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RESEARCH ARTICLE

BUNDLE PROTOCOL ALONG WITH OLSR IN MANET

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Abstract---- Mobile ad hoc network (MANET) is an autonomous system of mobile nodes connected via wireless links. Each node operates not only as an end system, but also as a router to forward packets. The nodes are free to move about and organize themselves into a network. Delay Tolerant Networking (DTN) is an end-to-end network architecture designed to provide communication in and/or through highly stressed networking environments. The key part in DTN is Bundling protocol. The bundling protocol allows hosts that normally cannot able to communicate each other due to network partitioning. Bundle Protocol follows the method of store, carry and forward. In case of store, carry and forward method, packets have been held for some period of time only. Probably there is a possibility of packet loss and delay occurs in those particular nodes, when time expires in Bundle Protocol. This paper aims to reduce such delay by using MANET routing protocol called OLSR (Optimised Link State Routing Protocol) for better delivery of packets. If the delay occurs in any node, Optimized Link State Protocol is enabled and the packets can be delivered quickly to the neighbours in an efficient manner. The parameters considered here are end to end Delay, throughput, route load and packet delivery ratio.

Keywords---- delay; bundle protocol; throughput; route load; packet delivery ratio

I. INTRODUCTION

DTN useful for two nodes cannot communicate with each other and also it allowing nodes to communicate with other nodes that are not always connected to the local MANET. The DTN research group (DTNRG) leads the field in DTN research. Members of the DTNRG created the Bundle Protocol (BP) to implement the DTN architecture. The key capabilities of the bundle protocols include custody-based reliability ability to cope with intermittent connectivity, ability to take advantage of scheduled and opportunistic connectivity, and late binding of names to addresses. DTNs employ temporal storage of data on moving network nodes (store-carry-forward principle). Using DTN protocols, numerous solutions for communication have been developed for various application areas such as space communication, rescue missions, vehicle communication and sensor networks. The key part in delay tolerant network is the bundling protocol. The data which we need to transfer must be packaged as a bundle before transmission. In delay tolerant network this entity is said to be bundle. Here we are sending bulk amount of data from one node to other as a bundle, based on custody transfer mechanism. The node which is ready to take that message as its custody receives that message. Nodes holding a message with custody are called custodians. Ordinarily, there is a single custodian for the message, but in some circumstance more than one custodian owns the message. A single node may take more than one message at a time to deliver based on custody transfer it depends on the memory available and message size. Mobile Ad hoc Network (MANET) is a collection of wireless mobile nodes which dynamically forms a temporary network without the use of any existing infrastructure. MANET possess different features in the form of dynamic topologies, bandwidth-constrained, variable capacity links, energy constrained operation and limited physical security. MANETs are set apart from conventional wired or wireless infrastructure type networks by a number of unique attributes and requirements. The two most critical attributes are self-configurability and mobility. A third important requirement is scalability. The structure of MANET is shown in figure 1.

