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Performance Investigation on Routing Protocols using Mobility Models with Multimedia Applications

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Abstract: Mobile Ad hoc Network (MANET)is a self-organized and self-configurable network where as mobile nodes move arbitrarily. MANET consists of mobile wireless nodes. The communication between these mobile nodes is carried out without any well defined infrastructure as well as centralized control or without any third party base station. MANET can be classified into three routing protocols are Proactive, Reactive and Hybrid. In this paper we compare performance of routing protocol with different mobility models and by its multimedia applications. We are focusing on Optimized Link State Routing (OLSR), which is proactive routing protocol, (AODV) Ad Hoc on Demand Distance Vector is Reactive Routing Protocol and also known as on demand routing protocol and Gathering-based Routing Protocol (GRP). Our simulation is conducting on OPNET 14.5 for both mobility model .In this paper we have compare two mobility models with above three protocols. We can compare its performance with its throughput, Delay, Network Load, Data dropped and Retransmission using 50 nodes in both mobility models and also further we have comparative analysis.

Keywords: MANET, AODV, OLSR, GRP, Mobility Model.

I. INTRODUCTION

Mobile ad hoc network (MANET) is a form of infrastructure less mobile network with no fixed centralized controller. In MANET, all nodes can be mobile and communication between all mobile nodes can be carried out without any centralized control .The nodes dynamically form to co-operate routing paths and relay each other's packets for throughput end-to-end communication. For a performance MANET and its routing protocols, it is important to study the use mobility models which represent movements of nodes accurately. The infrastructure less mobile network has no fixed centralized controller such as base stations among the mobile terminals for coordinating the communications in the network.

Generally existing MANET mobility models can be classified into two groups: - entity mobility models and group mobility models. In entity mobility models all nodes move independently from each other, where as in group mobility models, nodes are to cluster and it tends to move in groups. Here, we are focus on two mobility models are random way point model and vector mobility mode. According to these models they move independently and each node moves alternates periods of movement to periods during have pauses or pause phase. At the beginning of each move phase, mobile node selects new direction and speed in move phase, keep constant for whole network duration.

II. AD HOC ROUTING PROTOCOLS

These are broadly classified into three types of routing protocols: - Table driven, On-demand driven and Hybrid protocols. These Protocols can be explained by with its suitable routing protocol.

Proactive Protocols:-In a network proactive protocols or table driven protocols maintain all uniform and routing latest information about each node. The latest route information is available, when it required sending data from source to destination node rapidly because each node to integral network broadcast the messages. WRP (Wireless routing protocol), DSDV (Destination sequence distance vector), OLSR (Optimized link state routing protocol) are proactive routing protocols instantly.

A. Optimized link state routing protocol

It is a proactive routing protocol and known as table driven protocol. It permanently stores and updates its routing information in table, when it sends its data from source to destination. Optimized link State routing protocol (OLSR) is an edition to provide complete link state for MANET. OLSR keeps track when needed in routing table in order. OLSR can also be implemented in any other ad hoc network, because of its nature is called as proactive routing protocol. Multipoint relays (MPR) is a primary focus point

of optimization in OLSR. Each node identifies its MPRs in the network. After flooding the messages, each node ensured that whenever message is transmitted by MPRs and it will be received by its two-hop neighbors individually. OLSR protocol selects bi-directional links for its routing. MPR nodes do not broadcast the route packets in the network, hence evading packet transfer over the unidirectional links. These MPR nodes can be selected source node in the neighbor and each node keeps a list of MPR nodes in the network. This MPR selector selects and obtained HELLO packets from sending between its neighbor nodes. Each and every node keeps a routing table in the network. These routes before any source node are built intends to send a message towards defined destination. That was the reason the routing overhead for OLSR provide a shortest route to the destination in the network other than reactive routing protocols. There is no need to a new route, an existing route does not increase routing overhead .It reduces delay route discovery.

B. Destination-Sequenced-Distance-Vector(DSDV)

every mobile node station maintains its routing table that lists all available neighbor destinations, it will assigned the sequence number and the number of hops to reach to destination by the destination node. The sequence number is used to distinguish stale routes avoid the formation of loops from new ones. The stations transmit their routing table's periodically toothier immediate neighbors. A station also transmits its routing table when significant change has occurred from the last update in a table sent. So, the update is both events driven and time-driven. The routing table updates and sent with two ways that is full dump and or an incremental update. A full dump can sends the full routing table to its neighbors and span many packets, whereas in an incremental update only those entries values are sent from the routing table which must be fit into packet since last updates. If there is space find in the incremental update packet, it may be included those entries those sequence number has been changed. When the network is incrementally relatively stable, then incremental updates are sent to avoid unrelenting traffic and full dump are relatively infrequent. In a fast-changing network, the incremental packets can grow big and fast so full dumps will be more frequently works. Each route updates its packet, in addition to its routing table information; it also assigned a unique sequence number by the transmitter. This is also route labeled with the highest (i.e. most recent) sequence number is used by the transmitter. In the past history, the stations estimate the settling time of routes, delay the transmission routing update by settling time , so as to eliminate those updates when a better route were found.

