Improving the Network Performance using MP-OLSR Protocol for Wireless Ad Hoc Network (MANET)

B.Naveen Chandar, Arivazhagan.N, Venkatesh.K

Abstract—MP-OLSR is the abbreviation of Multipath (Optimized Link source Routing) Protocol which is also known as hybrid protocol, that helps to increase the path in OLSR which clearly works on proactive routing protocol specifically developed for Ad Hoc Networks. Wireless Ah Hoc Networks are one among the emerging technology with many operations. This network has some uniquecharacteristics like shared co-operation, dynamic topology and wireless medium.MP-OLSR protocol has the potential to achieve dynamic exchange of data without relying on one base station or a backbone wired network and it is also capable of handling the intermittent exchange of data to manage the topology information for the network also it maintains the design of on-demand routing table and the packets will be forwarded to multiple paths. Here, we propose an idea for enhancing the Multipath-OLSR by using Clustering Algorithm which helps to avoid link failure and recovering the route and also routing protocol to reduce traffic delay and overhead of network that eventually increases the throughput and delivery ratio of a packet.

Keywords—Cluster, Ad Hoc Network, Multipath- OLSR.

I. INTRODUCTION

These days, we have a huge demand for self-formulation, quick deployment of wireless Ad Hoc Network also comes with the improved wireless portabletechnologies. When compared with the previous wireless networks, Ad Hoc Network does not rely on the existing infrastructure where it does not need any wired or base station. This gives a resourceful outcome during quick search, rescue mission or at the battlefield where the fixed base station inaccessible and undesirable. Also for business applications like electronic classroom, conference and conversion center an instant deployment of all-on-air network gets the user a more adaptable and cheaper way to distribute information. The Architecture of Wireless Ad Hoc Network (MANET) is shown in Fig. 1.

B.Naveen Chandar*, Department of Information Technology, SRM Institute of Science and Technology, Kattankulathur, India.
Arivazhagan.N, Department of Information Technology, SRM Institute of Science and Technology, Kattankulathur, India.
Venkatesh.K, Department of Information Technology, SRM Institute of Science and Technology, Kattankulathur, India.
Corresponding Author: bnaveenchandar@gmail.com

But still, due to the instability and the dynamic characteristic of wireless Ad Hoc Network, the traditional wired networks routing protocol doesn't have the capability to be an Ad Hoc Network. So, there are a lot of proposals based on unipath routing protocol for Ad Hoc Network.In the past few years,more and thenthere were a lot of proposals based on single TCP routing protocols like Destination-Sequenced Distance Vector (DSDV), these protocols do consistently find multiple routes between sender (source) node to receiver (destination) node. But it does have some adverse circumstance like while using DSDV (Destination-Sequenced Distance Vector) protocol with TCP Reno Algorithm, the transmission between source and destination will experience a huge lag, which makes the packet drop count high and due to this more number of packet delay will take place,since the transmission throughput between the nodes are affected the range calculation is also being disturbed, which reduces the amount of data received to the destination. here is also a protocol named OLSR (Optimized Link State Routing) Protocol[1][2], which is a specially designed proactive unipath routing protocol for wireless Ad Hoc Network. This protocol can change the control message intermittently to make sure that each and every single node is familiar with its topology of the entire network since it's a table-driven protocol. It also reduces the flooding in control traffic and also gains the stability of link state protocol by using specifically selected nodes which is known as Multi Path Relay (MPR)[3].
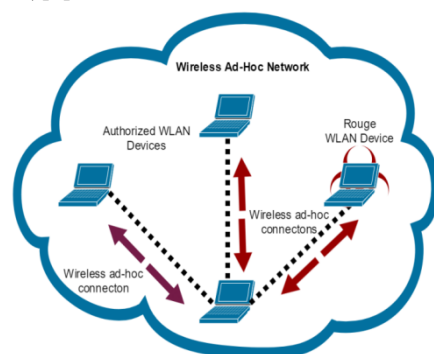

Fig.1. Architecture of Wireless Ad Hoc Network (MANET)

Considering the previous solutions. In this paper, we are going to talk about a new multipath routing protocol known as 'MultiPath – Optimized Link State Routing Protocol (MP-OLSR)' which is based on Multipath TCP and OLSR for supporting load balance, fault-tolerance and highly aggregated bandwidth[4]. This protocol transfer's control messages intermediately as OLSR do to get the entire information about the topology for the whole network.

Depending on the information from the topology, we use *MultiPath Clustering Algorithm*[5][6]to process and find multiple paths for routing. Using this algorithm we can easily get the Shortest Path First (SPF) for multiple routes while the packet is being transmitted. Also in this network, packets are being forwarded to the destination from the source with the help of a mechanism named Semi-Source Routing. To make sure that it also meets the requirement of a reliable transmission, we use a strategy like multiple descriptions coding during the data transmission. Thus making this paper marginally more resourceful than the previous work. At first, we are going to propose a MultiPath Routing Protocol based on MP-OLSR and Clustering Algorithm which allows us to find multiple different paths for routing. Even routing recovery from intermediate nodes is included too. Secondly, using the multiple description coding (original) we can accomplish multiple routes.

The remaining part of the paper is ordered as follows. In Section II there will be a brief review on the related works of both existing and proposed work. Then in Section III we will discuss on the existing protocol. The detailed view of our proposed work will be explained in Section IV. The performance Evaluation on the proposed work will be done in Section V and the paper will be concluded in Section VI.

