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PERFORMANCE ANALYSIS OF DSR PROTOCOL AND OLSR PROTOCOL IN MOBILE ADHOC NETWORKS (MANET)

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Abstract : This network's topology is dynamic due to the random motion of its mobile nodes. Routing protocols play a crucial role in MANET by ensuring constant and reliable communication between the mobile nodes. When a collection of autonomous mobile nodes is dynamically linked together through wireless connections, the resulting network is called a Mobile Ad Hoc Network (MANET). A MANET is a decentralized network that sets up its own nodes and does not require any sort of underlying infrastructure, be it wired or wireless Optimized Link State Routing (OLSR) and Dynamic Source Routing (DSR) protocols exhibit proactive routing behavior, Packets are distributed across the network via the multipoint relay (MPR) mechanism, and OLSR is the optimized form of this link state routing. this paper, tells how the OLSR routing protocol fares when faced with fluctuating network density and transfer rates compared DSR. The average packet throughput, packet delivery ratio (PDR), and average end to end delay are the study's performance indicators. We simulate and assess the effectiveness of such a protocol using Network Simulator 2 (NS-2) and an external patch called OLSR.

***Index Terms* OLSR,DSR,MANET,MPR.**

1. INTRODUCTION :

The capabilities of the MANET, a self-organizing, self-configuring, and self-repairing wireless network, have garnered it much attention in recent years [1]. It can be built by a distributed network of mobile nodes that communicate wirelessly and can be set up without the need for a centralised base station (BS) or access point (AP). In the event that conventional physical infrastructure becomes inadequate, a fixed in the short can be erected at any time and in any place as a backup. For instance, MANET is the primary network of choice in disaster zones when traditional infrastructure and communications may have been severely disrupted due to the crisis itself. Evidence from the past indicates that there is a correlation between a sharp increase in the need for communication and a subsequent catastrophic event. Improvements in end user hardware, such as mobile devices and other electronic devices, have played a significant influence in the development of wireless communication, which has played a critical role in emergency and search and rescue (SAR) operations in particular [1]. Losses in the disaster zone can be kept to a minimum by efficiently adapting the MANET to support a range of SAR operations [2]. Since MANET is a self-organizing, self-healing, and self-recovering network, it can function normally even in the face of disruptions to the surrounding infrastructure [3, 4]. There is hope for a speedy resolution of the communication network, which would lessen the likelihood of both delays and mistakes during the SAR operations. Therefore, the

MANET can be seen as a realistic option for performing SAR operations in a disaster region because to its rapid deployment, which allows rescue teams to respond rapidly to victims' calls [5, 6].

Common examples of nodes in MANETs include computers, mobile phones, and cameras. Thanks to the wireless network, all of these devices can connect with one another and exchange data. All mobile nodes have complete freedom to join or exit the network at their convenience. The movable nodes are autonomous and can go wherever they like. The topology of the network could experience sudden and unexpected shifts as a result. In addition to receiving and sending data, each network node can also function as a router, relaying information between mobile nodes. Since MANETs are used in real-world contexts, nodes must be highly transportable and run-on batteries [7,8].Fig1shows MANET Architecture.

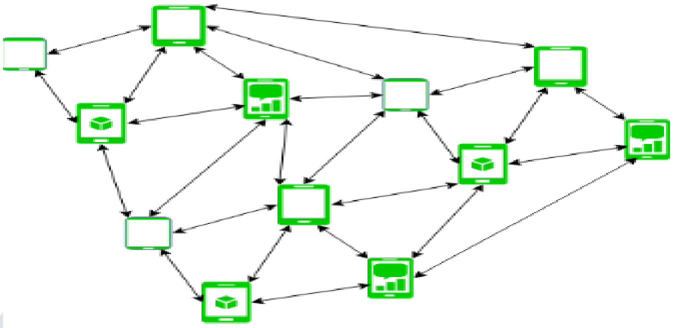

Fig1.MANET Architecture

Here's how the paper breaks down: We break down routing protocols into their various categories in Section 2. Section 3 describes related works that analyse MANET routing protocols for performance evaluation. In Section 4, we will go over the suggested method in the routing mechanism while taking into account the OLSR routing protocol. In Section 5, we go over the simulation's network settings. The findings and analysis of the suggested method are presented in Section 6. Section 7 draws the final conclusion.

