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Performance Analysis of Proactive OLSR and Reactive DSR, AODV protocols for MANET

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ABSTRACT: Mobile ad-hoc-network is the future network, because it can be developed easily, automatically configurable, flexible and don't depend on any network structure. It means MANET do not need already existing network infrastructure. A routing infrastructure requisite to establish in distributed controlled system. Various protocols for MANETs in routing have proposed and several evaluated work had conducted. A large amount of anticipated routing protocols and estimation made complicated to maintain the expansion and to acquire an impression of the strength and limitations of the protocols. The analyze evaluation techniques from the past and describes common problems to evaluate of routing protocols for MANETs and how to resolve them. A wide-spread MANET protocols have studied. They are categorized according their similarities and their results are deduced and eventually presented. The main goal of the work was to examine the recital of protocols, OLSR that was table driven DSR, AODV discovering average delay in packet sending and receiving, the average number of entries in the routing table: varying suspension time and different amount of nodes. An experiment was conducted to examine the recital of these protocols with OPNET 14.5 and NS2.

KEYWORDS: Average packet transmission delay, throughput, end-to-end delay, OPNET, MANET, FTP.

1 INTRODUCTION

MANET is a wireless network in which nodes are free to move, it do not depends on any infrastructure. In this system nodes automatically configure itself. Someone also called it is a mesh network, due to this reason that all nodes can communicate to each other. MANET network contained nodes, router and communication devices. Wireless devices are transmitter, receiver and antennas. Antenna devices may be of any type and the node also may be fixed or free to move. Here the node term referred to as a moveable node in any direction. Nodes may be a Personal Digital Assistance (PDA), notebook, cell phone or personal computer (PC) etc and location of these nodes might be in cars, airplanes or along with people having such type of devices. These nodes connect each other at random and make any topology and exchange data

with each other. Due to the capability of self configurability of MANET, it can be used in emergency situations like earth quake and in rainy season or flood areas [1].

A MANET is defined as:"MANET do not depend on any infrastructure, in this network, mobile nodes are free to move an work as router, by blending of nodes make a non uniform graph. Because the nodes movement is free, they automatically configure itself, structure changes quickly and it is not predictable. Such a network might be stimulate in stand-alone manner or could be associated to superior Internet. Various attributes such as distributed organizations, multi-hop routing, well structured and inadequate resources etc. Mobile nodes organize association and disconnection the distance among them and the enthusiasm to collaborate through the configuration of medium size networks [2].

1.1 CLASSIFICATION OF ROUTING PROTOCOLS IN ADHOC NETWORK

There are many routing technique in MANET, so these techniques are categorized in proactive, hybrid and reactive according to their behavior. Reactive is called on-demand protocol, due to on demand path is only created and maintain when acquired. Route to source or destination may be destroyed or remain if needed Proactive routing protocol: as well as table driven *i.e.* They keep the information of all routes that are part of the network [3]. As hybrid is mixture of both protocols, so it has combine properties. Example of hybrid is ZRP.

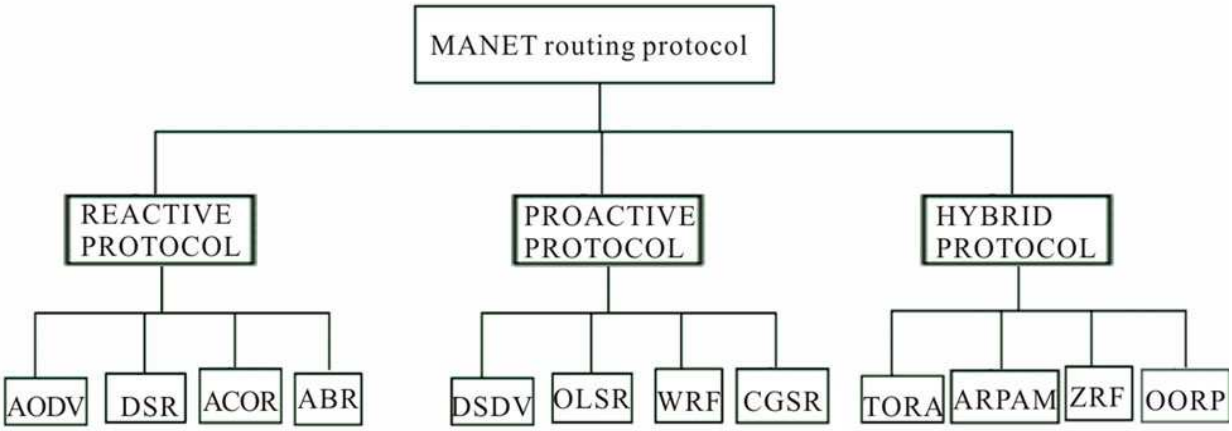

Fig 1: Classification of MANET protocols

1.1.1 OPTIMIZED LINKED STATE ROUTING PROTOCOL

An OLSR is a proactive link state protocol, that link-state protocol select most excellent path by formative a variety of properties as load on link load, holdup, bandwidth etc. These routes are more dependable, stable and precise in determining finest route and more complex that node count. To update topological information in each node that protocol was designed to work autonomously from other protocols. Theoretically, OLSR include three general fundamentals: first one is to find its neighbor, a technique for competent flooding of organizing passage and a condition how to choose and disperse adequate infrastructure information inside the network in order to establish finest routes. OLSR organize a multi-point Relays (MPRs), which reduce the flooding through establish the links of neighbor inside its MPRs as a replacement of other links. It can also be realized in every MANET.OLSR also supports protocol extension such as sleep mode operation, multicast routing etc. there are fundamental message types that must be observed in the OLSR implementation and must maintain compatibility with old implementation if any additional message type is to be implemented in OLSR [4].