Mobility will not be considered for the Base Station and also for the sensor nodes in the previously used routing protocol; so, therefore this will not be used directly to the wireless MANET. Here the routing protocol should consistently work on both routing the data packages properly and make sure to avoid all the connectivity problems which occurs in the wireless MANET. Or in other condition, there will be a huge loss of data packages due to fizzled links, apart from these reasons like instant demise of nodes for sensor or commotion produced by the wireless link [7]. In this phase, [E2 R2] the protocol of Reliable Routing and energy efficient which is also known as protocol of novel routing has been proposed for network of sensor which is a wireless type and also an hierarchical one. The real objective is to accomplish efficiency on energy and provide connectivity between the nodes which helps the packets to transfer to the destination using a suitable path by which we can avoid using mobility to the nodes that will end up in connection failure[8]. So an adequate throughput can be achieved at the base station by using the proposed routing protocol.

With the help of this protocol, the storage necessity will be minimized and the large part of the burden on computing will be taken to Base Station where it is also known as resourceful node. The Base Station is the one which creates the cluster nodes, where every cluster will have a node called (CH) Cluster Head and two nodes which will be represented as (DCH) Deputy Cluster Heads[9]. This composition will help the single Cluster Head node to reduce its load and then the Deputy Cluster Head node will manage the connectivity and mobility of the packet. The author depends on the evaluation mechanism to guarantee the throughput to its level of expectation on the Base Station. On the off chance that the throughput gets reduced concerned with packet delivery by the Base Station, then a message will be sent by the Base Station to the Cluster Head node and the Cluster Head node will then check the entire connectivity of its current cluster position and the Base Station will receive the report based on the evaluation done[10] [11]. If the degradation of throughput occurs because of connectivity loss, then the necessary steps will be taken by the Base Station which will change the process of re-clustering (or) the headship. Also it will be an overhead or energy consuming process when it comes to frequently selecting the Cluster Head (or) initiating the re-clustering process entirely.

So as to decrease it, a notion of CH panel has been introduced by the author, which decides the Deputy Cluster Head and Cluster Head role for the appropriate node[12]. This is applicable for a long period of time, which will be prepared during the system setup. Another decisive priority of [E2][R2] is to schedule the nodes for lethargic and dynamic state. Contingent upon the nodes density within a cluster few among the sensor nodes are scheduled as lethargic in state, so that disregarding the latent condition of these nodes the problem due to coverage will not emerge or the gathered tangible information does not become deficient[13]. The Cluster Head nodes based on the proposed protocol will not directly communicate with the Base Station. As for the alternate path multi-hops are used on the Base Station by Cluster Head nodes which will be maintained and used as a path for alternate.

The idea of spanning tree has been utilized[14]. In case of connection{link} failure, exertions are made to reduce the time taken for recovery by providing a path of alternative for the endued node. Since the nature of the protocol proposed is hierarchical, it will be more energy efficient and scalable. In addition the protocol proposed is also fault tolerant, which means as in the presence of connection{link} failure or nodes, the entire control obligation is given to some alternate nodes which are suitable for the process, so that the performance of the organized network will not get significantly degraded. Whatever which is left of the part is organized as purses: section expresses the problem of reliable routing and energy efficiency in wireless MANET. Section depicts the protocol proposed in detail pursued by section in which the analysis and stimulation results are being reported[15]. Al last, the work in section will be concluded referencing the future extent of the work.

Types of Protocol

There are various types of routing protocol being used in MANET. Here every routing protocol has its own upsides and downsides in different situation. The routing protocols in MANET have been categorized into three types that include Hybrid Routing Protocol (OORP, ZRP, TORA and HSLS), Reactive Routing Protocol (ABR, DSR, ACOR, and AODV) and Proactive Routing Protocol (WRP, OLDR and DSDV).

(i) Proactive Protocols

In proactive routing, the protocol is also called as table-driven routing protocol, here each and every node holds up a routing table which contains all the nodes route information. The calculation for the routing table will be made before it's needed because it intermediately exchanges the information in order to keep the table updated. In this way, we can reduce the latency and will have high control over it. Where OLRS and DSDV are RREQ packet that has TTL for validationof time for the packet in network. Where RREQ is the best example for proactive protocols.

(ii) Reactive Protocol

Reactive routing can also be known as on-demand routing, where a node tries to find another node only when it's necessary.

But still, whenever it couldn't get the route immediately, the reactive routing network will have a longer delay. Dynamic Source Routing (DSR) is a well-recognized protocol for reactive routing. Using DSR we can identify the forwarding *hop* with the next nodes address by the exact route list displayed in the packet's header. This procedure gets repeated until it approaches the destination node. These protocol has high latency but at the same time it has low overhead towards routing information.

(iii) Hybrid Protocols

These kind of protocol have consolidated features for proactive and reactive protocol where it takes advantage on both category, thus hybrid protocol will proceed with less time on discovering a route with no overhead on routing information. TORA and ZRP will be the best example for hybrid protocol.