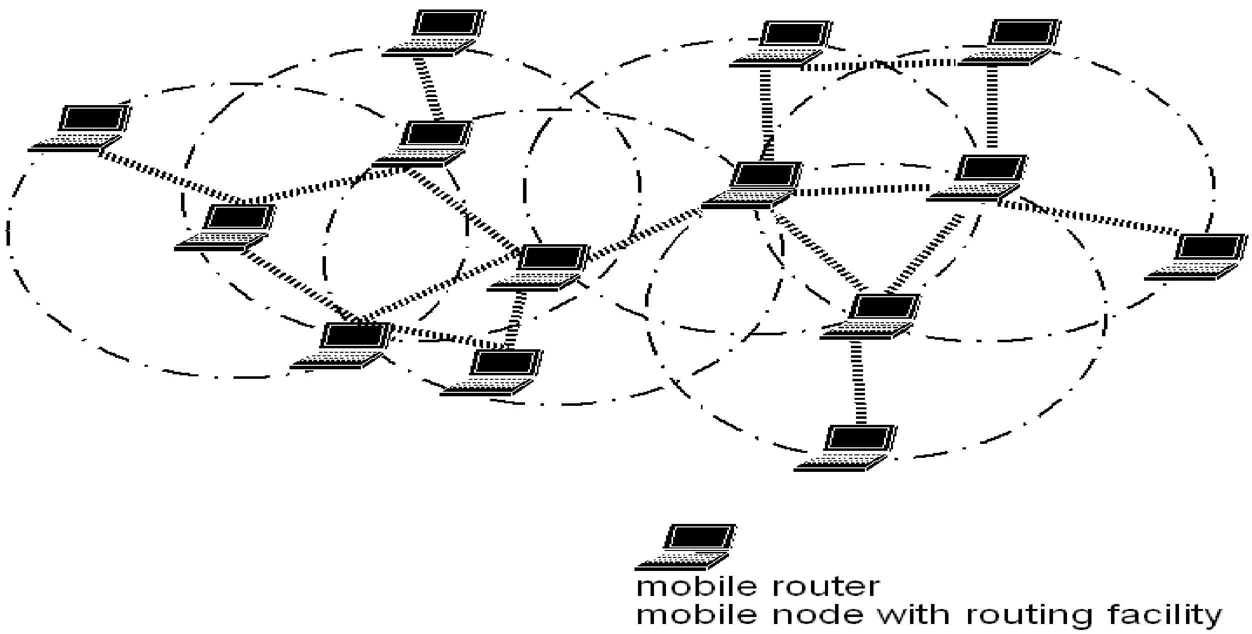

Fig. 1 Mobile Ad-hoc Network

II. RELATED WORK

In [3] the author proposed an effective routing protocol for MANETS to hold hurried node environment. To increase the delivery packet ratio, the directional forwarding method of main route node is taken as an important factor. So, it results in reduction in control message in large mobility networks. but, power optimization is not taken in to consideration. The AOMDV protocol is used as a base for the multipath routing. It is the reactive protocol. Only the node that faces an error can retransmit the data [4]. In [2] FTMR is used to retransmit the packets prior to packet drop by analyzing the energy level. FTMR increases the retransmission time. The established path is based on the node strength and battery power. If the node strength is poor, the established path will not be efficient. The realization of a DTN can be accomplished by using the Bundle Protocol [7] . It is the best-known protocol for DTNs and functions as a transport overlay (bundle layer), located above the transport layer of the ISO/OSI model. Source and destination hosts as well as intermediate nodes need to have a bundle layer. All application data is packed into bundles when it reaches the bundle layer. Afterwards, the bundles are forwarded to the lower transport layer and get encapsulated as usual data into the transport protocol frame. So, Large amount of packets losses and it increase delay.

In [6] the proposed method focused on bundle forwarding and custodial transfer of BUNDLE PROTOCOL and did not implement security function. The performance matrices were end-to-end delay and delivery ratio. But, End-To-End delay higher with custodial transfer due to retransmission and when bundle payload is small because, custody acknowledgement would add significant overhead. Ratio of bundle delivery is influenced by bundle retransmission timers. It may cause network congestion due to unnecessary retransmissions. Short bundle expiration time would cause dropped bundles and decreasing delivery ratio. A discrete event simulator that simulated DTN-like store-and-forward capabilities using objects representing nodes and links was proposed in [7]. The metrics used to evaluate performance were delay and delivery ratio. Specifically, they observed that algorithms possessing knowledge (such as network topology, queuing, and traffic demand) tend to achieve better performance. Another observation was that when the communication opportunities are plentiful, there is less need of smart routing algorithms. When communication opportunities are scarce, smart routing
Algorithms did slow significant benefit.

In [8] DTNs are capable of delivering data to destination nodes even though there is no traditional routing path available at time of the data transfer. In general, DTNs apply the concept of store-carry-forward communication. First of all, application data is packed into so-called messages on the source host. The messages are transferred to the destination node using various hops. If the destination host is currently not in wireless transmission range of the source MANET, the current node stores the messages and continues to operate as usual. When it finally reaches the destination MANET, it forwards the messages to the destination host, where an application receives and utilizes the actual data. Delays in DTNs vary due to temporal storage of data

III. PROPOSED METHOD

The flow chart of the method is shown in figure2. In the first step the mobile nodes are created. In the next step the nodes which are not properly communicated with other nodes due to network partition were identified using their transmission range. Bundle protocol is implemented in the network to make the nodes for proper communication with other nodes. Next the holding time of nodes which follows the concept of bundle protocol is to be identified by the use of bundle forwarding algorithm. Next the OLSR established in MANET when holding time expires. The enabled OLSR is a proactive protocol. So, it route the packets to destination through the safe route.