Reactive Protocols: - Reactive routing protocol is also known as "On-Demand based" routing protocols. In this network is determined its route only when the source node requests to find a path route to send its packets to the destination node. On demand routing protocol will establish a route when a node wants in the network to relate with another node, but source does not send route information to the destination node. Most commonly reactive routing protocols are used AODV and DSR.

C. Ad hoc On-Demand Distance vector Routing Protocol (AODV)

Ad hoc on-demand vector routing (AODV) is on demand based routing protocol, whenever a route required from source to destination node then only it creates a path. It is an advancement protocol of (DSDV) Destination Sequenced Distance-Vector routing protocol. AODV is also help in to minimize traffic in the network by eliminating extra routing nodes that are not in use. AODV is responsible to build a multi-hop route, when two nodes want to make a connection in ad hoc network. AODV have a property of route request (RREQ) and also route maintenance procedure from DSR and some attributes like sequence number, periodic updates, hop by hop count from DSDV routing protocol. If two nodes wish to establish a connection in an ad hoc network then AODV is responsible to enable them to build a multi-hop route. AODV uses Destination Sequence Numbers (DSN) that is why it is loop free to avoid counting to infinity. When a node wants to send a request to a destination, then it sends DSNs and based on this sequence number it will find most favourable route with all routing information. There are three AODV messages in ad hoc network i.e. Route Request (RREQs), Route Replies (RREPs), and Route Errors (RERRs), when the source node wants to create a new route for send a message to the destination, the requesting node broadcast message through RREQ in the network. The RREQ message is requested for broadcast from source A to the destination node B. The source node A broadcasts its RREQ message to all its neighbour nodes. When these neighbour nodes receives this RREQ message and then it creates a reverse route towards source node A. This neighbour will next hop to source node A. The hop count is incremented by one for RREQ. The neighbour node will check whether the active route is our destination or not. If it has a our destination route so then it will forward a RREP to source node A. Else if it does not indicates an active route towards to the destination it will again broadcast the RREQ message in the network with also again an incremented by one hop count value, then it procedure repeatedly for finding the destination node B. The RREQ message is flooded in searching for finding the destination node B in the network. The intermediate nodes can reply

immediately to the RREQ message only if when they have the destination sequence number (DSN) is greater than or equal the number of packet contained in header of RREQ.

The intermediate nodes immediately forward this RREQ message to all its neighbor nodes and record their address in their routing cache. This information will be used to find a reverse path for RREP message from the destination node towards source node A. The RREP in the network reached to the originator of the request. This route is only available to the source by uncasing a RREP back. The receiving messages are cached from its originator to all the nodes of the RREQ. When a link is failed then it generates an RERR message. RERR message contains information about all those nodes that are not reachable to its destination point.

D. Dynamic Source Routing (DSR)

Dynamic source routing protocol is also an On-demand routing protocol and the mobile node save its source routes into the caches. Dynamic source routing protocol uses no cyclic routing messages and loop free, therefore it preserves battery power and reduce bandwidth for network.

The working of DSR is classified into two parts as one is Route Discovery and second is Route Maintenance. Route Discovery is path finding, when source node wants to send a packet to destination node B, but does not know a route to B, and then node A originates a route discovery. Source node a floods Route Request (RREQ) and its each node attach its own identifier when forwarding RREQ. Route maintenance is a process in which a packet sender node A detects topology of the network has been changed, so that it does not have longer uses its route to the destination node B. This may due to link failure or may be host listed move out of transmitting range from source node. There are following characteristics of an Ideal Routing Protocol.

- It must be fully distributed all over the network.
- It must be flexible and able to change its topology frequently.
- Its Transmission should be reliable to minimize its message loss.
- The convergence must be fast and quick, once the network of the topology becomes stable.
- It must have optimal use of bandwidth, memory, computing power and battery power.
- It must provide a certain level of quality of service (QoS) in a network.

Hybrid Protocols: - These are the combination of proactive and reactive protocols .It is also based on both on demand and table driven. Gathering-based protocol comes on category of hybrid protocols.

E. Gathering-based Routing Protocol (GRP)

Gathering-based Routing Protocol combines both advantages features of Proactive Routing Protocol (PRP) and of Reactive Routing protocol (RRP). It is supporting for delay sensitive data both voice and video, but it consumes large amount of portion of network capacity. RRP is not suitable for real-time applications, the advantage of this approach is it can change dramatically reduce routing overhead when a network is relatively static and active traffic is low. However, the source node A has to wait until a route path to the destination node B can be discovered and also increasing the response time. The goal of the proposed routing protocol (GRP) is to rapidly gather network information rapidly from source node that without spending a large amount of time on overheads. It offers an efficient framework draw on the strengths of PRP and RRP simultaneously.

