Hybrid Routing Protocol for Reliable Path Selection in Mobile Ad hoc Networks

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Abstract- A mobile Ad-Hoc network (MANET) is the temporary network in which group of node are interconnected with each other. In the wireless sensor network, there is ad-hoc networks which are infrastructure less and no central controller present in it due the randomly distribution of the nodes. This mobile network contains the different set of communicating devices which require no prior existing infrastructure for connecting suddenly. There is continuous change in the network topology as nodes are moving freely from one place to another at varying speeds due to no fixed infrastructure. This network can be configured in two ways i.e. static or dynamic. This research work is based on the path establishment from source to destination. The most popular routing protocols like AODV, DSR and DSDV are compared in terms of certain parameters. The best performing AODV routing protocol is improved for path establishment. The hybrid protocol is derived using bee colony and ant colony algorithms. The proposed protocol is implemented in NS2 and simulation results shows improved in the results.

Keywords- AODV, DSR, DSDV, Hybrid, Bio-inspired, Bee Colony, Ant Colony

I. INTRODUCTION

The collection of wireless mobile hosts such that there is no central authority as well as fixed infrastructure present amongst them is known as a mobile ad hoc network. The multi-hop paths are used in order to provide communication in these networks. Instead of providing a direct communication with the base station like in the infrastructure wireless networks, this network generates a wireless ad hoc network [1]. A self-configuring type of network in which there is no access point available and the wireless links are used to connect the mobile routers amongst each other is known as MANET. There is still a need to overcome various design issues and challenges since these networks are deployed in different applications due to which some issues might arise. The extension of mobility into the region that is autonomous, mobile and wireless such that a network routing infrastructure is formed in an ad hoc manner through the combination of routers and hosts with set of nodes is the major objective of MANETs [2]. When MANETs are deployed, there are several security vulnerabilities found which have been solved by the researchers by providing various approaches. However, not all approaches can still guarantee that the networks can be secured. Thus, providing a robust and efficient operation in MANETs such that the mobile nodes can be provided routing functionality is the major concern. There is an increment in number of applications of MANETs within different sectors due to the increment in portable devices and increase in efficiency of wireless communications [3]. Irrespective of the geographic position or proximity of infrastructure, the information can be accessed and exchanged within MANETs. There is mobility amongst nodes and dynamic connections are provided unlike the infrastructure networks. There is no need of any fixed infrastructure in MANETs whereas other mobile networks require it. Thus, within the network an advantageous decentralized character is provided. The flexibility as well as robustness of the networks increases due to the decentralization. There is a need to overcome various design issues and challenges even though the numbers of applications in which these networks are being used are increasing each day. Thus, MANET is known to be one of the important research areas due to such reasons [4]. A wireless network in which there are several mobile nodes that generate a self-configuring network is known as MANET. It is possible for each device to communicate with each other using multi-hops. Various routing protocols are used in order to route the information from source to destination. In order to generate a route from source to destination such that the requirements of network can be accomplished, these routing protocols are used. The route request packets and intermediate nodes are used to flood the network. The intermediate nodes are chosen in order to generate a reliable path from source to destination using the route reply packets present in the network [5]. The on demand types of routing protocol in which the path is generated when required is known as AODV. A path is generated here known as route. There are three control messages included in this which are route request, route reply and route error. Prior to establishment of a route from source to destination, the route request packets are sent to the neighboring nodes. A reactive type of protocol in which depending upon the requirements, a path is chosen is known as DSR protocol. For creating a route the intermediate nodes act as mediators. The request that is sent by the source is responded back with the route reply packets [6]. The networks in which a route is predefined use the proactive types of routing protocols. There are several numbers of nodes present

in the network. There are several nodes present in the network and the routing is maintained by the individual node. Depending upon the information available in the routing table, a route is generated from source to destination. By integrating the characteristics of proactive as well as reactive routing protocols, a hybrid routing protocol is generated [7]. There are two zones into which the complete network is partitioned in these protocols. They are inter-zone and intra zone routing which are provided by reactive and proactive routing protocols respectively. In Zone Routing Protocol the node is localized using sub network and zones.

II. LITERATURE REVIEW

Takuya Yoshihiro, et.al (2018) presented mobile ad hoc networks in this paper in which wide variety of routing protocols has been utilized among those OLSR is considered as the essential proactive routing protocols [8]. There is reduction in the control load considerably with the help of providing high speed of convergence towards the destinations. For this they implemented the link-state schemes within k-hop distance only for the destinations. They proposed a hybrid routing protocol, new fundamental mechanism in this paper in which link-state routing is implemented. For all the destinations, higher level of convergence is found here. For each of the destination, high speeds of convergence as well as fewer loads are the two merits identified. Thus, the advantages of two different approaches are used by the proposed approach to provide a novel approach provides better outcomes.

