Novel Approach for Link Recovery in MANET

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Abstract- The network that consists of several nodes those are mobile and communicate amongst each other using multi-hop communication is known as Mobile Ad hoc Network (MANET). MANETs provide optimal solutions to various applications such that the problem of destruction of information and overloading can be solved. The quality of service is the major issue of mobile adhoc networks. The DFCP is the routing protocol which is based to establish path from source to destination. Due to link failure, the efficiency of the DFCP is reduced which need to improve to maintain quality of service. In this research work, DFCP protocol is improved for the path recovery in case of link failure. The proposed protocol is implemented in NS2 and simulation results shows high throughput, less packet loss as compared to existing technique.

Keywords- DFCP, AODV, Link Failure

I. INTRODUCTION

The network that consists of several nodes those are mobile and communicate amongst each other using multi-hop communication is known as Mobile Ad hoc Network (MANET). This type of network does not have any central controller within it. The mobility of nodes is random and they can move in any direction as this network is infrastructure less. The wireless links are used for communication amongst the mobile hosts. The nodes present within this network act as routers and transmit the packets across the network to other nodes. MANETs provide optimal solutions to various applications such that the problem of destruction of information and overloading can be solved. In the military, medical and research areas, these networks are deployed as per their requirements [1]. Maintaining of routes in the networks is the major concern of MANETs. For reducing the link failure problem, traditionally several local link repair techniques were proposed by different researchers. For instance, the condition when the network services are available, an ad hoc network is generated with the help of interconnectivity of all the machines that come from similar areas. The mobile nodes transmit the message repeatedly and all the neighboring nodes receive this message. There are however, some nodes that are out of range of other nodes. The intermediate nodes play an important role here in transmitting the packets further to other nodes and act as routers in this scenario. A fixed path across which the messages can be sent cannot be generated in this network since there is a random movement of nodes in these networks. Because of certain properties of the nodes of MANETs such as their dynamic nature, there are several issues being faced in them. The path or route is broken mainly due to the random distribution of the nodes as well as the mobility of intermediate nodes [2]. Thus, when routing is performed, an effective mobility management is needed here. The availability of limited bandwidth within the networks is another major design issues being faced in these networks. Thus, to solve the issues related to limited bandwidth availability and increment in overhead, routing protocols are designed by researchers. Collisions as well as congestion are the other major concerns of these networks. During the process in which the packets are being transmitted, the collision of data and control packets occur since the nodes move instantly in the network [3]. These networks also face other issues such as hidden terminal and exposed terminals. The hidden terminal issue is the one that occurs due to the collision of packets at the end of receiving nodes. In case when the nodes transmit the packets continuously within the indirect transmission range of sender but direct transmission range of receiver, this issue arises. Thus, the change in links causes interference amongst the nodes which are a huge problem for these networks. The total transmission being performed is destructed because of all such issues. Several routing protocols have been deployed in the MANETs such that the path from source to destination can be generated [4]. Thus, the overhead routing of network can be reduced along with the amount of bandwidth being consumed since there is an on time delivery of the packets. An effective and efficient manner of routing is important to be performed in MANETs which result in the introduction of various routing protocols. Since the transmission of packets from source to the destination completely depends upon the routing being performed, the intermediate nodes play a very important role in these networks. Thus, several routing protocols have been proposed till now by various researchers such that the data packets can be routed in effective, secure and dispersed. The classification of all the routing protocols is done in three broader categories which are proactive, reactive and hybrid [5]. The table-drive routing protocols is the other name for proactive protocols whereas the reactive protocols are commonly known as on-demand routing protocols. Further, the hybrid protocols are the ones that include the properties of both proactive and reactive protocols. Various routes are

generated from source to destination by several routes present in multipath routing process. A separate route is generated from source to destination when a link failure occurs within MANETs such that it is ensured that the communication process does not stop. The data however, stops being transmitted when disconnection occurs within the routes. Thus, in MANETs, multi-casting is reduced. The other routing paths available are used to reduce the maintenance of route as well as time being used [6]. The information is transmitted to source node in case when link failure occurs thus, several steps are taken with the help of which there is reduction in the data transmission rate and it is easy to identify an alternate path in the network. The congestion control approaches are used to inform the source regarding any kind of congestion. Here, there is various transmission control protocols involved. There is a need to collect the important information carefully from all the users such that the maintenance and allocation of network resources can be done. The several packets that need to be transmitted further are placed in queues [7]. The queue overflows in case when there are larger numbers of packets waiting for one same link to be available. This results in causing congestion in the network. The packets as a result, are dropped in the network frequently due to which link failure occurs further.