III. RELATED WORK

Bojd et al. proposed new algorithm which is modifies multi hop Dynamic Virtual Router algorithm for overcome the performance of MANETs. It defines the mobility metrics for neighbourhood nodes to estimate its mobility degree. This proposed algorithm significantly that network performance is improved, including with its throughput and overcome delay. The increasing overhead is not remarkable, so that considering this great performance improvement of the algorithm [1]. The main advantage for such types of protocols is to establish a session and also obtain route information quickly. A reactive routing algorithm helps to improve both capacity for a network and packet delay end-to-end in MANETs. The new algorithm is based on the DVR algorithm which is new method for robust communication in MANETs. The new proposed algorithm DVR leads to more stable as establishment for route in network, because it handle break links by using virtual route selection process.

Daas et al. discuss about a comparison between two reactive protocols which are evaluated during network condition. These two routing protocols are (AODV) Ad-hoc on-demand Distance Vector and (DSDV) Destination-Sequenced Distance-Vector which is establishing connectivity on demand. The simulation results shows that AODV routing protocol has better throughput and delivery ratio than DSDV routing protocol [2]. In MANET can be define as wireless network those mobile nodes are independent, and have the freedom to move independently any where time.

It can communicate with each other when they falling in the connectivity range of each other. In conventionally on-demand routing protocols discovers routes to a particular destination direction by broadcasting a Route Request packet (RREQ). On receiving site the RREQ node checks whether a previous packet is received or not. If the packet has received previously then it drop the node, otherwise it will send (RREP) route reply back to source node, if it is available. In this (MANET) has been introduced a deep comparison between two reactive routing protocols AODV and DSDV, in simulation environment AODV shows greater throughput and packet delivery ratio as compare to DSDV.

Suraj et al. discusses concept of genetic algorithms and history movement for approach of mobility prediction. This concept was introduced for the improvement of MANET routing algorithms. The purposed lightweight genetic algorithm works on its outlier on the basis of parent selection and heuristics by using weighted roulette wheel algorithm. An Adjacency matrix is obtained, after performing the genetic operations, from which each node is calculated predicted direction by using vector calculations and directed graphs. The technique purposed a new mobility prediction which is completely depend upon on genetic algorithms and does not based probabilistic methods [3]. MANET has a lower stability and has unpredictable results sometimes, that's why the main reason behind they do not have very much popularity. In the study of technique genetic algorithms make mobility prediction on the basis of history. Genetic algorithms have never been used to predict mobility for structure less infrastructure like MANET, but it provides possibilities to make better QoS in ad hoc networks .It has the problem of limited resources like memory storage and computational power. This problem will overcome by using grouping and clustering techniques.

Macone et al. presents a proposes work on proactive routing protocol, named as MQ-Routing. The aim of behind this work is to increases lifetime of minimum nodes when network topology changes rapidly. The new algorithms modifies Q-Routing algorithm, which was develop via Reinforcement Learning (RL) techniques. This technique introducing new metrics which account for energy introducing in path nodes and paths availability, that are combine dynamically when network topologies and resources change dynamically .A fully proactive approach always assure to usage of protocols and reactivity in mobile scenarios. The simulations provide validate results for proposed algorithm by a comparison of OLSR and Q-Routing protocol [4].In disaster relief scenarios with characteristics MONET FP7-ICT project processing to be considered. In rescue scenarios they have considered (1) All nodes should have homogenous and long lifetime that means have long discharge batteries that rescue team as such as possible to exchange vital information.(2)The communication should be maintained regain due to failure of link mobility nodes . They introduced an example in the introduction of collisions-aware metrics, which reduces collisions and increases its throughput for global network s, especially for standard 802.11 CSMA/CA Wi-Fi links.

Ahmed et al. discuss about the performance of evaluations of the OLSR routing protocol for TCP and UDP traffic management (Their work was supported by NSFC partly in under grant No. 61271246).They have discuss various varying parameters like speed node, density node and pause time, according to which they have perform under different scenarios. For the performance of OLSR the most widely used for performance metrics are throughput, packet loss and end-to-end delay [5]. In this paper they have assumed independency of geographic dependency, spatial dependency and temporal independency for the performance of Random Waypoint model. In the results prove that TCP performs well considerably as throughput, packet loss and end-to-end delay in different mobility scenarios, while in pause time UDP should be considered as a better choice .

Ajindrajit et al. discuss about how to predict a path length from source to destination using Autoregressive Integrated Moving Average (ARIMA) and Multilayer Perceptron (MLP) models. The routing protocols play a very critical role for ad-hoc network in communication for MANET. In MANET nodes normally operate with limited battery power supply and also have limiting in their transmission range. Path length can be determined by collecting data based on from three mobility models such as Random Way Point mobility model (RWP), Manhattan Grid Mobility Model(MHG)and) Reference Point Group Mobility Model (RPGM) [6].This paper basically Predicted forecasting accuracy for path length from source to destination for AODV in MANET using ARIMA model and MLP. We also compare the prediction capability and modelling of both ARIMA and(ANN) Artificial Neural Networks based models in terms of certain statistical performance evaluation techniques. In this it is found that neural networks model MLP based provide better results for outcomes for forecasting the path length then ARIMA models. In their experiment there is optimal number of neurons found in the MLP network to be in the range of 15–25 hidden units.