II. RELATED WORKS

A. TCP Fast Re-Transmit

According to this literature [16], the author discussed that TCP (Transmission Control Protocol) will be responsible for the reliability of all the transmission of data in TCP/IP Standard. Consequently, it needs to recover all the lost packets through propagation of data and re-transmit the packets after it gets three duplicate acknowledgments. Thus increasing the networks total delay by waiting for the duplicate acknowledgment. Also the author in [17], prospected a concept like "*Proposed-TCP*", where by using the wireless Ad Hoc Network and multiple end-to-end metrics it can identify all the lost packets as a result of congestion, failure of routing and channel error (wireless). In [18], the author suggests an evaluation on the behaviour of TCP in macroscopic manner in order to combine various source and routing algorithm using Dumbbell Topology, to gain on fairness index and throughput. So, we use TCP Reno and TCP Cubic for selecting the nodes and PFIFO (Packet First-in-First-out) with CoDel (Controlled Delay) mechanism is used for selecting the routers which helps to improve the throughput, but in high BDP situation its performance is enough.

B. Reactive and Proactive Routing

These reactive and proactive routing are the main two kinds of protocol used in Ad Hoc Network [19].

Reactive routing can also be known as on-demand routing, where a node tries to find another node only when it's necessary. But still, whenever it couldn't get the route immediately, the reactive routing network will have a longer delay. Dynamic Source Routing (DSR)[20] is a well-recognized protocol for reactive routing. Using DSR we can identify the forwarding *hop* with the next nodes address by the exact route list displayed in the packet's header.

In proactive routing, the protocol is also called as table-driven routing protocol, here each and every node holds up a routing table which contains all the nodes route information. The calculation for the routing table will be made before it's needed because it intermediately exchanges the information in order to keep the table updated. In this way, we can reduce the latency and will have high control over it.

C. MultiPath Transmission

Here Multipath transmission protocol is generally used as a backup routing. In [21], the author represents a scheme known as AODV-BR, which creates a mesh and develops alternative multiple routes so it can improvise the on-demand protocol. But since it's a backup route during the transmission only single path is used. Also in [22], the author states another on-demand protocol known as SMR (Split Multipath Routing) which organizes and uses the maximum out of the multiple paths. But a pure source of routing strategy will not work on dense network. A Multipath OLSR source routing presented in [23] used SPF (Shortest Path First), but the elimination of node for multiple times the Dijkstra algorithm can't work for inadequate networks.

D. Cluster Formation

We further deliberate about the internal operational component of that protocol for blockage mitigation. Subsequently, we provide a complete analysis regarding the different metrics of performance for these protocols to legitimize in which situation these specific classes of protocols should be deployed [24]. In light of the analysis on performance, we complete that the action of each class varies based on the protocols with their types of application deployed and the network congestion cannot be accurately detected by a single metric.

(i) Bandwidth Constraints

When comparing the bandwidth for the wireless connection with wired analogue it is much lesser than anticipated. But still for sure, few GBPS are accessible for the wired LAN, however, nowadays; the economic based applications related to LANs based on wireless normally works for 2 MBPS.

(ii) Energy Constraints

The intensity of the batteriesis being restricted in each and every devices, which is not going to allow the nodes to operate for infinitive time. Consequently, energy must not be squandered and that is the reasons to apply the algorithm for conserving the energy have been put into action.

(iii) High Latency

Here the nodes are computed by the conservation of energy design to stay idle or got to sleep while they are not transmitting any data. At the point when two nodes exchange data between them through the idle or sleeping nodes, then it might experience high delay because the routing algorithm have to awake the idle nodes.

III. PROBLEMS IN EXISTING SYSTEMS

Although DSDV (Destination-Sequenced Distance Vector) protocol is one of the most popularly known table-driven routing protocol for wireless Ad Hoc Network [25]; Since this routing algorithm is based on the total number of hops to its destination where the transmission of all data packets are done between the nodes using the node values stored in the routing table, DSDV protocol requires a legitimate update for its routing table, which drains up the batteries capacity and a tiny load of bandwidth even though if the network is still idle.

OLSR ('Optimized Link State Routing') protocol belongs to protocols like link state, so it gives the connection{link} promptly when it is needed because the protocol nature is proactive. In OLSR the messages will be controlled (or) the links will be flooded to keep each and every node among the network updated.

Rather than forwarding the messages which are controlled to every node, OLSR can forward it to a specifically selected node using Multi-point relay. The main task if this Multi-point relay is to scatter the information within the network.

Also, this protocol consistently maintains three major attributes like: (i) trying to diminish the high availability of routing overhead, (ii) avoiding loops, (iii) to reduce the routing count to infinity which makes the topology whenever it changes its network, before the re-converges of the network it is mandatory for the routing table to update a new set of sequence numbers, thus making Destination-Sequenced Distance Vector (DSDV) protocol not sustainable for highly productive networks.