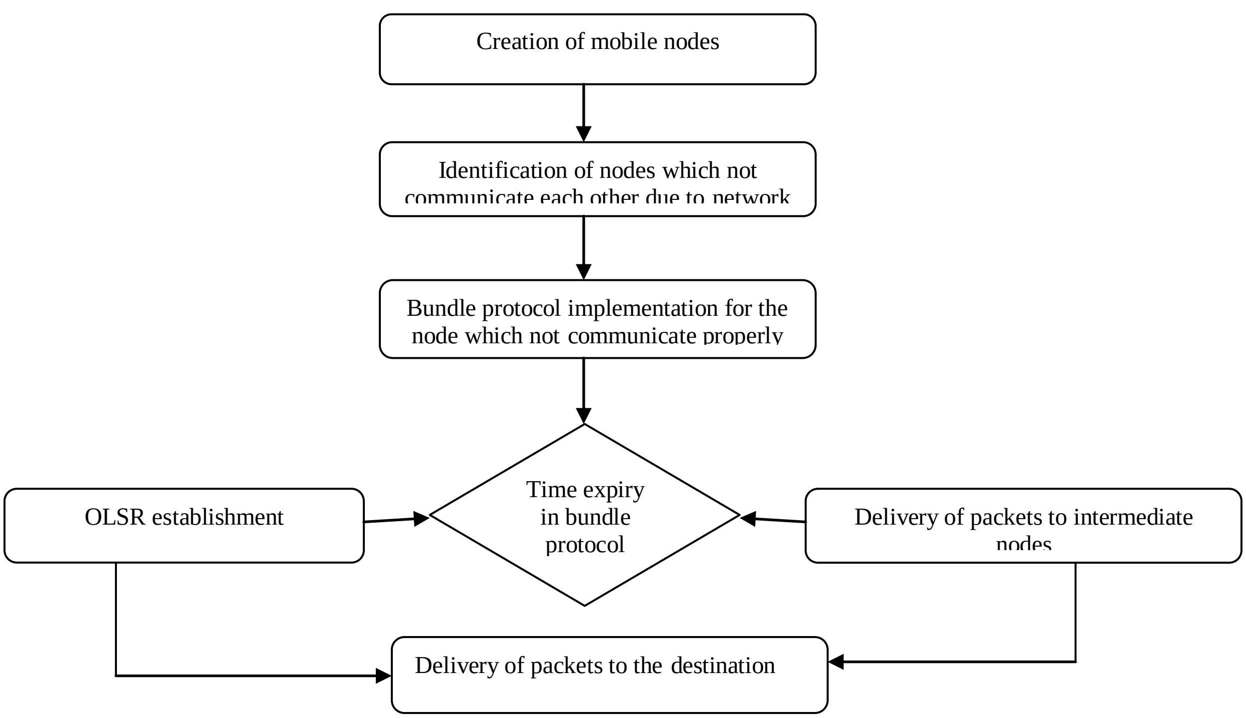

Fig. 2 proposed architecture

A. Algorithm: *Forwarding Of Bundles*

Data: When approaching to the location $L1$, the node $N1$ sets
a *holding time to wait next-hop node* (Th), and tries to forward the bundle B to the next-hop DTN node within Th

1 begin
2 if *a DTN node $N2$ is interested in forwarding within Th*
then
3 $N1$ checks the possible location $L2$ that $N2$ can carry the bundle B to
4 if *location $L2$ is closer to the destination D than $L1$*
then
5 $N1$ forwards the bundle B to $N2$
6 else
7 $N1$ continues to wait other DTN node which is interested in forwarding
8 end
9 else
10 when there is no DTN node which is interested in forwarding the bundle at location $L1$, $N1$ has to drop the bundle packet, since the next-hop route is not immediately available
11 end
12 end

B. DTN Bundle Protocol

The DTN bundling protocol defining a way to send information between networks which are unable to communicate directly. The key part in delay tolerant network is the bundling protocol. The BP is an address-centric, message-based experimental protocol for environments with intermittent connectivity, high bit-error rates and large delays. The bundling protocol allows hosts that cannot communicate with each other due to network partitioning or they do not have the same protocol set to be able to communicate.