Wang et al. they have discuss and drawn attention in the research on multi-hop wireless networking which is traditionally based on stationary wireless networks. One of the reason behind it was opportunistic data forwarding is not widely utilized in MANET and have lack of efficiency , light-weight proactive routing scheme have strong source of routing capability[7].In this paper ,propose a light-weight proactive routing protocol(PSR).It can maintain more information that are based on network topology to facilities source routing. In multi-hop wireless networking, it almost always makes sense to minimize any impact on the network's communication resources for us even if there is penalty in other aspects communications.

When a node should come for share its update route information with its neighbour nodes, it delays until end of cycle so that only once update its broadcast information in each node. It would trigger an explosive chain reaction and network overwhelmed then route updates, if the transmit node have any change to its routing tree .

Yuan et al. presents in this paper elaborates ideas and evaluates several perspective data and control planes .They provide integrative analysis of zero-information opportunistic routing protocols (ORP)as in terms of number of hops as per packet. It also represents and analysis information-rich ORPs and quantitative comparison including cumulative energy efficiency and cumulative packet delivery ratio. We finally find some research smartly in directions towards lightweight routing protocol [8].There is many emerging issue remain yet first is infrastructure less or infrastructure based. ORP's mainly focus on some scenarios that have pre-deployed network structure may destroy or may not exist for all. ORP's may provide solution for transmit packets. Separating or integrating routing functions, leading to have burden to each node .Control messages are collect and diffuse by selected backbone nodes in mobile opportunistic networks and other are responsible for relay functions and data forwarding.

Liu et al. propose work on general probing-based on two-hop relay algorithm, which have limited packet redundancy. In such algorithms will works limited packet limit f and probing round τ, each transmitter is allowed to identifying of possible receiver to conduct up τ rounds of probing and each packet delivered with at f most distinct relays .To understand such working a theoretical framework was introduced to help us for different setting of τ and f. In the terms throughput capacity for per node and end-to-end packet delay, it provide benefit for us to how we can get benefit from multiple probing[9].In two-hop relay routing have advantage of mobility node and sequence of node conduct a contacts to deliver messages from end to end, become promising routing protocol for MANETs. This paper was proposed for general 2HR-(τ, f) routing algorithm which have motive to efficiently utilised wireless resources. A theoretical framework Markov chain was further developed to improve the performance for new relay algorithm, based on as per throughput and end-to-end delay for per node. Extensive theoretical study and simulation provide a framework for the 2HR-(τ, f) algorithm to perform efficiently .A new relay algorithm can provide significantly improvement for throughputs capacity as per node by enabling rounds of receiver probing more.

IV. MOBILITY MODELS

Mobility models are graphic design to evaluate the performance of ad-hoc networks. It also characterizes movements with variation in speed and direction of real mobile node occurs in regular interval of time. Therefore, many researchers had attempted to design mobility models approximately to resemble with real node movements in MANETs. There are such as follows:

1) *Random way point mobility model:-* In this model, the position of each node is selected randomly and moved in linear form within fixed area, when it will move to next movement before that it has to stopped for certain period is known as pause time. The pause time is directly determined by its model initialization and speed, which is uniformly distributed between in Min Speed and Max Speed.
2) *Random walk mobility model:* - In this mobility model mobile host node can be moved from current location to new one by choosing randomly. It is just like normal human walk. The direction and speed between min speed and max speed defined previously ranges.
3) *Group mobility model:-*. In this mobile nodes moves in group form. In this model nodes are moved independently from each other .In ad hoc network, sometime, there are many situations where, it is necessary to model the behave like MNs as move together..
4) *Pursue mobility model:-*This Model is basically designed to describe the pursuit for a single node by a group of mobile nodes. Earlier it us described follows as SMOOTH-VARIATION motion. In randomly varying speed between Min is zero and have Max Speed. The nodes in runaway node have a direction, which an instant will have in a straight line.
5) *Vector mobility model:-*This model is used to avoid the unrealistic behavior, which is impossible physically. It remembering mobility state for nodes and also in the current mobility state allow only partial changes, only natural motions are reproduced. This model has various Advantages like easily implemented, simplification for positional updates and also provides mobility prediction opportunity.
6) *Pursue shortest mobility model:* - In this model, every node wants to attempts for chase a particular node moving towards a particular direction set as target but it starts from the nearest one segment. Every node chooses a shortest path to achieve it. But in the Pursue suit for every node.
7) *Gauss-Markov Mobility Model:-*This was first introduced by Liang and Haas. It is widely utilized by all .In this model, the velocity of mobile node can be assumed as correlated over time, and modeled as a Gauss-Markov in stochastic process.

