International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 04, April-2015

An Enhanced Reactive Routing to Reduce Rerouting Time with Enhanced Buffer Zone Approach in MANETs

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***Abstract*—The high mobility of nodes in mobile ad hoc networks (MANETs), there exist frequent link breakages which lead to frequent path failures and route discoveries. MANET routing protocols have to deal with link breaks, which occur due to the frequent movement of the nodes and a dynamic network topology. The latency that occurs during this retransmission is referred to as rerouting time. There are several researches have been proposed by different authors to enhance the rerouting time. One such approach is the buffer zone routing, where the transmission area of a node is isolated into a safe zone near to the node, and an unsafe zone close to the end of the transmission range. Be that as it may, this methodology has a couple of limitations and constraints, such as buffer zone size and network load etc. In this we propose a enhance buffer zone transmission, where the nodes within this buffer forms a virtual zones by considering node energy level. However this paper enhance this study by introducing virtual zone into unsafe zone by considering an energy aware reactive routing technique based on existing reactive protocols. The introduction of virtual zone increases the network performance. The proposed mechanism decreases the rerouting time and it recuse hop length. The proposed experiment is conducted in NS3 to analyze the performance.**

Keywords MANET, Routing, Rerouting Time, Buffer Zone, Virtual zone, Energy Aware Routing Protocol,

I. INTRODUCTION

A mobile adhoc network (MANET) is a decentralized type of wireless network. The network is adhoc because it does not rely on a pre-existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data to other nodes, so the determination of which nodes forward data is made dynamically on the basis of network connectivity. Mobile ad hoc networks (MANETs) consist of a collection of wireless mobile nodes which dynamically exchange data among themselves without the reliance on a wired backbone network or a fixed base station. MANET nodes are typically distinguished by their limited power, processing, memory resources as well as high degree of mobility.

Link break is a basic characteristic of MANETs, because of their dynamic topology. In such cases, the directing convention needs to discover elective ways. The time period before new ways are found is alluded to as the rerouting interim, and the term of the rerouting interim is alluded to as the rerouting time. Amid the rerouting interim, stale courses exist over the connection that has been broken. Rerouting can happen strictly when the directing convention has identified that the connection is broken. Actually, a noteworthy piece of the rerouting time is connected with the location of the connection break. In Mobile Adhoc networks mobile nodes consist of limited energy and limited memory. The limited nature of MANETs creates more routing issues. In this network each node sends a route request to the other node to reach to the destination node and it forms a dynamic routing to transmit a data to the destination. In order to organize an efficient routing in ad hoc networks, there are various routing protocols are presented into two different groups such as reactive routing protocols and proactive routing protocols. Route discovery and route maintenance are key factors for these routing protocols, this project focus on proactive routing protocol.

When a source need to send packets to a destination, it initiates a broadcast based route discovery process to look for one or more possible paths to the destination. However routing protocols Link failure causes different routing issues and which increases routing time. In addition, mobility nature of node leads to links breakdown, which makes link, based path selection unreliable in Mobile Ad Hoc Network. MANETs need to discover new routes to replace broken link to replace as alternate path. The rerouting mechanism consumes addition energy and it also impact Quality of Service, thereby resulting in the degradation of network performance.

Energy is a key factor in MANET, and it is essential to save energy to maximize the network lifetime and that result in the improvement of the networks performance. The routing protocol has to be designed in such a way, that it works effectively in energy constrained applications. This project proposes an energy aware reactive routing protocol based on existing reactive protocols like AODV. This protocol should use intermediate nodes residue energy as a route selection parameter and also try to reduce the network overhead. In our proposal an optimal path selection, based on node and path reliability is preferred to reduce risk factor involved in the network which makes network fault tolerant. The proposed model divide the transmission area into safe zone and unsafe zone, where safe zone is divided into multiple virtual zones based on the distance, energy and transmission range of the nodes. Unsafe zone is divided into multiple zones based on energy and transmission range to make this area to determine relay nodes.

II. BACKGROUND

The ordinary method for catching connection breaks for a steering convention is through lost surveying parcels (i.e. lost Hello parcels). The Hello bundles of OLSR are transmitted between one-jump neighbors at a pointed out time recurrence (e.g. like clockwork, which is the suggested transmission recurrence of OLSR) and give neighborhood network data and a methods for connection break recognition.