Primary header
Dictionary header
•
•
Payload header

Fig. 3 Structure Of Bundle

C. Routing Method

Custodial transfer is the method used in DTN bundle. A sending node can request the custodial transfer of bundle, meaning that any node on the path can take custody of the bundle. If a node chooses to take custody of a bundle, it takes over all responsibilities regarding the bundle, such are transmission and related resources can be released from the previous custodian. In DTN, routing is primarily done based on the region part of the end point ID and then according to local rules used by each network topology. As an aid in defining rules for routing decisions, a few different contact types has been defined.

D. Optimized Link State Routing Protocol

OLSR (Optimized Link State Routing Protocol) is a proactive, link state routing protocol, employing periodic message exchange to update topological information in each node in the network. The protocol inherits the stability of the link state algorithm. Due to its proactive nature, it has an advantage of having the routes immediately available when needed. In a pure link state protocol, all the links with neighbor nodes are declared and are flooded in the entire network. Let a node X is a neighbor node of node Y if node Y can hear node X (i.e., a link exists between an OLSR interface on node X and an OLSR interface on Y). A node heard by a neighbor is said to be to hop neighbor, strict 2-hop neighbor which is not the node itself or a neighbor of the node, and in addition is a neighbor of a neighbor.OLSR protocol is an optimization of a pure link state protocol for mobile ad hoc networks. First, it reduces the size of control packets: instead of all links, it declares only a subset of links with its neighbors who are its multipoint relay selectors. Secondly, it minimizes flooding of this control traffic by using only the selected nodes, called multipoint relays, to diffuse its messages in the network. Only the multipoint relays of a node retransmit its broadcast messages. This technique significantly reduces the number of retransmissions in a flooding or broadcast procedure. The protocol keeps the routes for all the destinations in the network, hence it is beneficial for the traffic patterns where a large subset of nodes are communicating with each other, and the [source, destination] pairs are also changing with time. The protocol is particularly suitable for large and dense networks, as the optimization done using the multipoint relays works well in this context. More dense and large a network is, more optimization is achieved as compared to the normal link state algorithm. The protocol is designed to work in a completely distributed manner and thus does not depend upon any central entity. This protocol does not require a reliable transmission for its control messages: each node sends its control messages periodically, and can therefore sustain a loss of some packets from time to time, which happens very often in radio networks due to collisions or other transmission problems. The protocol also does not need an in-order delivery of its messages: each control message contains a sequence number of most recent information. therefore the re-ordering at the receiving end cannot make the old information interpreted as the recent one. OLSR communicates using a unified packet format for all data related to the protocol. The purpose of this is to facilitate extensibility of the protocol without breaking backwards compatibility. This also provides an easy way of piggybacking different "types" of information into a single transmission, and thus for a given implementation to optimize towards utilizing the maximal frame-size, provided by the network.