When DSDV protocol is being using in a Fast-retransmit algorithm also known as TCP Reno algorithm it faces some major drawbacks like when the transmission between source and destination will experience a huge lag, which makes the packet drop count high and due to this more number of packet delay will take place, since the transmission throughput between the nodes are affected the range calculation is also being disturbed, which reduces the amount of data received to the destination. This happens because the TCP Reno algorithm works with a principle based on Tahoe like slow-start and a rough gain over the re-transmit timer, which do avoid the congestion between the nodes but it couldn't produce high stability and throughput when being used in larger networks. A sender is required for the Fast Re-Transmit to set cwnd=1 in light of the fact that the pipe has been depleted and there are no ACKs arriving for pacing the transmission. Depletion of the pipe can be often avoided by allowing the sender with Fast-Recovery technique and also it enables to move from cwnd to cwnd/2 with the space of single RTT. TCP Reno is also known as TCP Tahoe when it's been expanded with Fast-Recovery. The thought is to utilize the arriving duplicate ACKs to speed up the re-transmission. We made a presumption that each arriving duplicate ACKs shows that by following the lost packets some data packets can be delivered successfully; where it doesn't matter which one. Also by discovering the lost packet using Fast Re-Transmit, we can set cwnd=cwnd/2; the next stage is to find out the number of duplicate ACKs which we have to wait before we can continue the new data transmissions. At first, we should make sure that the lost data packet is just one, however in the remaining section we can see that multiple numbers of losses can be controlled with a slender modification on the Fast-Recovery technique.

For instance, let's consider in TCP Reno the sender's node becomes *min(anod, cnod+ndupl),* here *anod* stands for the receiver's advertise node, *cnod* is for the sender's congestion node and *udupl* will be kept 0 as far as the number of Duplicate Acknowledgement reaches its threshold, then the duplicate ACK will be tracked. Therefore, when the Fast Recovery is being performed the sender "escalates" the nodes based on the received number of Duplicate Acknowledge. In reference to the observation, it indicates that each Duplicate Acknowledge has some packet loss after the transmission is completed.

TCP utilizes different algorithms based on avoiding network blockage. In network, these congestion happens when a node or connection{link} is conveying too much of data that its characteristics on service gets neglected. TCP Reno will be the algorithm that re-transmits fast and recovers fast. This algorithm is very easy and successive for transmission of data. This new algorithm will help to keep the correspondence path {"pipe"} from moving empty when the 'Fast Re-Transit' is done, in this way we can avoid the need to Start-Slow to re-fill when an individual packet is lost. If the receiver gets the duplicate ACK, then it will represent the pipe having an individual packet.TCP Reno will assess the accessible bandwidth by actuating the lost packets in the network. At the point when there are no losses in packet transmission, TCP Reno keeps on expanding its size of window one by one, with the trip time of each round. When it encounters loss of packets, the current size of the window will get decreased by one half of it. This is known as additive increment and multiplicative decrements. TCP Reno diminishes the loss in packets to evaluate the traffic in the network. During every round trip the size of the window gets increased continuously by TCP Reno.On the off chance when the packet gets lost, at that point it reduces the window size to one portion of the present estimated window size.This procedure is known as additive increment and multiplicative decrements. TCP Reno occasionally updates the window size. If there is an occurrence of, an off chance that a packet gets lost, at that point the packet that got lost will be re-transmitted to the accessible bandwidth. The window size on the receiving end is totally dependent by the delay of the round trip in the connection. On the off chance when the connection speed gets increased, at that point the window estimated size will shortly increase. TCP Reno neglects to accomplish the decency since TCP isn't a synchronized based plan.It can just maintain a strategic distance from the clog in their exist limit. At the point when a message is send it will begin with moderate speed and after that it will naturally cover the transmission speed.

Disadvantages:

- Existing protocols for routing revealed that not to be concerned about the portability in nodes of sensor and with the BS, and so for this reason, it will not be directly relevant for the versatile .In mobile, the link for communication may come up and gets failed very frequently. Subsequently, the protocol for routing needs to deal with the issue in connectivity and with addition on its setup too. The packets with data are to be directed on taking this issue of connectivity under consideration. Or else, there will be a huge loss on packets with data due to the fizzled interface separated from every other reason like, intermittent death on nodes of sensors (or) the wireless connections noise.

- None of the current conventions can accomplish all the following objectives at the exact time:

➢ Ensuring unwavering quality in an energy-efficient way in the presence of BS portability and nodes.

➢ Managing versatility of the acquired nodes and keeping up the connectivity with all the alternate ways it can.

➢ Limiting message overhead and overpowering the less dependable wireless connections.

IV. PROPOSED METHOD [MP-OLSR]

Here MP-OLSR is considered as a hybrid of multipath routing protocol. It is a combination of MultiPath TCP and OLSR.

It can send out both *HELLO* and *TC* message instantaneously across all the nodes in the topology to make sure that all the nodes are aware of the entire network, which is similar as OLSR.

Before we move on let's get brief idea on Multi-path TCP and OLSR. MultiPath TCP is also known as MPTCP[26], which is an extension of Transmission Control Protocol (TCP) that authorizes an individual connection to split across multiple networks. For instance, a connection is established from source to destination using a single network, when the connection is established the source node will be aware of the destination nodes IP addresses, with that help the source node can open up further sub-flows towards the destination node. Each and every sub-flow is considered as a typical TCP connection when being transported through the network. In MPTCP it can essentially use different port numbers (or) IP addresses using a single IP address from the source (or) destination node during the transmission.