2. LITERATURE SURVEY

In the MANET context, the term "ad hoc routing protocol" refers to the protocol that assists in deciding the paths to be utilized for routing packets between the source and destination of the nodes. Maintaining routing tables with all available routing information and dynamically preserving a router's table are the responsibilities of routing protocols [1]. The nodes in the ad hoc networks had little knowledge of the topology of their networks. Due of the limited resources and erratic node movement in MANETs, routing can be rather difficult. In order to solve the conundrum and identify the best route between the origin and destination nodes, a routing algorithm is described. Active Procedure

It is also a table-driven protocol that uses mapping tables to keep track of each node's path and course inside the designated network. By continuously transmitting topological knowledge data packets to the network's nodes, this offers the routing method. As a result, each node's routing information is consistently updated using the most recent topological data. Routing tables are altered and control messages are sent to nearby nodes when nodes are added or withdrawn from the network. Usually, this network protocol uses a lot of link state strategies to communicate information about the networks that are close to it [9]. Responding Procedure:

On-demand protocols start a path discovery process as soon as the source node has network packets to send to the destination node, hence the name. finding the quickest route between the communication nodes is necessary. Once the path has been established, it will remain in place until either the packets of information reach their destination or the pathway is no longer allowed. To remember the new path and prevent repeat, a number of measures have been adopted, including the use of a sequence number [10-11].

K. Natarajan and G. Mahadevan [12] conduct an analysis on how mobility speed can impact network routing techniques' performance. The chosen routing protocols include Zone Routing Protocol, Location-Aided Routing (LAR), OLSR, Fisheye State Routing (FSR), Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR), and AODV (ZRP). Low mobility, medium mobility, and high mobility are the three diverse circumstances that make up the network stimulation. According to the simulation results, LAR and AODV outperform other protocols, securely sending 50% to 60% of data packets regardless of speed. The DSR technique also has delays that are respectively 53% and 95% longer than those of the AODV and DSDV procedures.

Furthermore, by altering the speed of the nodes, Lakshman Naik L, R. U. Khan, and R. B. Mishra [13] investigated the efficacy of several ad hoc routing algorithms. The purpose of the article is to examine how different routing approaches are impacted by a node's mobility speed. A performance analysis of the AODV, DSDR, and OLSR routing protocols will be done. With a fixed number of ten source/sink links and three variable node speeds, they replicate the network. As a result, when the node speed varies, OLSR protocol has a greater throughput than AODV and DSDV. The performance of OLSR is still better than that of AODV and DSDV, despite a minor decline as node speed increases. Moreover, OLSR outperforms AODV and DSDV in terms of packet delivery ratio. On the other hand, as the node speed goes up, OLSR starts to suffer a little. Both OLSR and AODV outperform DSDV and AODV in terms of E2E delay. However, OLSR experiences a slight decline when the node speed rises. The OLSR outperforms AODV and DSDV, according to the studies on packet loss, although performance suffers as node speed increases. Finally, they came to the conclusion that OLSR performs better than AODV and DSDV in every aspect they took into account.

3. OLSR PROTOCOL (OPTIMIZED LINK STATE ROUTING)

The traditional link-state is implemented in the routing protocol as OLSR. These routing techniques prevent routing loops and have no scalability problems in comparison to the distance vector routing protocol [9]. As a result of the flooding technique utilised by traditional connection state routing protocols, a significant amount of traffic is produced when topological information is shared between nodes. Due to a lack of resources, it is a disadvantageous feature of the MANET. To reduce the amount of traffic, the OLSR introduces a novel technique into the network. Although all OLSR nodes are allowed to receive data packets including topological information, only a few nodes known as MPRs are allowed to transport messages across the network. A node requires a minimum of MPRs in order to communicate with all of its other neighbours within two hops [13].