On the off chance that no Hello parcel from a neighbor is gotten inside a tagged time interim (e.g. inside 6 seconds, the prescribed interim of OLSR), the neighbor is considered distracted and a connection to this neighbor is considered as broken and invalid. An alternate route for the steering convention to locate join splits is to surrender it over to a system executed at the hidden connection layer. The steering convention should then be told unequivocally around a connection break by the connection layer. The hindrance of this Link Layer Notification (LLN) methodology may be the expense of extra usage many-sided quality. Be that as it may, the playing point is that the connection layer is regularly ready to recognize connection breaks sooner. As a connection layer, IEEE 802.11 is regularly fit for identifying a connection break extensively speedier than a second. Conversely, without LLN and with the suggested estimations of OLSR, a connection break won't be discovered before 4 seconds best case scenario and 6 seconds even from a pessimistic standpoint. This paper concentrates first on connection break recognition through lost Hello parcels, while the utilization of LLN will be talked about and assessed before the end of the paper.

It is critical for the general execution to locate the connection soften up an opportune design, since two negative impacts happen in the period between the physical connection break what's more the discovery by the steering convention. In the first place, the parcels lined in the interface line are stamped with an inaccessible next bounce address. This implies that these parcels will never achieve their end, and are as of right now lost. Second, these bundles will be endeavored transmitted a few times by the mac layer before they are disposed of.

This will take significant medium time from bundles transmitted from different nods with a legitimate next bounce address. The retransmission impact is delineated through a recreation where a node was put in the core of the recreation zone and set up to get information from 40 nodes moving haphazardly inside the recreation region at 10 m/s (Fig. 1). In this recreation, a node inside the transmission zone of the accepting node effectively sends activity to the accepting focused node until it moves out of the getting node's transmission zone. By then a connection break happens, yet

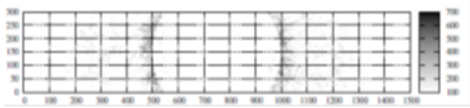

Fig. 1. Accumulated Tranmission Diagram

it is not distinguished by the transmitting node's steering convention for an alternate 4-6 seconds. At the time at the point when the connection break is discovered by the steering convention, the node may have set out 40 to 60 m past the edge of the transmission territory of the getting node. Amid this time the MAC layer will transmit every parcel with the getting node as MAC end of the line a few times. Fig. 1 demonstrates the reenactment territory with the positions for all happening transmissions plotted in. A ring of an expanded number of transmissions is seen outside the transmission territory of the getting node, a direct impact of connection breaks and resulting retransmissions.

III. RELATED WORK

Akyildiz et al. conducted an in-depth, layer by layer survey on wireless sensor networks [15]. Power efficiency is an important consideration in network layer. So, energy-efficient routing is essential to improve the network performance. Different routing schemes like maximum power available route, minimum energy route, minimum hop route and maximum minimum available power node route are discussed by authors. Authors also discussed various network layer schemes like flooding, gossiping, directed diffusion, Sensor Protocol for Information via Negotiation (SPIN), Small Minimum Energy Communication Networks (SMECN), Low-Energy Adaptive Clustering Hierarchy (Leach), etc. Arvind Shankar and Zhen Liu worked to improve the lifetime of the network by introducing a distributed routing algorithm and analysed it theoretically [4]. It works for static network and slowly moving networks.

Baisakh et al. worked on Energy Conscious DSR (ECDSR) [6] by introducing the concept of energy saving and energy survival in DSR protocol. Energy saving was introduced in route discovery stage by modifying the dynamic jitter and replacing it with residual energy related jitter in intermediate node. The jitter is inversely related to residual energy. In any node reaches low power, energy survival stage is initiated. In this phase the low energy node broadcasts an alert message and the other nodes which receive this alert message will delete all the routes which has low power node. This method increases the lifetime of the network. Their ECDSR outperformed traditional DSR protocol but suffered network overhead for large networks.