Optimized Link State Routing Protocol (OLSR) [27], is a table driven pro-active routing protocol for wireless Ad Hoc Network which optimizes the information flooding mechanism of the entire topology by cutting down the amount of connection that are displayed and also by setting up the message control to a group of MPRs (MultiPoint-Relay) it condenses the forwarding number of nodes at every topology. Information control also known as (TC) Topology Control Message, which has the set of MPR Selector for each nodes across the network and it only gets emanated by the selected nodes as MPRs (MultiPoint-Relays), this makes OLSR quite adequate on the utilization of bandwidth and calculation of the path. Optimized Link State Routing protocol is uniquely designed to process in a distributed pattern, thus it can provide load balance, fault-tolerance and highly aggregated bandwidth.Based on these two protocols MP-OLSR (MultiPath-Optimized Link State Routing) protocol works on transmitting the data between nodes without any backtracking issues.

'MP-OLSR (Multi-Path Optimized Link State Routing) protocol', which is based on Multipath TCP and OLSR for supporting load balance, fault-tolerance and highly aggregated bandwidth. This protocol transfer's control messages intermediately as OLSR do to get the entire information about the topology for the whole network. Depending on the information from the topology, we use MultiPath Clustering Algorithm to process and find multiple paths for routing. Using this algorithm we can easily get the Shortest Path First (SPF) for multiple routes while the packet is being transmitted. Also in this network, packets are being forwarded to the destination from the source with the help of a mechanism named Semi-Source Routing. To make sure that it also meets the requirement of a reliable transmission, we use a strategy like multiple descriptions coding during the data transmission. Thus making this paper marginally more resourceful than the previous work. At first, we are going to propose a MultiPath Routing Protocol based on MP-OLSR and Clustering Algorithm which allows us to find multiple different paths for routing. Even routing recovery from intermediate nodes is included too. Secondly, using the multiple description coding (original) we can accomplish multiple routes.

As discussed before MP-OLSR can send both *TC* and *HELLO* message instantaneously across all the nodes in the topology, the core functionality of MP-OLSR is to reduce the TC message so just like Optimized Link State Routing (OLSR), MP-OLSR also uses MPR (MultiPoint-Relay) to keep the routing path contained, unlike OLSR, MultiPath-Optimized Link State Routing (MP-OLSR) protocol will not be maintaining the routing table for all the nodes in the network. The multipath calculation process is done by the on-demand computation within a source node. So, only when a data packet has to be sent towards a destination node the Multi-Path computing is triggered. The main reason of using MP-OLSR is because it is capable of both forwarding packets in multiple paths and load balancing; the imperative part of load balancing is to choose the exact path for carrying the packets to the destination from the source. In MultiPath-Optimized Link State Routing (MP-OLSR) Protocol, the packets are distributed from the source to destination using multiple different paths using clustering algorithm.

Clustering algorithm is understandable and it doesn't need and extra information on network for selection of the path. Since it is capable of handling the load balance among all the miscellaneous multiple paths. This can be achieved by forming a cluster head in each and every cluster the interaction between the source and destination node from two different groups of nodes (clusters) which makes the transmission easier. To identify and select a cluster head in a cluster i.e. a group of nodes can be done by analysing the cluster and get the node with highest energy or weight, which will be considered as the cluster head for every cluster. If the cluster has more number of nodes which cannot be maintained by an individual cluster head then it creates a sub-group of deputy.cluster heads which handles the nodes by splitting it among itself. Once the structural balance of the cluster is maintained the Shortest Path First (SPF) will be found and eventually if one of the nodes couldn't balance the packet load once the MP-OLSR splits the packet for balancing the load multiple paths will be made with the help of the cluster head and deputy.cluster head for transmitting the separated packet to the destination through an individual shortest path.

MP-OLSR is a multipath protocol on routing established under OLSR. To acquire various paths an algorithm is proposed based on multipath Dijkstra. This algorithm profits on high extensible and flexibility by utilizing different connections {link} metrics and functions on cost. Also, recovery of route and detection of loop will be implemented in MP-OLSR so as to improve the service quality with respect to OLSR. The retrogressive compatibility in OLSR which depends on IP routing source will also be supported.

Advantages:

- We think about the versatility of the nodes of sensor and the BS while decisions based on routing is done.
- The thought of DCH 'Deputy Cluster Head' is utilized, which builds the lifetime of the network.
- The thought of CH 'Cluster Head' is utilized, which also builds the lifetime of the network.
- The thought of evaluationdone based on BS with respect to delivery of datawhere it will be considered.
- This protocol guarantees unwavering quality as far as delivery of data based on BS; this is accomplished using numerous switching of the paths and routes as chosen by the BS.

- We adjust a likelihood based numerical model that can be utilized for distinguishing the most appropriate path for forwarding the data.

V. PERFORMANCE ANALYSIS with STIMULAITON

A. Assumption and Environment

The algorithm proposed will be stimulated using NS-2 (Network Stimulator - 2). The architecture of Network Stimulator - 2(NS-2) is shown in Fig. 2. The capacity of the channel for the wireless hosts will be set to 11MBPS. Reflection model used in this process will be a two-ray ground model, which recognizes both ground reflection and direct model path that can be used as a radio-propagation model. Also we can use Distributed Coordination Function (DCF) for MAC layer protocol with wireless LAN of IEEE 802.11.With its capabilities, when a link breakage occurs the network layer will be notified instantly.