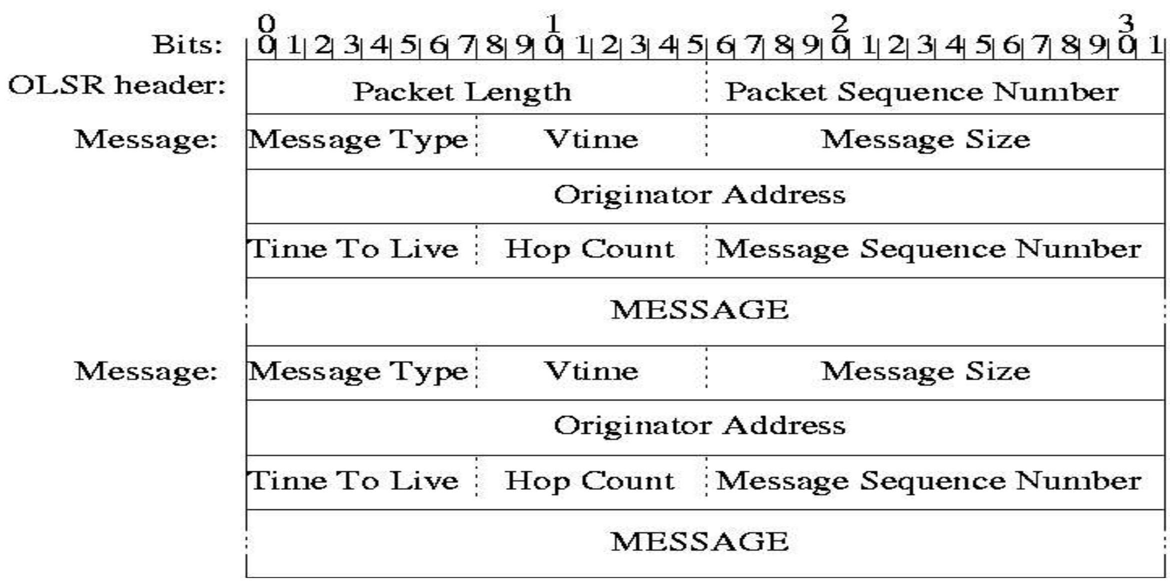

Fig. 4 OLSR Packet Format

Protocols	End to End delay	Packet delivery ratio	Through put	Routing load	Packet delay variation	Jitter
AODV	145.64	43.91	52.16	3.27	95.097	0.21
DSR	349.82	18.11	12.91	6.52	412.21	12.3
OLSR	106.83	46.20	55.42	3.16	34.69	0.13
TORA	294.06	42.05	24.38	3.37	629.62	0.55