Santivanez et al. worked on the scalability of Ad Hoc Routing Protocols [3]. They defined scalability and conducted an analytical study on scalability of various routing protocols like PF, SLS, DSR, HierLS, ZRP and HSLR with respect to network size, mobility, and traffic. Authors analysed that HSLS protocol outperformed HierLS protocol in term of scalability. Chipara et al. proposed a Real-time Power-Aware

Routing protocol for wireless sensor networks [2], which used dynamic power adaptation algorithm and achieved application required delay. This protocol improved the power consumption aspect with respective to other energy efficient protocols.

Kush et al. proposed an energy aware scheme [7] for Manet based on energy level of intermediate nodes. Authors aimed to provide a long lasting, efficient and stable route from source to destination. This scheme is implemented in route reply stage (RREP) of modified AODV protocol. Intermediate nodes participate in communication only if there energy level is more than threshold level. In this scheme distance between neighbour nodes is calculated and data is forwarded to nearest active nodes. There simulation indicated the enhancement of protocols performance and provided robustness to mobility. There is a good improvement in the performance of AODV protocol. Tamilarasi et al, proposed a modification to the DSR protocol [8] for improving scalability and reduce energy consumption. To reduce the network overhead DSR cache is replaced with routing tables. In this modified DSR energy consumption is reduced by tuning the transmission power based on the distance between transmission node and receiving node. The distance between the nodes is calculated based on the time taken by route reply to reach the node from the neighbouring node. The simulation using GloMoSim simulator showed the improvement in the power consumption and control overhead.

Yottttg-BaeKo and Nitin H. Vaidya proposed a reactive routing protocol named Location-Aided Routing (LAR) [9] which uses location information details from global positioning system in route selection. Authors proposed two schemes namely LAR1 and LAR2. In LAR 1 route search is limited for only a small zones called expect and request zones. In LAR 2 the route is selected based on nodes distance from destination. Request zone contain the source node and the destination expected zone. When compared to other reactive routing protocols this protocol has less overhead and uses less energy for routing but its overall energy is more due to the use of GPS. Barati et al. conducted a performance analysis of energy consumption of AODV and DSR reactive routing protocols [11]. They simulated AODV and DSR protocol using ns2 under the influence of varying traffic pattern, node mobility speed, density of nodes and simulation area. This analysis shows that DSR protocol consumes less energy when compared to AODV protocol.

Doshi et al, proposed a minimum energy on-demand (reactive) routing protocol for Ad-hoc networks [5]. They discussed and implemented features like route energy cost comparison to select best route, transmission power control and minimum energy route discovers to conserve energy. They highlighted the importance of efficient catching techniques to store the minimum energy routeing information. Authors tested there protocol by conducting a simulation and also in real-time test bed containing wireless cards and laptops. Bilandi et al, conducted an analysis of existing six popular routing protocols based on users point of view [10]. They simulated AODV, DSR, LAR, OLSR, STAR and ZRP protocol using QualNet simulator and analysed packet delivery ratio, throughput, end-to-end delay, battery power consumption, average hop count for connection, packets drop, and average jitter for receiving packets. Their analysis shows that the reactive routing protocols consume less energy compared to proactive or hybrid protocols.

When using LAR, any node needs to know its physical location. This can be achieved by using the Global Positioning System (GPS). Since the position information always includes a small error, GPS is currently not capable of determining a nodes exact position. However, differential GPS5 offers accuracies within only a few meters. In the LAR routing technique, route request and route reply packets similar to DSR and AODV are being proposed.
Ahmed et al. conducted a survey on routing and information dissemination algorithms for wireless sensor networks. Authors reviewed these algorithms in term of design goals, assumptions, operation models, energy models and performance metrics. Some minimum energy and maximum lifetime protocols are discussed by authors. They are Direction Diffusion, PEGASIS and LEACH protocols. Power-Efficient Gathering in Sensor Information Systems (PEGASIS) protocol is an energy efficient protocol for WSN which is 100 to 300

IV. Buffer Zone Algorithm

The buffer zone arrangement is focused around characterizing nodes as safe or unsafe, and either utilizing them as hand-off nodes, on the off chance that they are protected, or dodging them as transfer nodes in case they are perilous. Additionally, activity to unsafe nodes inside the sending node's transmission range ought to be endeavored transferred through protected nodes, if conceivable.
par The signal quality of the Hello packets can be utilized as parameter to have the capacity to figure out which nodes are in what is viewed as the safe zone and the perilous zone with changing portability speeds. In any case, different methods for deciding this are likewise conceivable, including the utilization of GPS.