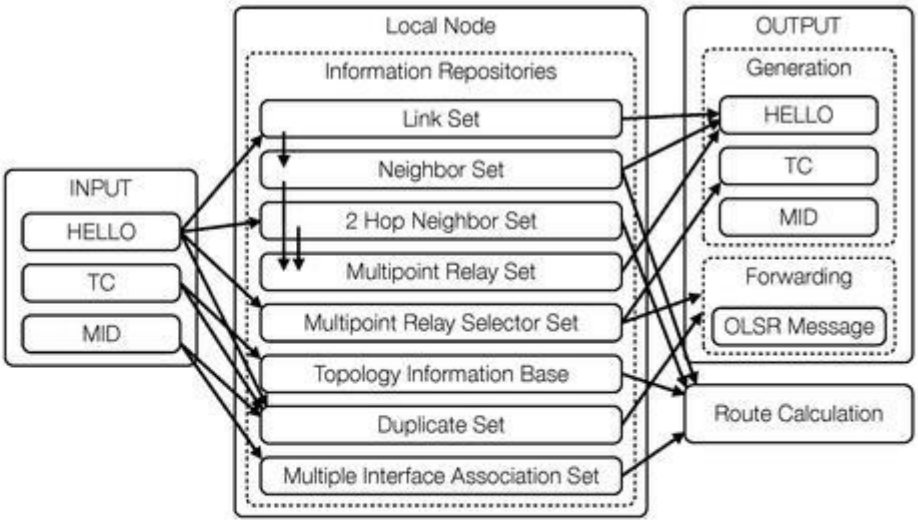

Fig 3.1 Diagram of OLSR data flow

Neighborhood identification and neighbourhood sensing are the two primary topology management techniques that form the foundation of the OLSR protocol. Through the employment of four different control message types—HELLO, TC, MID, and HNA—the OLSR protocol takes use of both of these procedures. Additionally, the OLSR protocol uses HELLO packets for neighbourhood sensing [2]. The TC packets are dispersed using MPRs or optimum dissemination to communicate the topological data. The links in the vicinity of the network nodes used to handle the packets of the OLSR protocol make up the TC messages [20].

Additionally, when transferring MID messages, the OLSR protocol takes into account all interfaces connected to network nodes. As a result, nodes in the network can use any route, regardless of the interfaces being used at each hop. One of the interfaces on the OLSR node is given a primary address that can later be utilised as a pointer in control messages. Similar to this, hosts and subnetworks outside of MANET that can be found by a node acting as a gateway are built using the OLSR protocol's HNA messages [7].

MPRs' main objective is to reduce unnecessary data transfer during the usual message delivery. When it comes to transmitting control information over a network, MPRs are particularly beneficial. The conventional diffusion process of the link state protocols is improved by MPRs. Based on its knowledge of its two-hop neighbourhood; a given node selects a group of MPRs.The MPRs in a MANET with a constantly shifting topology required to be updated whenever the experience of the two-hop neighbour set changed. The MPRs' position in the neighbourhood is thereore constrained [18].

2.1 Dynamic Source Routing :

Dynamic source routing protocol (DSR) is an on-demand protocol designed to restrict the bandwidth consumed by control packets in ad hoc wireless networks by eliminating the periodic table-update messages required in the table-driven approach[5].