II. LITERATURE REVIEW

Pratik Gite, et.al (2017) proposed the emerging technology of Mobile Ad-hoc Network in this paper that is utilized widely in the wireless connections. They proposed a new routing protocol in this paper using which priority is given to the available routes on the basis of their path stability [8]. They utilized the link prediction technique for the illustration which is based on the signal strength. On the AODV routing protocol, they implemented the proposed routing concept. The issues of routing overhead, energy consumption, and the throughput for different number of experiments is improved considerably by this method.

Kavitha T, et.al (2017) presented the major issue of the link failure within the mobile ad hoc network occurred because of nodes mobility. In order to re-route the packets quickly, various methods has been proposed so far in which hop count is considered as the parameter but they do not provide the optimal results for end to end delay. Therefore, they proposed an Instant Route Migration protocol in this paper using which immediately path is constructed in which path distance and hop count are considered [9]. With the help of this method in which packets to the destination can be easily rerouted in case of link failure as at every node cache maintenance is present. As per obtained results, it is concluded that maximum throughput, less end to end delay, instant route migration is provided by the proposed method as compared to existing systems.

Chanda Dhakad, et.al (2016) presented the major issue of the routing protocol designing in the mobile ad-hoc network that leads to various major issues are discussed in this paper. They proposed a new technique in this paper in which nodes calculates the RSSI values of the neighbour node [10]. This proposed method calculates the every node, link failure factor and also the LFF up to destination node is calculated. The route of the minimum link failure factor is selected after calculating all the values. The minimum steps count between senders and destination is the basis using which the selection of route is done. On the basis of the performed experiments, it is demonstrated that the proposed LFAODV outperforms to SEAODV routing protocol in terms of routing overhead, throughput, packets delivery ratio.

Jyoti Upadhyaya, et.al (2016) presented the infrastructure less and decentralized network in this paper termed as the Mobile Ad-hoc network [11]. This leads to change in the routes due to which shortest and optimal path is not selected timely. They proposed a novel routing metric method using which the signal strength of neighbouring nodes can be calculated easily. They proposed an energy based delay in this paper in which on the remaining energy of the nodes this delays is based. Therefore, it becomes possible to enhance the performance of the network and the network lifetime only by selecting the strong and stable route towards the destination. As per obtained simulation results, it is concluded that proposed SSED-AODV method has better performance as compared to the previously utilized routing protocol.

MOHAMMAD M. KADHUM, et.al (2016) presented there are various significant domains such as emergency search-and rescue, policing, and military operations in which MANET has been utilized for the data acquisition purpose. Therefore, to overcome all these issues several routing protocols have been developed so far in which initially in the route discovery backup routes are created [12]. The selected routes have less chance of utilization as the topology changes are not reflected by those routes properly. The active route is restored before the breakage happens is possible by utilizing the available information about the link must be done before becomes exclusive. This procedure enhances the network performance and minimizes the packet loss.

Deepika Vodnalaa, et.al (2016) presented the network in which nodes are independent of each other and can move freely within the network, this network called as MANET. Therefore, no protocol is developed so far which can overcome all the issues related to link failures. Therefore, they proposed an efficient backbone based quick Link Failure Recovery Multicast Routing Protocol in this paper by which all the limitations of existing protocols is overcome [13]. This proposed method has the four phases such as group formation, backbone construction, on-demand route discovery and route maintenance. The construction of the efficient robust backbone is the main objective of this protocol using which all

the limitations associated with previous methods can be overcome easily. It also provides the mechanism using which link failures can be recovered quickly by providing separate path in between the failure point and destination.