Table. 1 Comparison Of Various Parameters

IV. RESULTS AND DISCUSSIONS

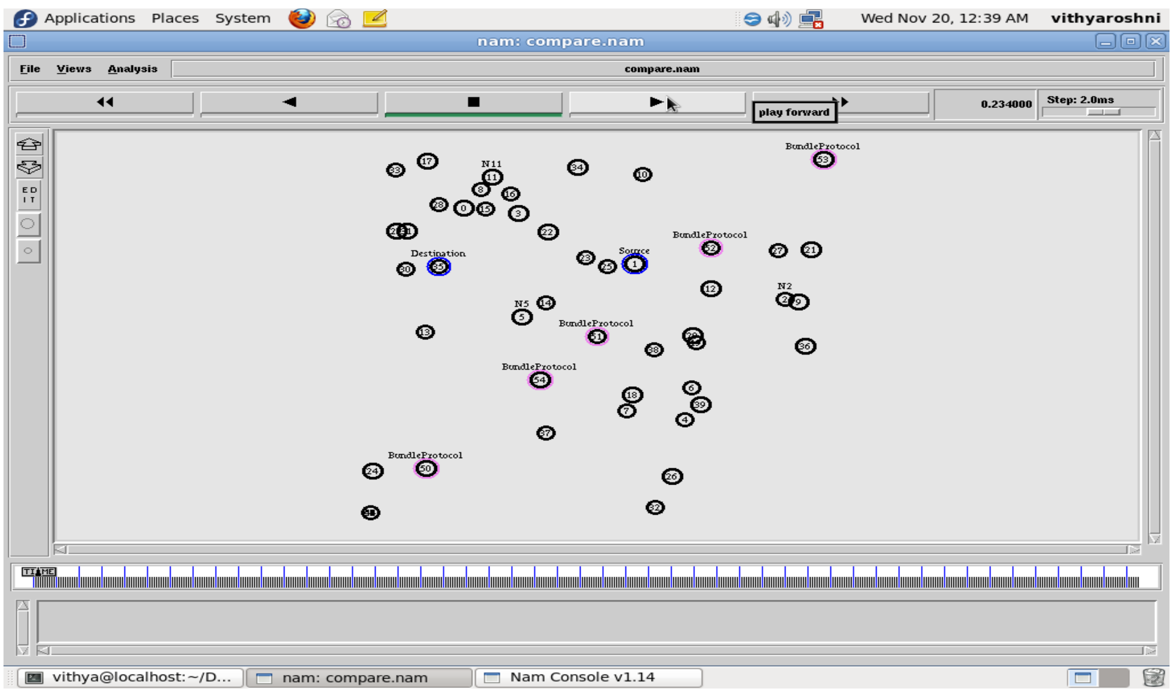

Fig. 5 BUNDLE PROTOCOL CREATION

Fig. 5, shows the creation of bundle protocol. 40 nodes have been created. Blue color nodes indicate the Source and Destination Nodes. Pink color of bundle protocol indicates that the protocol holding the packets.

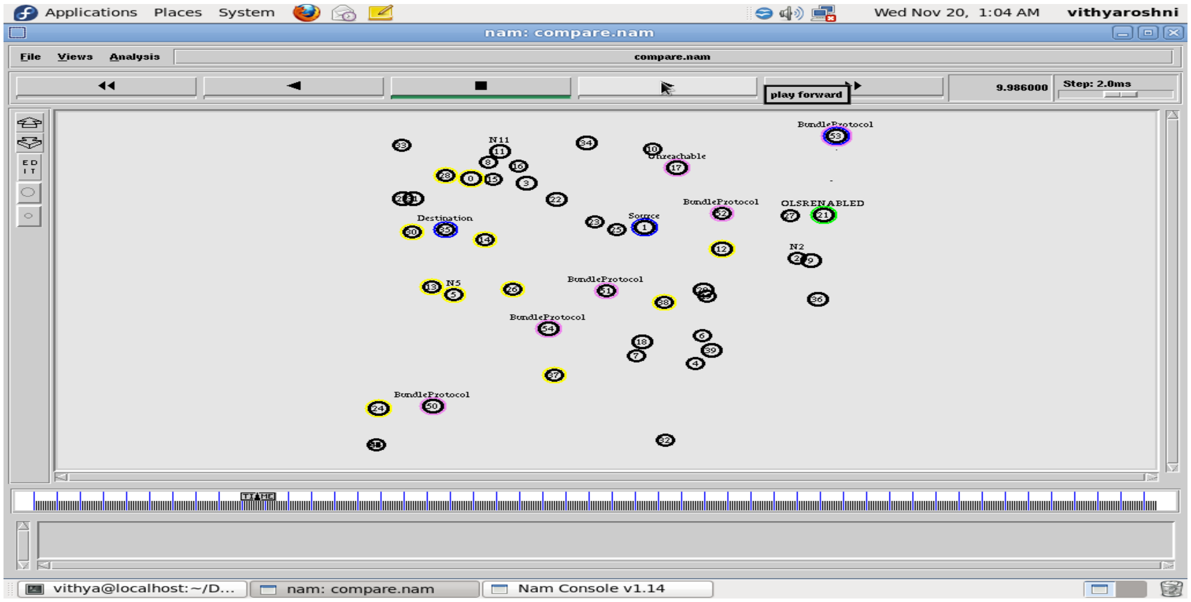

Fig. 6 OLSR ESTABLISHMENT

In fig 6, when packets about to drop from node 53, OLSR enabled. It indicated by green color.