The zone status of each one neighbor must be added to each one connection entrance in the Hello parcels and affirmed to the different neighbors, so as to help neighboring nodes in directing movement to its risky neighbors. It is essential to abstain from directing a packet to a transfer node which has the goal as a unsafe neighbor, if the source node moreover has the goal node as a unsafe neighbor.
par Fig 2 contrasts standard OLSR directing with OSLR directing with the proposed cushion zone calculation. The dashed shaft demonstrates the typical steering, where all packets from A to C are transmitted specifically to node C. This makes the transmission helpless against portability on the off chance that node C move far from node A. The consistent bolts demonstrate the bundle way utilizing the zone calculation, where activity from node A to node C is directed by means of node B, in light of the fact that node C is in the hazardous cushion zone of node A. This implies that the activity way is not helpless against node C moving out of the transmission region of node A.

The directing table of every node is initially figured based just on nodes in the safe zone, and if this prompts dividing, courses by means of nodes in the risky cushion zone are incorporated in the steering table. The guideline of cushion zone steering is to just utilize nodes as a part of the safe zone to forward movement. The nodes in the risky cushion zone ought to just be utilized for sending on the off chance that it is difficult to acquire full network without them. As the neighbor set, two-hop neighbor set and topology set are crossed, no course overhauls to the as of now characterized courses are permitted. This implies that if a node as of now is spoken to in the directing table as an objective, the recently discovered course to the same objective is disposed of, regardless of the possibility that it is of less bounces than the first course. The steps of the cushion zone directing calculation are appeared

1. Clear routing table.
2. Add route to all neighbors (1st time: only neighbors in the safe zone).
3. Add 2hop neighbors
3.1. Add route to all 2hop neighbors that both are in the safe zone of the relaying neighbor and where the neighbor is in the routing table.
3.2. Add route to all 2hop neighbors that are this nodes neighbors with direct route.
3.3. Add route to all 2hop neighbors in the unsafe zone of their neighbor while the neighbor is in this nodes safe zone.
3.4. On 2nd iteration: Add 2hop neighbors in the unsafe zone of their neighbor while the neighbor is in this nodes unsafe zone
4. Add route to all topology tuplets with increasing hop count.
5. If first time, return to step 2, else exit.

1) Rerouting Time Factors: Despite the fact that there are such a large number of variables , like the vitality level of the node, transmission extent, system topology, and so on., which influence the rerouting time, node speed and movement burden have more effect on this MANET execution parameter.

Node Velocity: Reducing the node speed lessens the quantity of happening connection breaks. The Rerouting time increments with an increment in the node speed. With lessened speed, the likelihood of a connection break because of a neighbor moving out of the transmission region is lower, just due a to lower node speed. Subsequently, the edge extent can be effectively be set higher, to attain to the same playing point, while the inconvenience of expanded way lengths is decreased [5].

Traffic Load: When the whole ‘network is pushed with an expansive number of unnecessary transmissions and expanded bundle misfortune, it leaves a lower offer of the aggregate system ability to the effectively transmitted movement. The blend of apportioning and lessened retransmissions in the occasion of connection breaks makes the throughput higher for the lower limits. Be that as it may, because of the dividing, the packets are very prone to travel just a couple of hops, subsequently expanding the shamefulness between the short way and the long way movement [5]. In synopsis, the rerouting time is specifically proportionate to the node speed and activity load, i.e., an increment in the node speed and movement burden, would the expand rerouting time.