III. RESEARCH METHODOLOGY

The Improved Dynamic Connectivity Factor routing Protocol (DCFR) includes the several components in it which are discussed further. The major objective of this proposed protocol is to replace the variables used within the network parameters by utilizing a novel connectivity and buffer size estimation metric. Further, a novel dynamic connectivity factor is utilized in order to drop the extra RREQ packets. Due to this, the routing overhead of the network is minimized. In order to work within the three major stages which are route discovery, route reply as well as route maintenance, the AODV, the NCPR, and the proposed improved DCFR protocol are introduced. The routing table for the destination needs to be checked when there is a need to transmit the data from one node to another within the network. The transmission of data from source node is initiated once the destination is identified. If the destination is not found, a route to the sink node is identified by RREQ. The flooding mechanism however is the only mechanism through which the nodes that have path towards the destination can be identified. In this mechanism, each node that receives RREQ for the first time rebroadcasts RREQ in the network. Further, a Route REPLY message (RREP) is sent back as a reply from the sink node or any node that needs to establish route. However, there is link breakage within the nodes as they move frequently. A Route ERROR message (RERR) is generated if any such event is identified by any node to the neighbours so that this breakage can be notified .With the minimization of redundant RREQ packets, the flooding issue is addressed by DCFR at initial stage. However, routing overhead still occurs due to the presence of these messages that are relevant to the flooding mechanism. The performance of the DCFR degrades the performance when the link failure occurred in the network. The performance of system is enhanced by recovering the path in the least amount of time. There are numerous disadvantages of various protocols presented in this research. The performance of network is degraded due to the extra routing overhead caused by protocols. In order to resolve all such issues occurring within the route discovery and link recovery process, a novel protocol is proposed here [13]. The various parameters utilized within the experiments are explained further.

IV. EXPERIMENTAL RESULTS

This proposed work is implemented in NS2 and the results are analyzed in terms of several parameters to show their outcomes as compared to existing approaches.

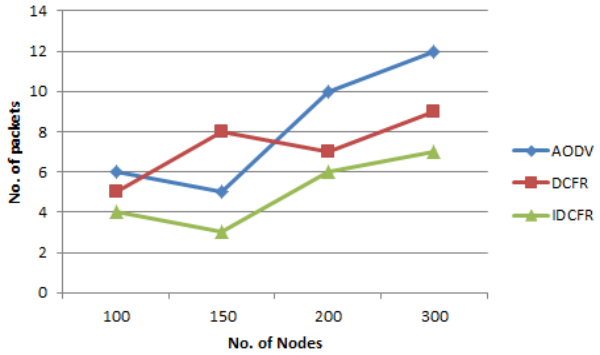

Fig.1: Packet loss Comparison

As shown in figure 1, the packet loss of the AODV, DCFR and IDCFR protocol is compared for the performance analysis. The Packet loss of the IDCFR protocol is least as compared to AODV and DCFR protocols.

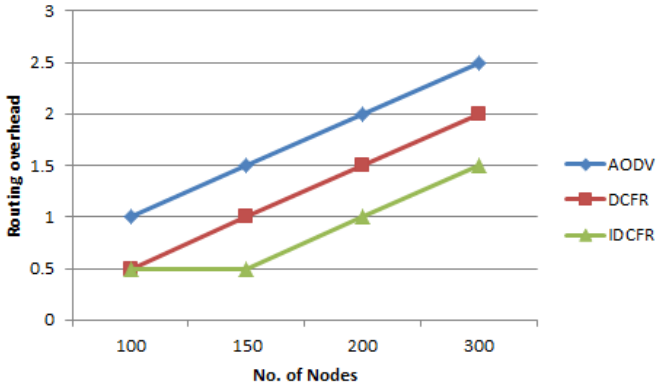

Fig.2: Overhead Comparison

As shown in figure 2, the routing overhead of improved DCFR protocol is compared with existing DCFR protocol. In the improved DCFR Protocol, the routing overhead is reduced as compared to DCFR Protocol. The routing overhead of AODV protocol is also compared with other two protocols and performance analysis is done versus number of nodes.

