established and therefore the performance development with high opinion to a solution using hop count because the metric for each routing and gateway allocation was shown by means that of simulations. Surprisingly, deviating from shortest hop routing doesn't considerably improve performance. Additional work will investigate the possibility of applying Genetic Algorithms to mobile networks, as opposed to the static topology considered here. Additionally, distributed algorithms that don't need global data of the network topology will also be considered. The solution provided by the GA can be considered as an upper bound in order to assess the performance of distributed algorithms.

In a Mobile ad hoc Network (MANET) a reliable and economical end-to-end communication among the network nodes, an acceptable routing protocol is required. during this paper [7], present an intensive simulation-based comparison of three well-known MANET routing protocols like AODV (ad hoc on-demand distance vector), DSDV (destination-sequenced distance vector) and OLSR (optimized link state routing protocol) estimate their performance among three real situations. Allowing for a variety of performance metrics PDR (packet delivery ratio), Delay, Average Delay, throughput and Total Energy Consumption. Author suggests the foremost applicable routing protocol in each situation. According to simulation-based results, author concludes that considering PDR and regardless of the size of the network, OLSR performs higher. Also, DSDV achieves higher results for larger packets sizes and for lower DSSS (direct sequence spread spectrum) Rates. Considering the average delay, DSDV performs higher for lower DSSS Rates. For little networks, OLSR achieves higher results and because the size of the network increases, DSDV performs higher. Average delay exhibits massive variability in AODV however remains almost constant (with extraordinarily tiny changes) because the range of nodes and also the speed changes in OLSR and DSDV (Proactive Protocols). Considering the throughput, regardless of the size of the network, OLSR performs higher. DSDV provide higher results for bigger packets sizes and for lower DSSS Rates. For the entire energy consumption, DSDV performs higher for larger packets sizes and OLSR achieves higher results for higher DSSS Rates, once the size of the network is tiny (less than 40 nodes). Overall, it's clear that

DSDV and OLSR continually outperform AODV. In most cases, DSDV and OLSR achieve similar results because of their similar nature.

In this paper [8] the problem of dynamic multicast routing in mobile ad hoc networks has examine. Lots of engaging mechanisms are completed on multicast routing since it's established to be a NP-hard problem. The topology dynamics brings huge challenges for finding this problem. So far, very little work has been done on the dynamic multicast routing problem of MANETs. In a MANET, the topological changes because of its inherent characteristics like node mobility and energy preservation. Therefore, an efficient multicast algorithm ought to adapt the simplest multicast tree to the changes consequently. The dynamic multicast routing problem in MANETs seems to be a dynamic optimisation problem (DOP). In this paper apply hyper-mutation GAs to the dynamic multicast routing problem in MANETs. Experimental results demonstrate that when the mutation rate is instantly enhanced to a high level when there is an environmental modification, the hyper-mutation GA can well solve the dynamic multicast routing problem.

From another survey authors [9] mentioned different multicasting routing protocols for MANETs and their deployment problems. Wired and infrastructure-based wireless networks supported by several multicast routing protocols. Issues in MANETs were the short lifetime of the nodes because of power constraints and dynamic topology because of the mobility. For that reason to design a simple, subtle, robust and energy efficient routing protocol for multicast atmosphere.

A new Position Aware Energy efficient Multicast Routing in MANET is projected by author [10]. Author during this work address the scalability problem of multicast routing protocols to support energy efficient ways over MANETs. During this paper a brand new position based multicast routing protocol is introduced. Here the network area is split into the equal sized hexagonal cells. For every cell, cell head (CH) is elected. During this novel approach cell head backup is chooses only if the cell have any multicast member. There approach reduces the energy constraint by selecting the cell head backup, cell head and forwarding nodes based on the best battery capacity. The protocol also increases the lifetime of the node and network. Results show that PAEEM provides higher packet delivery ratio and provides less energy utilization compared to PBQMRP protocol. Simulation results show that PAEEM has batter performance in terms of energy consumption and packet delivery ratio compared with PBQMRP.