8) *Reference Point Group Mobility model:*-The Reference Point Group Mobility model (RPGM) has a special logical centre. The motion of this mobile node defines with feature for entire groups like speed, direction, location and acceleration, etc. Basically nodes are uniformly distributed particularly within the geographic range. Each node is assigned by reference point which followed as group movement. This reference point allows independent behavior random motion for each node.
9) *Manhattan Mobility Model:*-Manhattan Mobility Model is used as grid road topology.In this mobility model every mobile nodes move in horizontal or vertical direction on an urban city map. It employs a probabilistic approach for the selection of nodes movements, for every intersection, a vehicle chooses path to keep travelling in same direction. Along as horizontal and vertical streets, the mobile nodes are restricted to move on the map. At an intersection, the mobile node can be move straight, right, left, straight with some certain probability. The previous speeds also provide time dependency to speed of a mobile node, in same direction for front nodes.
10) *Chain mobility model:* - The Chain model is not considered itself as a model but it is concatenation of some implemented models like Random Waypoint, RPGM, and Manhattan etc. In some cases required to necessary have model scenarios from which mobile nodes behave differently, depending on position and time.

V. MULTIMEDIA APPLICATIONS FOR MOBILTY MODELS

In MANET there are different types of mobility models used to evaluate performance of ad hoc network. According to these mobility models certain multimedia application and perform its operation .There are various applications of ad hoc networks to finding several areas due to economic deployment. These applications are including military applications, law enforcement applications, and emergency operations, meeting applications, collaborative and distributed applications.Group mobility models that represent multiple MNs whose actions dependent on each other completely. In this mobile nodes moves in groups to perform certain task.

In a military application, mobile ad hoc networks can provide necessary and important communication information between groups of soldiers in unknown or undefined area where no fixed infrastructure may be possible.

In the emergency situation such as search and rescue operations mobile ad hoc networks are very useful for establishing communication, whereas conventional infrastructures are destroyed due to a war, earthquake tsunami and other natural or manmade disaster. Mobile ad hoc network also helpful for meeting applications whereas students in class, researchers and developers are in conference or business owners need to establish a meeting may be through video chatting or video conferencing and may be through voice conversation.

Ad hoc networks can also be used to support collaborative and distributed environment applications where the decision of one participantcan depends on current environmental conditions but it effects on the action of other users. An example of this type of applications is the coordination between managers whereas one is general manager and other one is financial managers in business firms, where as the operations is based on the conditions that affect all areas.

The shared characteristics of applications are used for collaborate large number of mobile nodes, have limited bandwidth, need for supporting for low latency access to distributed resources.

Ad hoc network is also expected to be deployed in different types of applications environments. These environments include cities, markets, universities, highways, business environments, conferences and battlefields. The most common obstacles present in environments are act as barrier and block node movement. Examples of such types of obstacles are buildings, hills, mountains and cars. Real-time include video conferencing applications over wireless ad hoc networks at a location with no wireless infrastructure, transmitting video towards battlefield, search and rescue operations. Real-time applications are different fundamentally from other best-effort applications. Real-time applications are sensitive for delay and loss packet. The later packets will be dropped in real-time while best-effort packets can be accepted. Therefore, there-transmissions are not generally applicable to real-time applications, especially in multicast situations. These applications in the ad hoc networks are performed under one–to–many or many–to–many communications so multicasting technique is very important for these applications.

VI. SIMULATION ENVIRONMENTS

A. Simulator

To simulate the protocols OPNET 14.5 (Optimized Network Engineering Tool) is chosen. It supports the reference point group mobility and vector mobility model. It simulates the network graphically and provides mirror structure of actual network. The modular follows object oriented approach; nodes and protocols are modeled as classes with specialization and inheritance.

B. Simulation mode

In this paper we have considered models based on vector mobility model and random way point mobility model.

In previous related work it describe TCP is responsible for end-to-end delivery of packet, it works only on wired network and does not support few condition like packet loss or delivery delay. MANET Simply encourages the delivery of data packets into the wired networks.

The proposed simulation parameters are summarized in table 1.

Parameters	Value
Simulator	OPNET 14.5
Numbers of Nodes	50
Area	3.5 x 3.5 Km
Wireless MAC	802.11
Mobility model	Vector mobility and Random Way Point mobility
Data rates	11 mbps
Application	Multimedia

Table 1: Network Parameters

The following parameters metrics are proposed on base on various routing protocol:-

Delay: It specifices how long a network takes for a bit of data to travel from one network to or end point to another across the network.It is typically measured in multiples or fraction of seconds.

Throughput: It is the time that the total size of useful packets that received at all the destination nodes. It is the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network.

Network Load **:** It specifices how number of hosts, helping to enhance the availbility and scalibility for transmission of data into the network efficiently.