Prateek K. Singh, et.al (2017) presented a direct trust computation, a trust computation method in this paper in which the Reputation Routing Model (RRM) fundamentals has been utilized for the mobile ad hoc networks (MANETs). In order to minimize the effect of black hole attacks, this routing framework has been utilized in Optimized Link State Routing (OLSR). This method does not change the originality of protocols as well as not increasing the overhead [9]. As per done observation, it is find out that performance of the proposed protocol is better as compared to original OLSR protocol. In the condition of high mobility rate, the performance of proposed method is optimal, even in the presence of a malicious node in terms of packet delivery rates. Therefore, the effect of black hole attacks in MANETs is minimized by the proposed method mainly in the low mobility.

D.S.John Deva Prasanna, et.al (2017) presented the mobile ad hoc networks in this paper in which network has dynamic topology and self configuration property. Therefore, in these networks implementation of conventional routing algorithms is not easy as these algorithms are not able to handle the maintaining and discovering new routes [10]. In the graph theory, the concept of Connected Dominating Sets (CDS) has been implemented as it provides the productive result while doing the routing in MANETs. They discussed the widespread survey of various CDS formation algorithms and the evaluation of their performance in this paper.

Ramjee Yadav, et.al (2017) presented the emerging technology of mobile ad hoc network in this paper, is considered as the major application of wireless networks. They presented Dynamic Transport Throughput (DTT) in this paper. This proposed method utilizes the nodes geographic location as information and statistics channel in order to improve the performance of routing at each hop. They utilized network simulator using which functionality of channel usage is supported. Therefore, with the help of this simulator, they simulate the Location Aided Spectrum Aware Routing (LASAR) protocol in which DTT metric has been utilized [11]. There are various protocols using which this proposed method is compared. As per done simulations, it is concluded that there is improvement in the proposed protocol when it is used with the combination of proposed DTT metric.

Gayathri.D, et.al (2017) presented the combination of the mobile nodes formed the mobile ad hoc network. In order to minimize the effects of malicious node's attack, they utilized the proposed method for the evaluation of different parameters [12]. They compared the results obtained from the proposed method of AODV protocol. They discussed the two attacks in this paper and also provided solution in order to minimize all these effects. On the basis of performed experiments, it is concluded that with the help of proposed method superior performance is achieved in MANETs as compared to OLSR based approach. There is significant improvement in few parameters and end to end delay are some parameters minimized which shows the effectiveness of the proposed method.

Jingwen Bai, et.al (2017) presented the mobile ad hoc network in this paper in which they discussed the two major issues that disrupted the functionality of this network such as link breaks and limited energy [13]. They proposed a Constructive-Relay-based Cooperative Routing (CRCPR) protocol in this paper in order to minimize all the issues faced by this network. This is used to construct adequate relays for data forwarding managed itself. This proposed method adopt the new route selection mechanism as almost all nodes operated on battery, this mechanism has been used to for energy consumption, energy harvesting, and link break probability. It is also beneficial in determining the appropriate route across a network. As per obtained simulation results, it is concluded that proposed method outperform as compared to other methods and provide network throughput up to 60% and network lifetime up to 40%.

III. RESEARCH METHODOLOGY

This research work is based on to increase performance of AODV routing protocol for path establishment. The hybrid technique is developed using Bee colony, ant colony and AODV protocol for the path establishment. Let us suppose the

path which is selected between source and destination is [2 4 6 8 10 12]. When the ant colony technique is applied based on the distance between each mobile node, the best path is selected is [2 3 6 9 10 12]. In the third step, the union is calculated between the AODV path and ant colony path. To complete the path, the nodes are selected which has least distance. In the fourth step, the bee colony technique is applied which select best path from source to destination. Let suppose the best path is [2 3 7 9 10 12] In the last step, the path which is selected by the bee colony and hybrid path derived in path three is again hybrid by taking union of both paths. To complete the path distance is calculated between the two nodes. The procedure is described in the figure 1.