In this stimulation, we will be representing around 60 nodes in a 1000M x 1000M NAM (Network Animator) with a stimulation time of 350 seconds. The arbitrary waypoint wireless model will be used and the Data Packet transmission will start after 25 seconds of the stimulation so that the node distribution will be well placed, also the initial node processing like recognizing the neighbour node under a sufficient amount of time. There will be a standard transmission range of 260 meters for all the nodes.
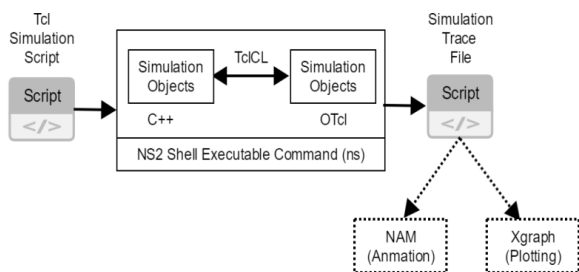

Fig.2. Architecture of Network Stimulator -2 (NS-2)

In every stimulator, 10 packets per second will be generated having a node size of 512 MB, which is done using Constant Byte Rate (CBR) here we go with 30 from the source.

B. Performance Analysis

The performance of the protocol and algorithm can be analysed or evaluated with the help of these following metrics:

1. Traffic Packet Delivery Ratio:

The traffic bandwidth for the expected approach has been enhanced than the existing method. Traffic bandwidth in kbps = (Received size / (Stop Time – Start Time)*1/60. The result is shown in Fig. 3.

Delay ratio of packet will be the ratio that is utilized to figure out the quantity of packets with data transmitted from the node at source and no. of packets got delivered at the receiver node. It is utilized to figure out the rate of loss of packets while amid transmission of data in the network. It assesses the rate of loss and measures up both the accuracy and productivity of the protocol based on Ad-Hoc routing. A

higher proportion of delivery of packets is trusted in every network.

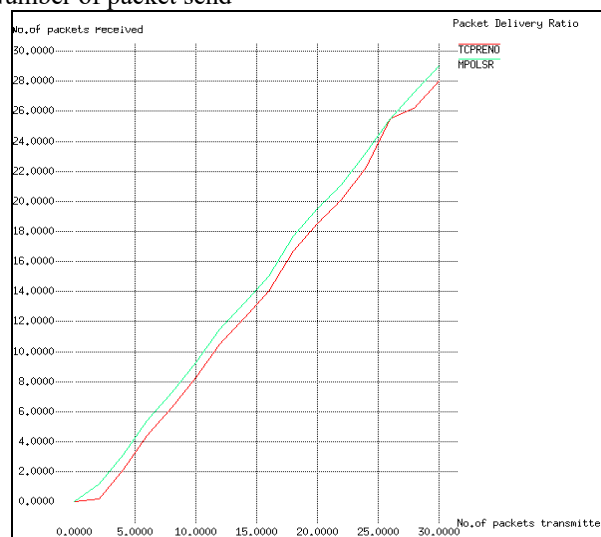'Packet Delay Ratio = ∑ Number of packet receive / ∑ Number of packet send'

Fig.3. Traffic Packet Delivery Ratio

2. Throughput:

Throughput is defined as number of packets transmitted from sender to receiver in a particular time (megabit/sec). Alsothe existing techniques of throughput analysis have been improved for the forecast technique. The average of Throughput (kbps) has been calculated and shown in Fig. 4. It has to be calculated in the standard procedure as ofthe ratio between size of the packets from the receiver side and the characteristic between the packets receivedtime with the sending time of that packet.

Throughput can be characterized as what number of packets with data gotten by recipient with in the transmission of data time or effective transmission of data performed inside a time frame. In whatever network throughput is normal rate of effectively packets of data conveyed from sender node to receiver node. Throughput is identified in bits/bytes every second. In the entire network higher throughput is most fundamental factor.
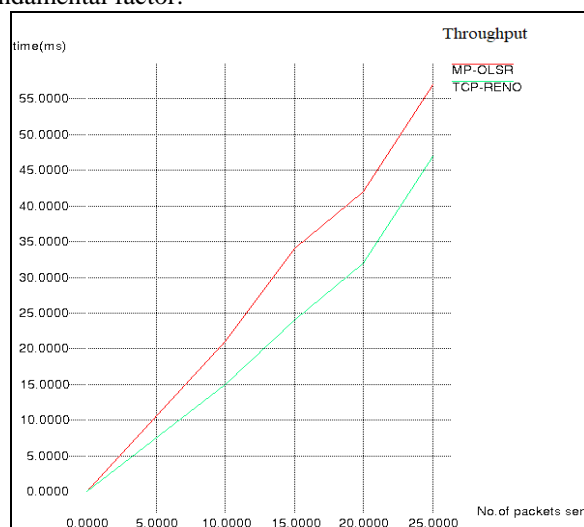

Fig.4. Throughput

3. Average End-to-End Delay:

This is actually the time gap which is been created between the packets generated from the source and the packets receiver in the destination. An average end-to-end delay is calculated using all the survived data packets in the transmission between the source to destination, which includes propagation and queuing delay. This shows the lost packets and the time laps between source and destination during the transmission. Result is show in Fig. 5.

End to End delay of data packet is time taken by the packet from source node to destination node. End to end delay time include all the delay taken by router to seek the path in network consumption, propagation delay, processing delay and End to end delay for packet p which was sent by the node n, as a source node and received successfully at destination node is End to End delay.