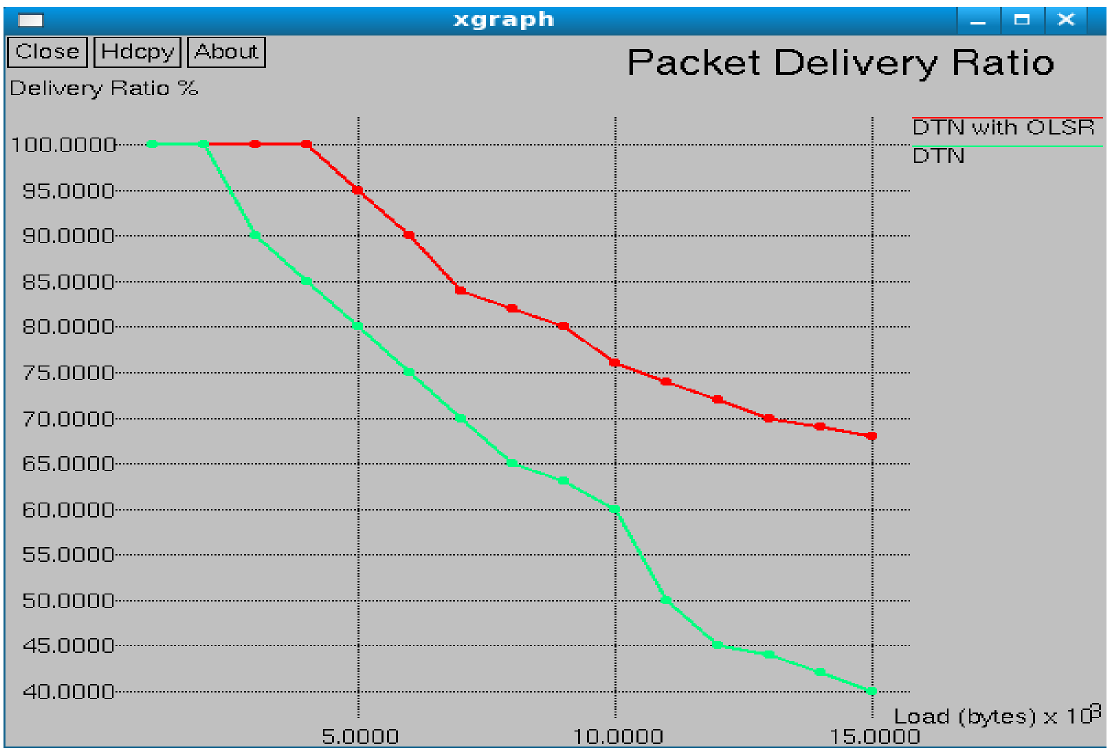

Fig. 7 PACKET DELIVERY RATIO

In Fig. 7, X-axis indicates the packet overload and Y-axis indicates the packet delivery ratio. Initially when load is very low, DTN bundle can have better delivery ratio. But, if load increases, the delivery ratio reduces gradually. But, in case of DTN along with OLSR, delivery ratio increases.