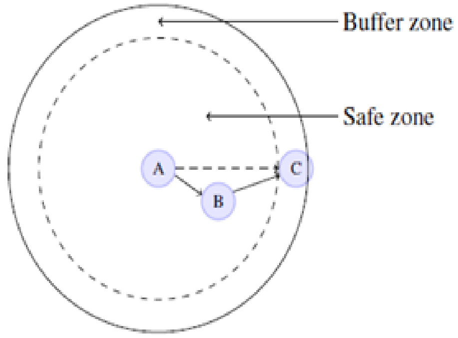

Fig. 2. Tranmission Zone Area

A. *Analysis of the effects of link breaks*

The queuing situation is created by connection breaks. At the point when a node loses its transmission to its neighbor, the steering convention searches for the following accessible option briefest way. These connection breaks must be distinguished much prior, to dodge such situations. Looking into the points of interest of this preventive component is out of this present paper’s degree. The typical system for recognizing connection breaks for a steering convention is through lost surveying parcels (i.e. lost Hello bundles).

The Hello packets of the OLSR are transmitted between one-bounce neighbors at a detailed time recurrence (e.g. like clockwork, which is the prescribed transmission recurrence of the OLSR) and give neighborhood network data, and a methods for connection break identification. On the off chance that no Hello packets from a neighbor is gotten inside a defined time interim (e.g. inside 6 seconds, the prescribed interim of the OLSR), the neighbor is viewed as inaccessible, and a connection to this neighbor is considered as broken and invalid.

An alternate path for the directing convention to discover connection breaks is to abandon it to a component, actualized at the basic connection layer. The directing convention should then be advised unequivocally around a connection break by the connection layer. The detriment of this Link Layer Notification (LLN) methodology may be the expense of extra usage many-sided quality. Notwithstanding, the playing point is that the connection layer is ordinarily ready to recognize the connection breaks sooner. Transmission with the cradle zone or the cushion zone calculation concentrates on connection break recognition through lost Hello parcels.

It is imperative for the general execution to catch the connection soften up an auspicious design, since two negative impacts happen in the period between the physical connection break and its identification by the directing convention. To start with, the parcels lined in the interface line are checked with an inaccessible next bounce address. This implies that these bundles will never achieve their goal, and are as of right now lost. Second, these parcels will be endeavored to be transmitted a few times by the MAC layer before they are tossed. This will take significant medium time from bundles

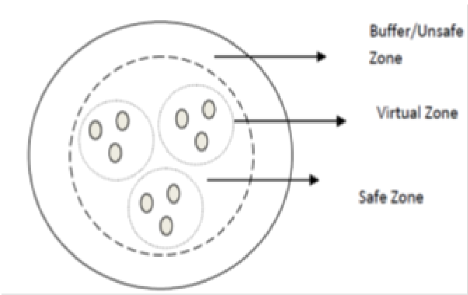

Fig. 3. Tranmission Zone Area

transmitted from different nodes with a legitimate next bounce address.

V. PROPOSED MODEL

This model shows the key behavior of enhancing the buffer zone routing algorithm. When the nodes get to be live, they impart among themselves and overhaul their particular steering tables. This stage is known as the neighbor revelation stage. After this, every node is mindful of its single, twofold and different bounce neighbors. Alongside the neighbor data the node's virtual zone data is likewise upgraded in the directing table. This data is then utilized, while settling on a steering choice. Virtual Zones are shaped alertly, based on the closeness of the nodes. A Virtual zone arrangement could be performed at whatever point there is a change in the starting topology or it might be possible on an intermittent premise. Fig. 3.presents a thought regarding nodes gathered in virtual zones inside the safe zone.

At whatever point a node moves out of a virtual zone, it imparts the same to its neighbors by means of the HELLO packet. At that point the neighbors upgrade this data in their individual steering tables. Subsequently, at any given purpose of time, the nodes are mindful of their neighbor's virtual zone area. As all the nodes have the data about their neighbor's virtual zone data likewise, alongside other data in their steering table, directing inside the virtual zone is upgraded, with least diminishment in the aggregate number of hops and rerouting time. This methodology increases the routing performance and decreases the rerouting time within the safe zone. The best case scenario would be, when the source and destination nodes are within the same virtual zone, and the worst case scenario would be, when either the source or destination is within the safe zone. When the source or destination or neighbor or anyone of the multiple hop neighbors is within the virtual zone, the scenario would be an average case.

VI. MATHEMATICAL MODEL

In this model first we calculate local bandwidth, will derive this bandwidth by considering this equation. The minimum amout of time required to transmit a data packet

T = Tr$_{m}sg + Tmac + Tframe$

Tr$_{msg}$ - time consumed by the RTS, CTS, ACK routing messages overhead.