Data dropped and Retransmission: It is to retry threshold exceeded in bits/sec. Retransmits the data packets into the network to its specified destination.

VII. RESULTS

In the results we have comparative analysis for random way point and vector mobility model with three protocols:-OLSR AODV and GRP. These protocols having parameters as Throughput, Delay, Network load, Data Dropped and Retransmission.

A. Throughput

In this figure 1 show that throughput in OLSR is the higher than AODV and GRP because of its proactive nature. In both mobility models vector mobility and random way point mobility throughput shows higher in OLSR with up to 50 nodes. OLSR 2,500,000bps in vector mobility shows higher throughput as compare to OLSR in random way point mobility model 1,300,000bps because in vector mobility it shows to avoid unrealistic behaviour which is not possible in physically.

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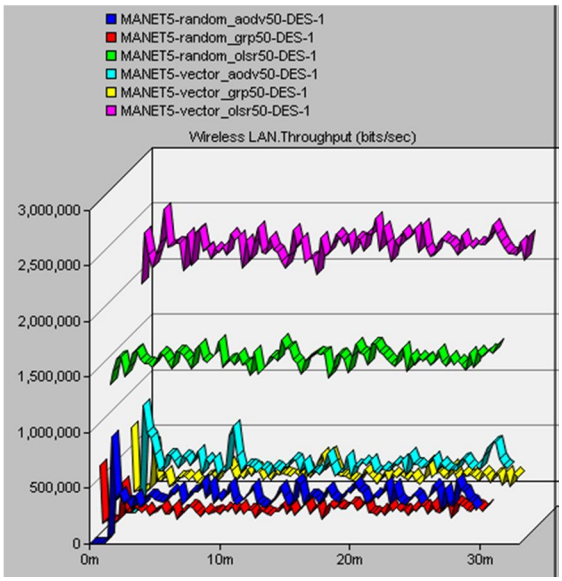

Figure 1.Throughput (50 Nodes Random Way Point and Vector Mobility)

B. Delay

In figure 2 again OLSR shows minimum delay in both mobility models as comparison of both other two protocols are AODV and GRP. OLSR in vector mobility shows minimum delay0.0006sec as compare to OLSR in random way point mobility delay of 0.0010 sec because of its proactive nature and it is based on table driven and immediately transfer packet to next nodes when it got and it does not wait for pause time as in random way point.

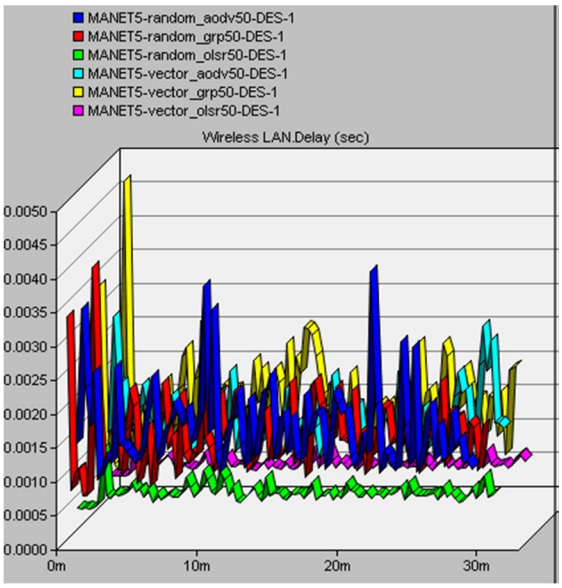

Figure 2.Delay (50 Nodes Random Way Point and Vector Mobility)

C. Network Load

According to Figure 3 vector OLSR shows highest network load and then vector GRP. The efficient network can easily overcome with large traffic coming, and to make a best network path. For this many techniques have been introduced. High network load affects the whole MANET routing packets and slow down the packet delivery for reaching towards its channel, and as results it's increasing the collisions of these control packets. Thus, may be slow to stabilize for routing protocol. OLSR in vector mobility experiences the maximum network load of 510,000 bits with nodes density of 50 this may be due to the reason that OLSR requires a reasonably large amount of bandwidth and computational power for optimal path in network.

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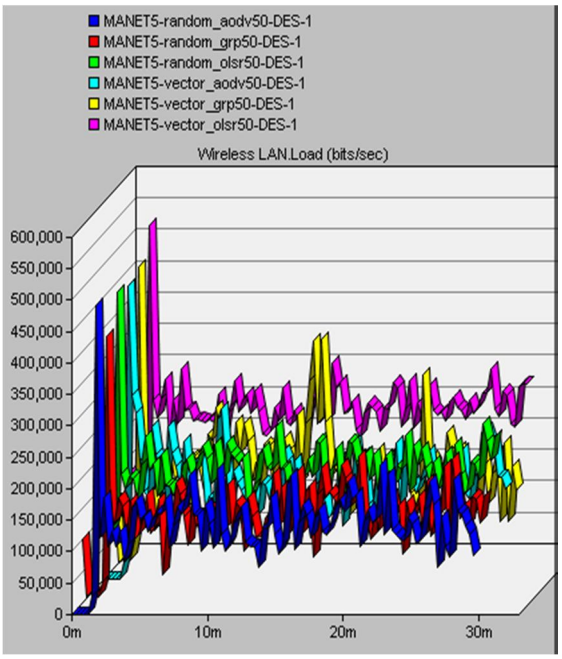