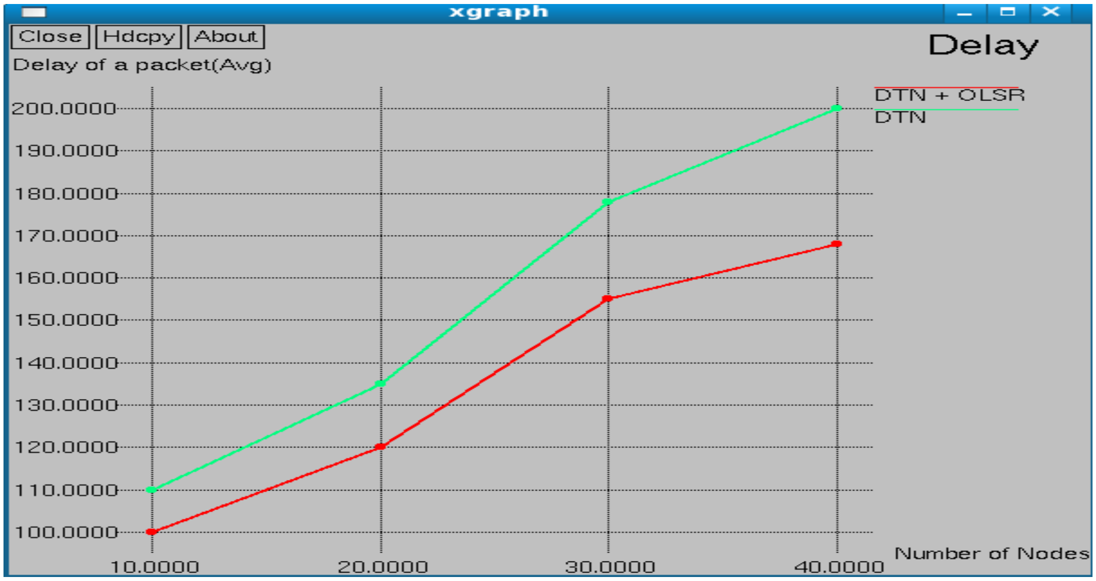

Fig. 8 END TO END DELAY

In Fig. 8, X-axis indicates the Number Of Nodes and Y-axis indicates the Delay. When number of nodes is low,average delay also considerably less in both the cases. But, when number of nodes increases, the delay in DTN is higher compared to DTN WITH OLSR.

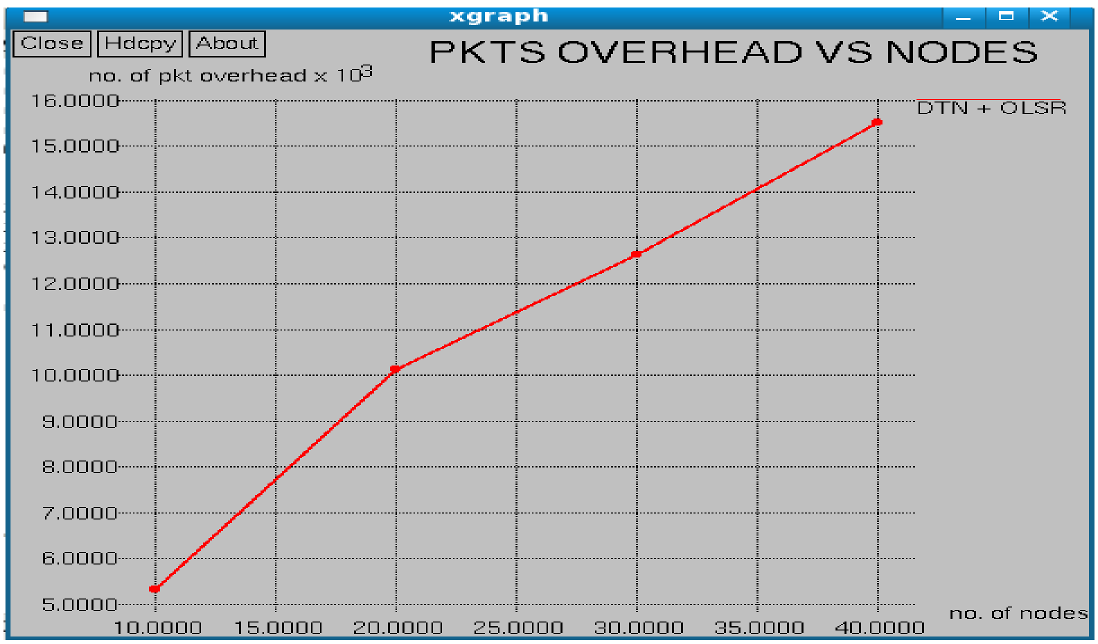

Fig. 9 PACKET OVERHEAD

In Fig. 9, X-axis indicates the Number Of Nodes and Y-axis indicates the number of Packet Overhead. Number of packet overheads happens approximately for various nodes. It shows that overhead is less, when no of nodes is less and gradually increase, when no of nodes gets increases. i.e. number of nodes is directly proportional to packet overhead.

V. CONCLUSION AND FUTURE WORK

In this project, we have provided a solution to reduce the delay in MANET by utilizing the proactive routing protocol, especially, Optimized Link State routing Protocol for better performance. Whenever the node has responsibility to deliver more packets, OLSR tries to deliver it with the help of routing tables created which is based on the information obtained from neighbour table and topology table. The packets can be routed in efficient manner by predicting the better path to deliver that packet to its destination. So that the delay can be reduced and the packet loss due to life time expiration in bundle protocol also be reduced. Better packet delivery ratio and reduced delay also be achieved. For our future work, we will implement a Pi (practical incentive)protocol to provide security among mobile nodes in MANET and to thwart various attacks.

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