Flowchart:

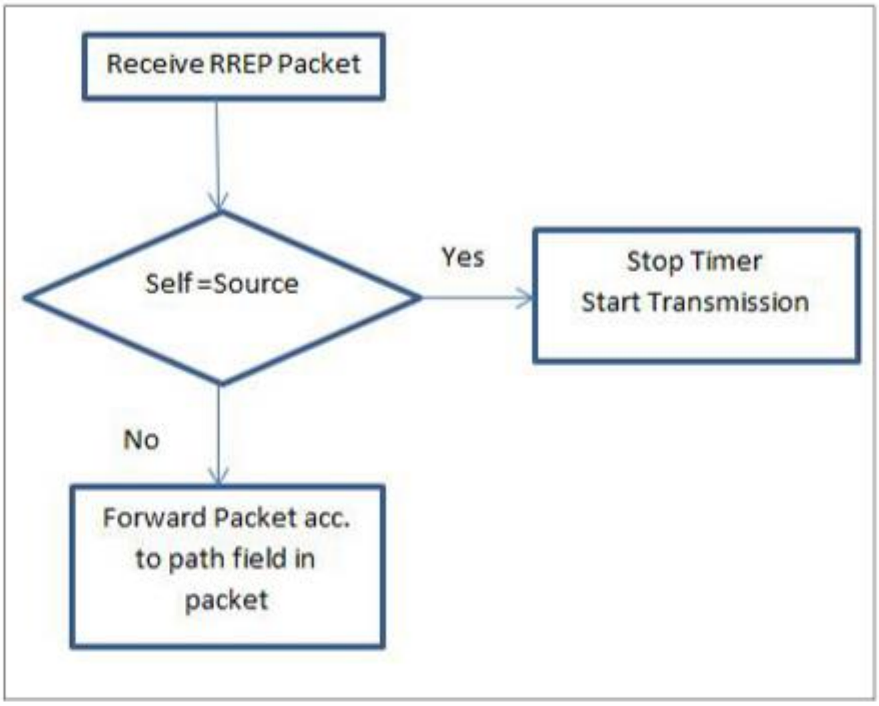

Fig 3.1.1.DSR working process.

3. SIMULATION:

Utilizing NS-2, the paper simulation is carried out. One of the popular network simulators for MANET and vehicle ad hoc networks is called NS-2. With regard to routing and multicast protocols, NS-2 supports both wired and wireless networks. Due to its widespread use by other researchers and its ease of network simulation, NS-2 was chosen for this study above alternative network simulators. NS-2 is more useful for simulating networks because there are more academic sources that examine such protocols. NS-2 is more useful since it allows researchers to compare their findings to those of other studies that have utilised the same simulator but different methodologies and measurements. One of our methods for ensuring that the project is being carried out properly is to use the same simulator as other research.

The recommended simulation parameters for the project are based on a summary of earlier work. The 1000 m x 1000 m simulation area was chosen. Additionally, there are 20, 40, 60, 80, and 100 nodes chosen for the subsequent project, accordingly. Since the simulation takes too long to run on the system being used, nodes more than 100 are not chosen. The maximum simulation time in the study publications is 900 s, thus that is the time restriction for simulations. Table 1 below provides a summary of the parameters.

Table1.Simulationparameters.

Parameter	Specification
SimulationArea(mxm)	1000x1000
MobilityModel	RandomWaypoint
RoutingProtocol	OLSR,DSR
NumberofNodes	20, 40, 60, 80, 100
Speed(m/s)	10, 15,20,25,30
SimulationTimeLimit(s)	900
MacType	802.11
Traffic	CBR
Packet Size(bytes)	512

4. RESULTS &DISCUSSION :

4.1 Average latency between nodes relates the performance measures are taken into account in this paper that to assess the network performance of the suggested routing approach. between OLSR & DSR. Here OLSR outperforms the DSR interms of latency. Number of clusters formed, and are the

Table 5.1 Average End to End Delay(micro seconds) for OLSR &DSR

Number of nodes	DSR	OLSR
75	1.007	0.978
125	1.004	1.222
175	9.885	11.196
225	16.423	14.145
275	36.422	31.327