Figure 3.Network Load (50 Nodes Random Way Point and Vector Mobility)

D. Data Dropped

In figure 4 GRP in random way point mobility shows maximum data dropped and retry to threshold exceeded .It shows its maximum value 37,000bps in the graph where as AODV in both vector mobility as well as random way point shows lowest value in data dropped.

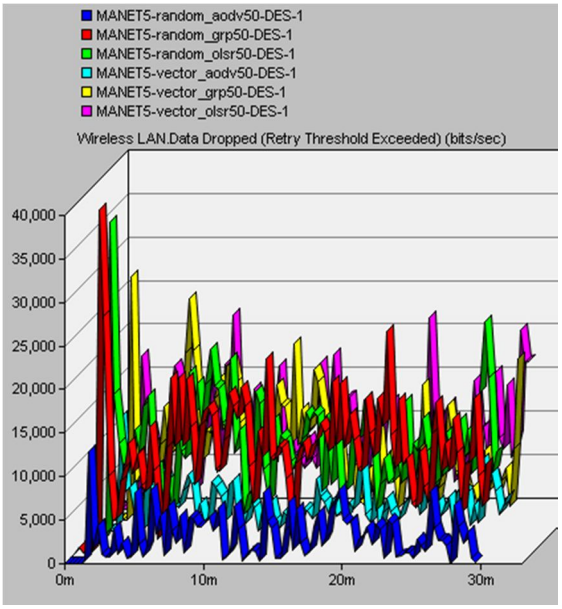

Figure 4.Data Dropped (50 Nodes Random Way Point and Vector Mobility)

Because GRP, being a hybrid protocol, it shows values of network load typically which lie in between both reactive and proactive protocols .Initially it is proactive in nature when it starts moving it changes into on-demand as reactive in nature. In reactive protocols, if there is no route found towards a destination node, then packets will be stored in a buffer until a route discovery is conducted (forwarded hop by hop). In other words, a route discovery process has to be activated process, because of AODV is a routing protocol that has no required for available route.

E. Retransmission

It is a total number of retransmission attempts in the network by all WLAN MACs until or unless either packet is transmitted successfully or it discarded the packets as a result of reaching for short or long retry limit.

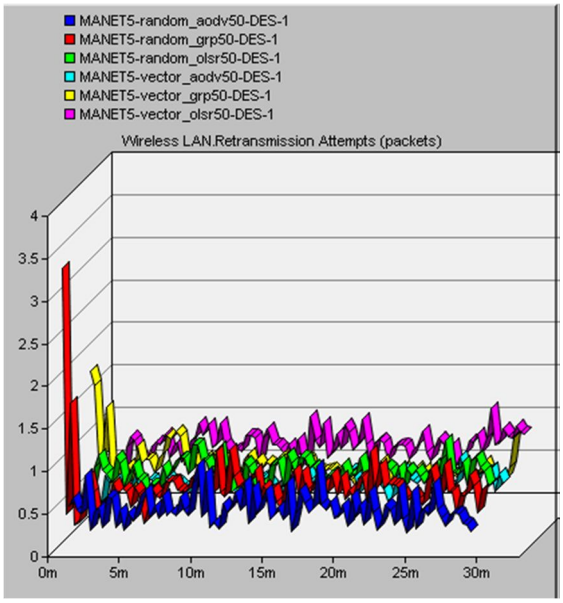

Figure 5.Retransmission (50 Nodes Random Way Point and Vector Mobility)

According to Figure 5 GRP in random way point retransmission attempt 3.4 is highest and AODV in random way point retransmission attempt 0.4 is low after end of simulation time. As per number of nodes is increases the performance becomes less or more constant but if density is too large, more and more of nodes try to get same common medium, then it starts collision and increases packet loss and also decrease its transmission attempts. GRP performs better than OLSR and AODV because of its hybrid nature. Overall, the protocols drop its packet delivery ratio as network loading increases. GRP in both mobility experiences less overhead as compared to AODV and OLSR, but in vector mobility GRP, it has higher attempts than GRP random way point mobility .

The overall results observations are summarized in table 2.