Mobile Ad-hoc Network plays a very important role in emergency communications wherever network has to be made temporarily and quickly as advised by author [11]. They propose an optimized protocol MAODV-BB based on MAODV, which improves robustness of the MAODV protocol by combining benefits of the tree structure with the mesh structure. The key idea of MAODV-BB is to make over all use of GRPH messages that the group owner broadcasts periodically to update shorter tree branches and develop a multicast tree with backup branches. It not solely optimizes the tree structure however additionally reduces the frequency of tree reconstruction. Mathematic modelling derivation and simulation results each demonstrate that MAODV-BB protocol enhance the network performance over standard MAODV in heavy load ad hoc networks, which meets QoS necessities for communication in a MANET.

In this paper [12] performance metrics for numerous protocols are first known and then simulation is performed to investigate their performance in several situations varying the multicast group size. QoS metrics known during this work are multicast throughput, average multicast end to end delay, packet delivery ratio, average multicast jitter, link utilization and control overhead. Qualnet 6.1 simulator has been wont to calculate these metrics. The general results obtained conclude that if all the metrics are considered then ODMRP outperforms the other protocols because of consistent performance. end to end delay, jitter and control overhead of MAODV is largest among all. However if only throughput and Packet delivery ratio is concerned than it's determined that MAODV performs higher. They concluded that MAODV performs well with reference to throughput and packet delivery ratio however additionally exhibit high end to end delay and interference than mesh based mostly ODMRP.MOSPF shows highest link utilization. Just in case of accelerating cluster size each ODMRP and MAODV have

comparable performance however mesh based mostly protocols exhibit consistent performance in most of the situations. So that they will state that mesh based mostly protocols are appropriate for optimum situations thanks to their robust and comparatively more stable topology.

Authors of paper show throughput vs. group size of various protocols comparison in: Figure 2. The figure shows the effect of increase of multicast group size on throughput of each protocol.

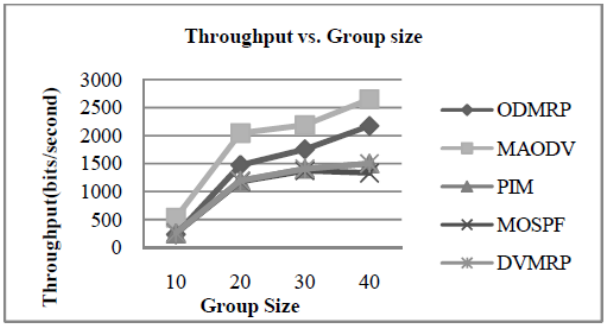

Figure 2. Throughput vs. Group size [12]

An Improved BMER scheme is proposed by author for bandwidth-efficient multicast routing in MANET [13]. consistent with them this Improved BMER scheme will reduce the control overhead while increasing the bandwidth efficiency. The IBMER scheme eventually builds a shared tree for this multicast group instead of an obsessive tree for a selected multicast sender generated by the first BMER They Shows that for both, route setup phase and route recovery section, the IBMER scheme give the batter multicast routing efficiency with more reduced communication overhead as compared to Classical BMER scheme.

3. CONCLUSION

In this paper we present a widespread survey of the routing protocols for MANETs. The aim of this paper is to survey the routing protocols and study their primary routing selection problems. Any routing protocol in MANETs tries to beat some troublesome problems which might be categorised below basic problems or considerations. All protocols have their own advantages and drawbacks. Additionally we've study genetic algorithm (GA) based routing solution in MANETs. GA solve several issues like dynamic optimisation problem, shortest path problem, joint internet gateway allotment and scheduling crisis in wireless ad hoc network. In MANET, the network topology keeps changing because of node mobility. Mobility is that the main issue affecting topology changes and route formation. The mobility affects the quantity of average connected path and performance of the routing algorithm. Therefore required to search out a brand new strategy by which the mobility of network is handled efficiently.

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