'np=start_time_np -end_time_np'

Where start_time np is the time when sending of packet Ptothe node N, end_time_np, is the time when packet P is send by node n is received successfully at destination node.
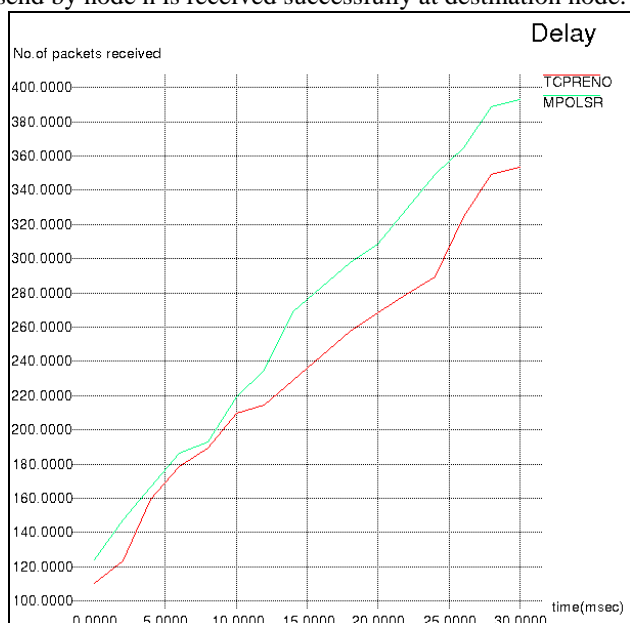

Fig.5. Average End-to-End Delay
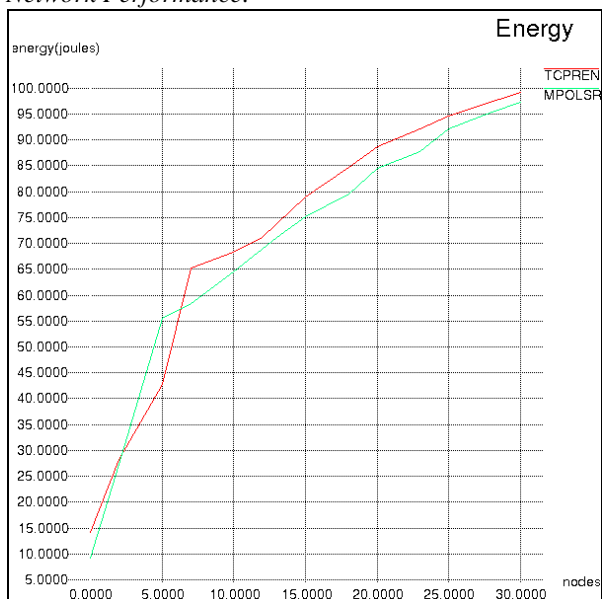
4. Network Performance:

Fig.6. Network Performance

Network performance is calculated using a script which processes the trace file and produces the result. Implementing this will improve the network performance when compared with (AODV) Ad Hoc On-Demand TCP RENO Routing Protocol, which is triggered by the buffer in route discovery. The buffer is used to store the RREQs so that the path with more power will be taken, that helps in power saving and increasing the performance of the network. The Result is shown in Fig. 6. Xx

VI. CONCLUSION

So, up till now in this paper we reviewed a multipath expansion to 'OLSR which is known as MP-OLSR (MultiPath – Optimized Link State Routing) Protocol'. Here by utilizing MP-OLSR with multipath Clustering Algorithm we can find an alternate path when a particular node of the SPF in a cluster couldn't handle the load of the data packet, by which with the help of the alternate path from the Source to destination route the data packet is delivered without any end-to-end delay or packet losses, this acts as a route recovery during the packet transmission. The new MP-OLSR multipath protocol can offer a reliable load balancing and reduce end-to-end delay. Due to the MAC protocols limitation with the neighbouring nodes and the radio-coverage overlapping results in a durable interdependency for multiple routes, compared with the achievement of performance gained by the multi-path routing protocol in Ad Hoc Network the wired internet performance is not up to its mark. Furthermore, with the strategy of pure source routing will be reliable when it's partially exploited for a good knowledge on topology in-order to have a proactive behaviour. We have also noticed that there are some unreliable protocols with poor delivery ratio like SR-MPOLSR which is worse than the link layer OLSR.But still, with the multipath clustering algorithm as route recovery 'MP-OLSR (Multipath – Optimized Link State Routing) Protocol' can accomplish its top performance.In future, MP-OLSR protocol will be further improved by exposing it to QoS metric where the bandwidth, delay, energy consumption and buffer size can be more optimized, which ensures an exceptional adaptive mechanism design that helps to figure-out the path weightage for clustering algorithm.