Table 2: Comparison Table

Nodes	Parameter	OLSR		AODV		GRP	
		Vector mobility model	Random waypoint mobility	Vector mobility model	Random waypoint mobility	Vector mobility model	Random waypoint mobility
50	Throughput (bits/sec)	2,500,000	1,300,000	800,000	680,0000	680,000	600,000
50	Delay (sec)	0.0006	0.0010	0.0026	0.0033	0.0046	0.0038
50	Network load (bits/sec)	510,000	448,000	447,000	450,000	490,000	380,000
50	Data Dropped (bits/sec)	22,000	34,500	10,000	10,000	25,100	37,000
50	Retransmission (packets)	1.1	0.7	0.5	0.4	1.7	3.4

VIII. CONCLUSION

It is observe in our comprehensive simulation on various routing protocol of MANET under different mobility models. It shows comparative analysis towards significant performance and behaviour different state and find out appropriate condition towards conventional MANET's. To analysis such type of scenarios we have modelled variably the nodes movement by vector mobility model and random way point mobility model. In this paper we are focusing three routing protocol is: OLSR, AODV and GRP for vector mobility model and random way point mobility model. Our simulation was conducted on OPNET 14.5 for both mobility model to improve packet delivery capacity and end-to-end delay in MANETs. However this method is more robust for communication in MANET. In simulation result the mobility nodes achieves a better throughputs, delay and network load for retransmissions for network. The considering work improve the performance of the for its significant. We finally point out some promising research and directions towards smart routing protocols.

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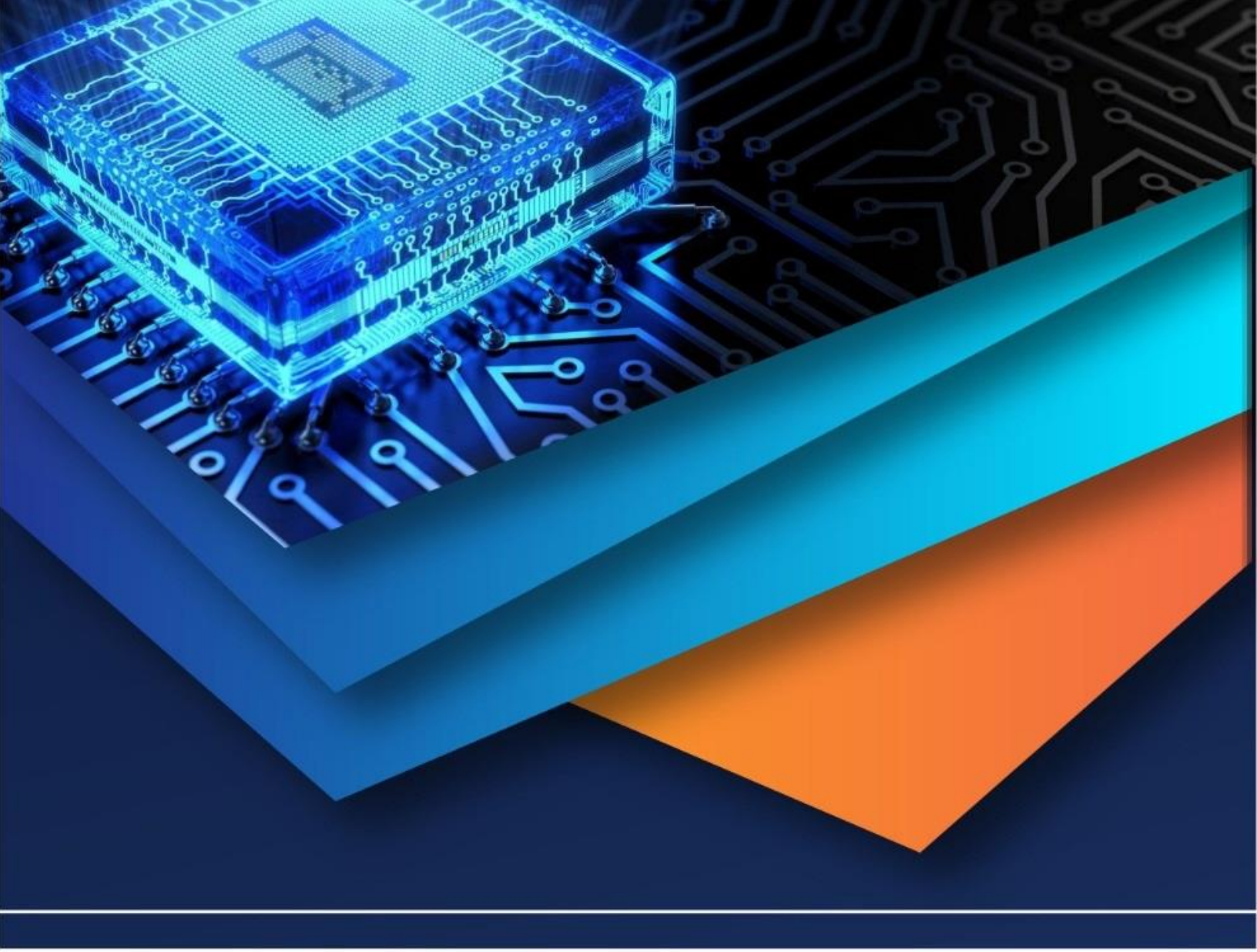

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