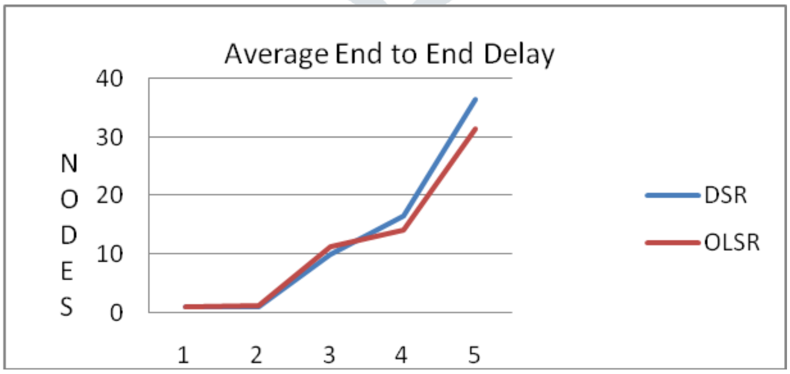

Fig5.1Average End to End Delay(micro seconds) for OLSR &DSR

4.2 Average Packet Delivery Ratio(PDR) between nodes shows the network performance of the suggested routing approach. between OLSR & DSR. Here OLSR outperforms the DSR interms of Average PDR.

Table 5.2 Average Packet Delivery Ratio for DE-MST

No. of nodes	DSR	DOLSR
75	0.9397	0.9513
125	0.9078	0.9206
175	0.8905	0.8994
225	0.8455	0.8574
275	0.7851	0.7984

Fig 5.2 Average PDR in OLSR &DSR

4.3 Number of Clusters formed between nodes improves the network performance between OLSR & DSR. Here OLSR outperforms the DSR in terms of no. of clusters formation.

Table 5.3 Number of Clusters Formed for DE-MST

Number of nodes	COTS	DE-MST
75	10	11
125	14	16
175	23	26
225	24	30
275	24	31

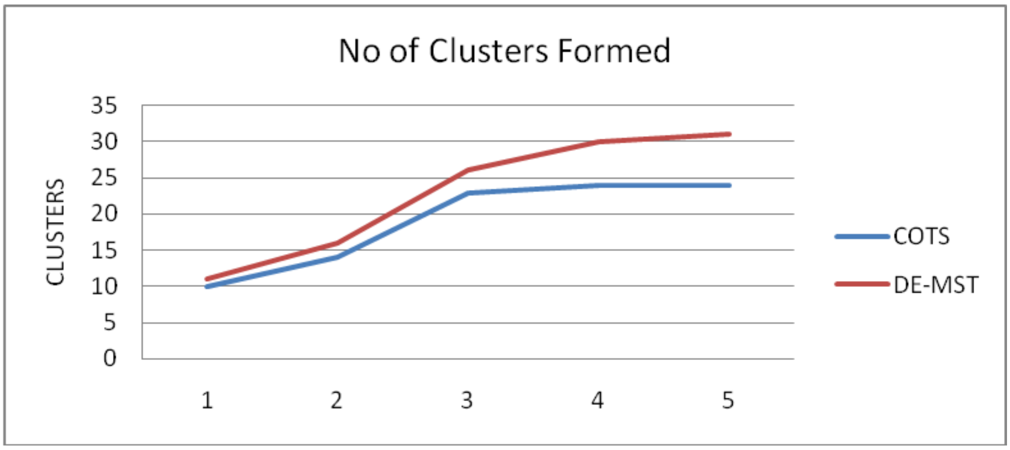

Fig 5.3 Average no.of clusters formed in OLSR &DSR

5. CONCLUSIONS:

The performance analysis of the OLSR and DSR is explained in this paper by changing the network density and mobility speed. All of the outcomes of the network simulation for the OLSR and DSR protocolsare recorded. The average delay, PDR, no of clusters formed graphs shows a rising tendency as the number of nodes increases as a result of the analysis in OLSR compared to DSR. Based on the results, a performance analysis and evaluation were conducted. The approach can be further investigated by applying it to various scenarios, such as a disaster area scenario with various types of mobility models and metrics for assessing network performance.

A CONFLICT OF INTEREST

The authors say they have no competing interests.

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