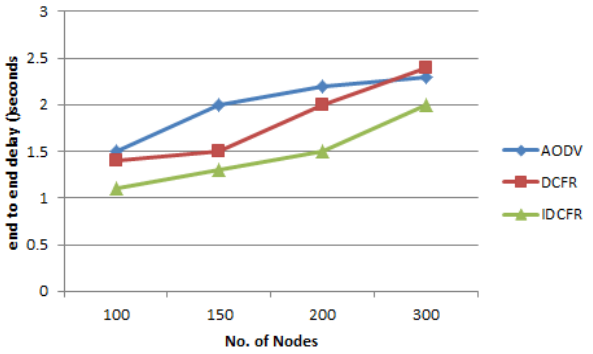

Fig.3: Delay Comparisons

As shown in figure 3, the delay of improved DCFR Protocol and existing DCFR Protocol is compared and due to route maintaining property of improved DCFR Protocol delay is less as compared to existing DCFR Protocol. The graphs are drawn versus number of nodes.

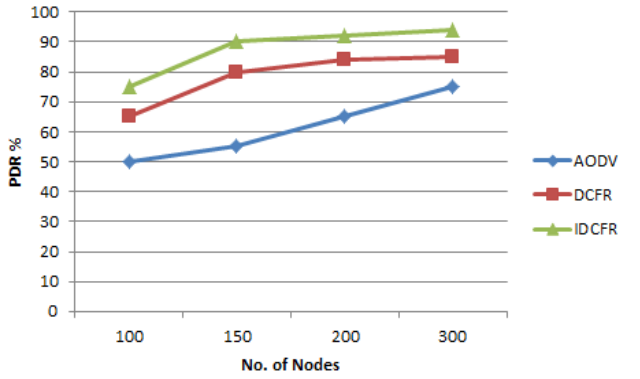

Fig.4: Packet Delivery ratio

As shown in figure 4, the PDR values of AODV, DCFR and IDCFR protocol is compared and it is analysed that IDCFP protocol performs well as compared to other two protocols. It is analyzed that graphs are drawn versus number of nodes.

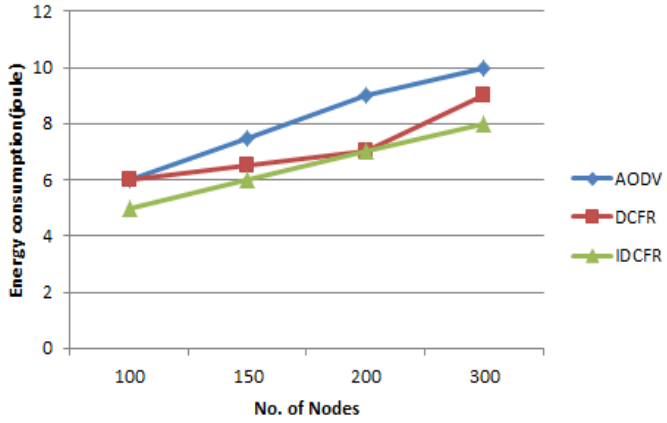

Fig.5: Energy consumption

As shown in figure 5, the energy consumption of AODV, DCFR and IDCFR is compared for the performance analysis. The IDCFR protocol has least energy consumption as compared to DCFR and AODV

V. CONCLUSION

In this work, it is concluded that mobile ad-hoc network is the self-configuring type of network in which mobile nodes are move freely from one place to another place in the network. The DCFR protocol is the routing protocol which helps in route establishment and route maintenance on the basis of node connectivity. In this research work, the buffer size parameter is further added for the route recovery. The node which has maximum connectivity factor and also has maximum buffer size is selected as the best node for path recovery from source to destination. The simulation of proposed DCFR protocol and existing DCFP and AODV protocol are compared in terms of packet loss, routing overhead, delay and energy consumption. The simulation results shows up to 10 to 15 percent improvement in improved DFCR protocol as compared to existing DFCP Protocol.

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