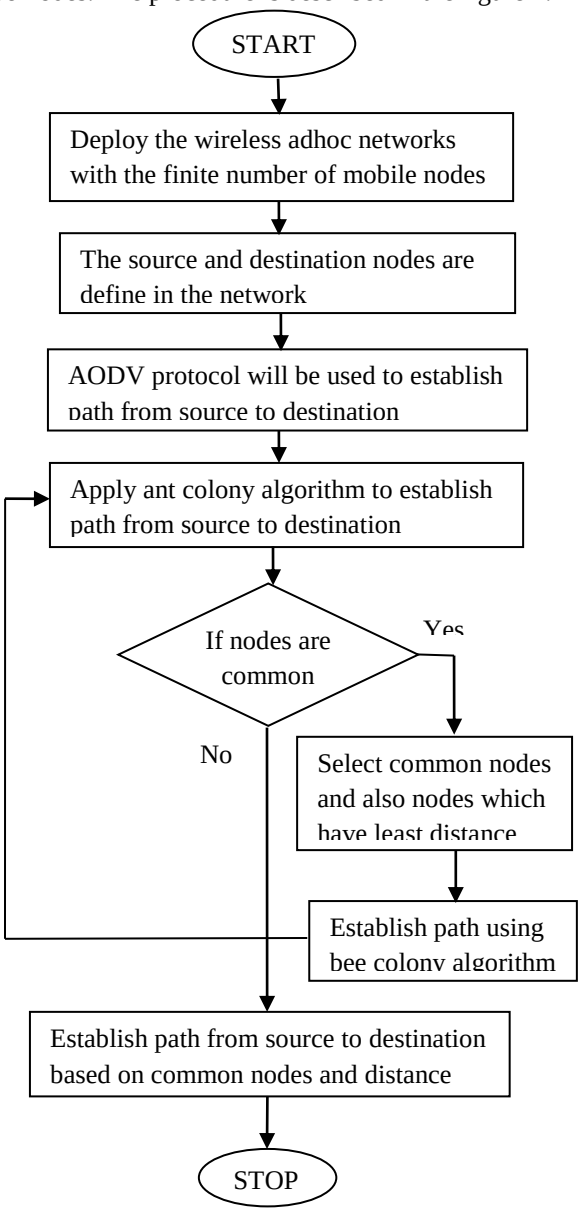

Fig.1: Proposed Flowchart

IV. EXPERIMENTAL RESULTS

The proposed work is implemented in NS2 and experiments are conducted to evaluate its performance. The evaluations are performed in terms of certain parameters such as packet loss and throughput and comparing the values achieved with the outputs of existing approach.

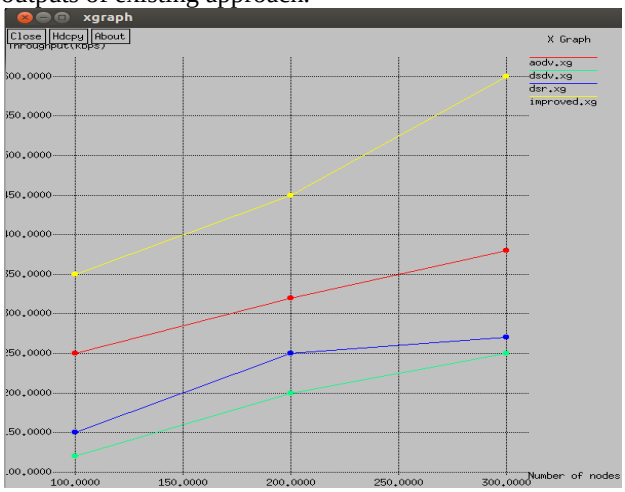

Fig.2: Throughput Comparison

As shown in figure 2, the throughput of the AODV, DSR, DSDV and hybrid protocol is compared correspond to Number of nodes. The throughput increased at steady rate due to generation of efficient path from source to destination. It is analyzed that hybrid protocol has maximum performance as compared to other protocols.

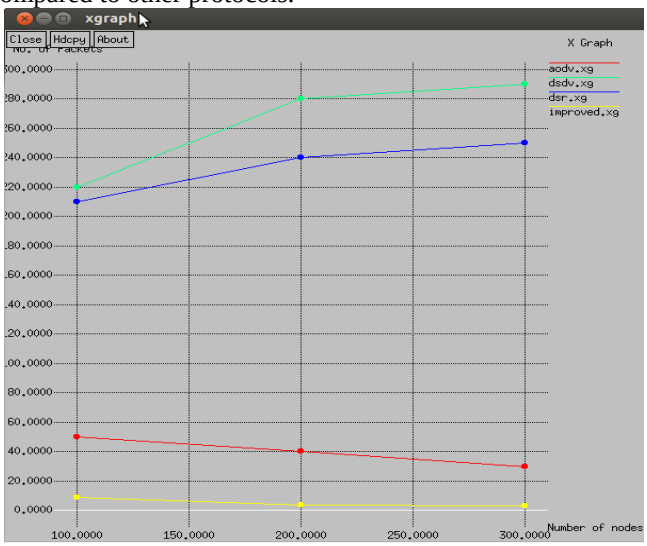

Fig.3: Packet loss Compression

As shown in figure 3, the packet loss of AODV, DSR, DSDV and Hybrid routing protocol is compared for the performance analysis. It is analyzed hybrid routing protocol has least packet loss as compared to other packet loss

V. CONCLUSION

The MANET there are various issues are faced due to the continuous movement of nodes as they are randomly distributed within the network. Due to the movement of intermediate nodes in the path and end nodes there is breakdown in the path. For routing protocol in the MANET, it is necessary to have feature of effective mobility management for dynamic MANETs. Bandwidth constraint is the other major design issue faced in MANETs. In this work, it is concluded that routing is the major issue of mobile adhoc network. The AODV, DSR and DSDV are the high performance routing protocols for path establishment in the network. It is analyzed that AODV protocol is best performing protocol. In this work, hybrid protocol is generated from AODV, bee colony and ant colony algorithm for the path establishment. The simulation is performed in NS2 and results shows improvement in terms of throughput and packet loss.

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