REFERENCE

1. P. Jacquet, P. Mühlethaler, T. Clausen, A. Laouiti, A. Qayyum, and L. Viennot, "Optimized link state routing protocol for ad hoc networks," Proc. - IEEE International Multi Top. Conf. 2001 Technol. 21st Century, IEEE INMIC 2001, pp. 62–68, 2001.
2. C. Adjih, T. Clausen, P. Jacquet, A. Laouiti, and P. Minet, "Optimized link state routing protocol," Internet Eng., vol. 36, no. 22, pp. 1–76, 2003.
3. M. Kun, Y. Jingdong, and R. Zhi, "for Mobile Ad hoc Network," pp. 522–525, 2005.
4. A. Boushaba, A. Benabbou, R. Benabbou, A. Zahi, and M. Oumsis, "An enhanced MP-OLSR protocol for MANETs," Int. Conf. Next Gener. Networks Serv. NGNS, pp. 73–79, 2014.
5. M. Balakrishnan, "Overcome the Routing Issues in Ad Hoc Networks : a Review," pp. 673–678, 1972.
6. A. Chriqi, H. Otrok, and J. M. Robert, "SC-OLSR: Secure clustering-based OLSR model for ad hoc networks," WiMob 2009 - 5th IEEE Int. Conf. Wirel. Mob. Comput. Netw. Commun., pp. 239–245, 2009.
7. A. Mathematics, "NETWORKS USING VIRTUALIZATION AND SOFTWARE DEFINED NETWORKING," vol. 118, no. 11, pp. 733–737, 2018.

8. M. Sayee Kumar and T. Purusothaman, "Hybrid broadcast group management protocol for secure, scalable and efficient group communication," J. Comput. Sci., vol. 11, no. 2, pp. 344–350, 2015.

9. A. Mathematics, "Fully Homomorphic Public Key Encryption Based on Arbitrary Key Aggregation Cryptosystem (AKAC) for Secured Data Communication in Cloud Infrastructure," vol. 117, no. 15, pp. 1143–1149, 2017.

10. A. Mathematics, "AN ANALYSIS OF OUTLIER DETECTION TECHNIQUES FOR WIRELESS SENSOR NETWORK APPLICATIONS," vol. 117, no. 16, pp. 561–564, 2017.

11. S. Ratnasamy, M. Casado, A. Ghodsi, S. Shenker, B. Raghavan, and T. Koponen, "Software-defined internet architecture," pp. 43–48, 2012.

12. G. M. Karthik and S. Karthik, "Growth and Performance monitoring of Web-log file using CBFP and generating Cache hits for query templates," Aust. J. Basic Appl. Sci. Aust. J. Basic Appl. Sci, vol. 9, no. 91, pp. 194–204, 2015.

13. K. Venkatesh, L. N. B. Srinivas, M. B. Mukesh Krishnan, and A. Shanthini, "QoS improvisation of delay sensitive communication using SDN based multipath routing for medical applications," Futur. Gener. Comput. Syst., vol. 93, pp. 256–265, 2019.

14. [14] A. Vishnoi, R. Poddar, V. Mann, and S. Bhattacharya, "Effective switch memory management in OpenFlow networks," pp. 177–188, 2014.

15. S. Wang, J. Wan, D. Zhang, D. Li, and C. Zhang, "Towards smart factory for industry 4.0: A self-organized multi-agent system with big data based feedback and coordination," in Computer Networks, 2016, vol. 101, pp. 158–168.

16. H. Mulugeta, "Performance of TCP Variants over Proactive and," pp. 123–130, 2012.

17. G. Janakiraman, T. N. Raj, and R. M. Suresh, "AODV , DSDV , DSR Performance Analysis with TCP Reno , TCP New Reno , TCP Vegas on Mobile Ad-hoc Networks using NS2," Int. J. Comput. Appl., vol. 72, no. 19, pp. 1–7, 2013.

18. V. Arora and C. R. Krishna, "Performance Evaluation of Routing Protocols for MANETs under Different," Eng. Technol., no. 2, pp. 79–84, 2010.

19. S. Hamma, E. Cizeron, H. Issaka, and J.-P. Guédon, "Performance evaluation of reactive and proactive routing protocol in IEEE 802.11 ad hoc network," Next-Generation Commun. Sens. Networks 2006, vol. 6387, p. 638709, 2006.

20. D. B. Johnson and D. A. Maltz, "DSR : The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks," Comput. Sci. Dep. Carnegie Mellon Univ. Addison-Wesley, pp. 139–172, 2001.

21. S.-J. Lee and M. Gerla, "AODV-BR: backup routing in ad hoc networks," pp. 1311–1316, 2002.

22. S. J. Lee and M. Gerla, "Split multipath routing with maximally disjoint paths in Ad hoc networks," IEEE Int. Conf. Commun., vol. 10, pp. 3201–3205, 2001.

23. [X. Zhou, Y. Lu, and Y. Gao, "A multiple disjoint paths routing protocol for Ad Hoc sensor networks," 2006 Int. Conf. Commun. Circuits Syst. ICCCAS, Proc., vol. 3, pp. 1502–1506, 2006.

24. R. Mehra, R. S. Bali, and P. Kaur, "Efficient clustering based OLSR routing protocol for VANET," 2016 Symp. Colossal Data Anal. Networking, CDAN 2016, 2016.

25. K. Manikandan, A. Saranya, Shanthi, and C. Vinodini, "Performance evaluation of routing protocols in mobile AD HOC network," Int. J. Appl. Eng. Res., vol. 8, no. 19 SPEC.ISSUE, pp. 2295–2298, 2013.

26. O. Vondrus, P. Macejko, and Z. Kocur, "Multipath TCP in LTE networks," Adv. Electr. Electron. Eng., vol. 12, no. 4, pp. 294–300, 2014.

27. A. Loutfi and M. ElKoutbi, "Optimizing the process of OLSR clustering based on mobility and density in ad hoc networks," Proc. 2012 Int. Conf. Multimed. Comput. Syst. ICMCS 2012, pp. 522–526, 2012.