No. of Nodes	6 and 25
Area Size	500 X 500
Mac	802.11
Routing protocol	OLSR
Simulation Time	10mins
Traffic Source	CBR
Packet Size	512 bytes
Antenna	Omni Antenna
Speed	5,10,15,20 and 25

Fig. 4. 25 nodes flow transmission

T_{mac} - time consumed by DIFS, SIFS, Backoff intervals i.e. MAC overhead.

T_{frame} - time needed for single data frame transmission.

Local bandwidth available BWl$_{local} of anode$

BW$_{local}$= ω BWlocal + (1- ω)(T$_{idle}/T_p$)BW$_{channel}$

Calculation of neighborhood bandwidth as

$BW_{c-neigh}$= ω BW$_{c-neigh}$ + (1$-$ ω)(Tidle contention/Tp)BW$_{channel}$

Neighborhood available bandwidth as

$BWc - neigh = \omega$ BWc-neigh + (1-ω)(Tidlecontention/Tp)BWchannel

Data packet transmission as $Tdata$ =Trts+Tcts +Tack+Tdifs+3Tsifs+(P+Q)/BWchannel

VII. SIMULATION STUDY

In this section we are discussing about performance report of proposed model. In order to analyze statics report of proposed network model, I have evaluated various scenarios for determining performance report of extended buffer zone and OLSR model by employing various experiments. However rerouting always impact on performance, the entire study has concerned with virtual zone with performance prospective. In any mobile networks rerouting always consumes energy; the entire study described various buffer zone solutions and its impact on performance report. According to my research work, the main aim is to produce better virtual with better performance by computing different scenarios. In this chapter I am describing about performance report and I am presenting results by presenting different models performance report and its comparison.

Simulation Results Table 1 summarizes the simulation parameters used

Fig. 5. Routing Flow

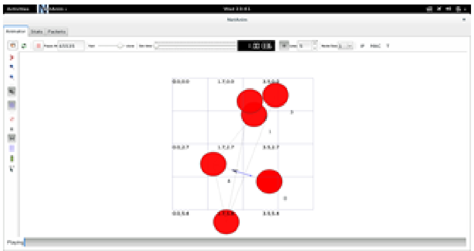

Fig. 6. 6 nodes network topology

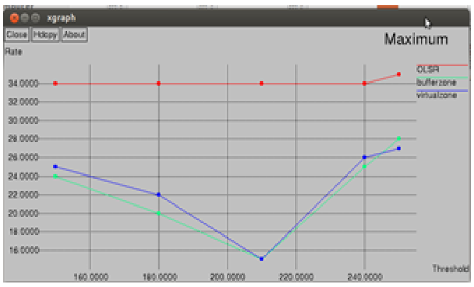

Fig. 7. Maximum Retransmission caused performance

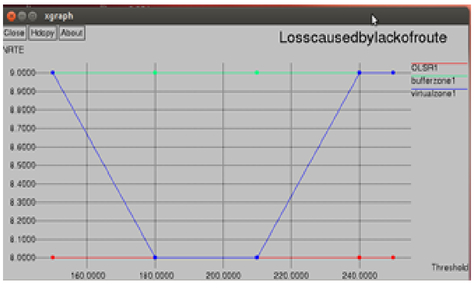

Fig. 8. Loss caused by lack of routing

VIII. Conclusion

The introduction of a transmission buffer zone in OLSR gives improved throughput compared to standard OLSR (or compared to no buffer zone, which is approximately equal to standard OLSR). The advantage of using a buffer zone is observed both for low and high traffic loads. A too large buffer zone, however, leads to an unnecessary higher mean number of hops between pairs of nodes in the MANET and a higher probability of network partitioning. Thus, the size of the buffer zone should be optimized. The optimal size of the buffer zone (which is given directly by the optimal threshold range of the buffer zone algorithm) is increasing with increasing node mobility. At no node mobility, the optimal size of the buffer zone is zero, assuming that all link breaks are caused by mobility. However, in a realistic network scenario where link breaks are also caused by changing radio conditions, it is reason to believe that the buffer zone algorithm is useful also at no mobility.

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