1.1.2 DYNAMIC SOURCE ROUTING PROTOCOL

Dynamic Source protocol belongs to the family of reactive routing protocol and named as on-demand protocol, simple and efficient protocol due to source protocol and used in multi-hop ad-hoc network, it is self-governing protocol, two routing techniques used by this protocol, i.e. route discovery and maintenance. It periodically keep info up-to-date its cache for new easy routes, and find any new route then send data packet to new one, and packet knows new direction of the route, because the info of the route is set in the packet. This info will help it to avoid the periodic loop, and find route. Two messages are sent for finding new route, route request and route reply. The routing info about the network is maintained at each and every node in their cache, first node take a look in its cache to find the desired route if find then it will not

retransmit the message in the network, and reduce the memory burden, and simply transmit the request packet to the destination, this will be the first packet from sender to destination and it have the complete info about the path, and the node on which route is find will send the reply message to the source, containing the complete info about the route [5].

1.1.3 ADHOC ON DEMAND DISTANCE VECTOR

On-demand protocol, the algorithm use in this protocol easily finds the link status in network whenever change comes. This is explained here through an example, if any link goes down in the network, the notification of down link is only sent to the nodes that are directly affected by the down status of link, and all the routes that are affected by this node will be vanished, and the network usage will be minimum due to the uni-cast traffic. Because routes will be construct on-demand so that traffic overhead will be minimum. AODV definitely will not permit the route information about those routes that are or not in use, vanish them, if any two nodes desire to communicate; it is the AODV responsibility to make a route by multi-hop. It is a loop free that is achieved by destination sequence number (DSN), and also the main feature of the protocol. Whenever a node required route, it send request to its neighbor along with dsn's also sent, containing all information about routing, and select the shortest path that is selected by the dsn's number [6].

2 RELATED WORK

Author[7] discuss performance comparison of DSR and AODV by considering the avg. energy-consumption and routing energy-consumption using NS-2 simulator. Their behavior on graph shows shat DSR consumed very low energy when no of nodes in network are less, but AODV use greater energy than DSR. They concluded that the protocols are used in MANET need some exertion that can make the MANET life great and reduce energy-consumptions factors. The author [3] performed the comparison of SEAD and Ariadne protocols, analsis was done on the basis of performance parametric not on the security parameters. Their performance shows that Ariadne give excellent results in all metrics but when pause time was very low SEAD gives excellent results, this is only due to the routing procedure in protocols. SEAD summarized the routing information in the tables that's why it gives remarkable results than Ariadne at low pause time. Ariadne has a notify feature that it has less control overhead than SEAD, therefore it has superior scalability than the SEAD. But Ariadne may face the problem of lengthy delays to find the routes for sending the packets. So Ariadne is not a good for related applications. Their comparison shows that performance depends on the need of routing system.

The author performs the comparison of DSR with DSR using Aunt Algorithm. Here the researcher describes the behavior of ant that they find the nearest route from their nest to food. He implements that idea in DSR and named it as DSR-ant. Author fined the results on different implemented scenarios and concludes that ant-DSR give better results than the original DSR. The results shows that ant-DSR give results in the improving terms of source to destination delay, their throughput and the number of nodes that counterpart in the route. Author results shows 48% delay was less than original DSR, 1.37 times less it contains nodes and its throughput was 3.6 times great. There is only the one drawback with ant-DSR was that it have 58 % more overhead than original DSR [8].

Author stated that there are lot of many various types of routing protocols in the MANET. The consideration of using which particular protocol in the MANET depends upon many factors which one should observe like the network size in which they want to use, how much load they require, how much movement of node is, etc. They analyse the three protocols(DSDV,AODV,DSR) by using the NS-2 simulator tool. They consider following parameters to check the QoS (PDR, Avg-Delay, throughput and delay) and conclude the performance of MANET by normalized the routing and MAC load by changing the speed of the nodes. Simulation fallout shows that DSDV that is a proactive protocol and is appropriate when number of nodes are limited and their moving speed is also low due to the storage space of routing information in the routing table at each node. However, DSR utilize source routing and route cache, but there is an overhead in each packet will be increase whenever network infrastructure change. So, DSR is the best suitable for temperate traffic with temperate mobility. For the robust scenario where movement is high, nodes are much in count, the traffic is more, the AODV achieve better among all the protocols that are under consideration. They concluded that the AODV perform well in the all kinds of network but not the best due to some shortcomings in it [9].

Author stated that in the current scenario, MANET has achieve very much significance and reputation in the research. The technique by which recital of MANETs can be estimate is use of various simulation tools. A MANET is fundamentally set of distributed nodes where each and every node whether it is transmit or getting data, acts as host as well as router. It is a dynamic wireless network that can be shaped not including any pre-existing structure. They explained the results which tell about protocols on the foundation of different recital metrics. AODV performs enhanced than DSDV and ZRP on the foundation of limit like routing overhead, average end- to- end delay, network overload and packet. delivery ratio. The

simulation was about three protocols of MANETs by having invariable number of nodes and using different parameters like routing overhead, Average End- to -End delay, Network Overload and Packet .Delivery ratio (PDR). The first three parameters discussed are in favor of AODV and last one is in the favor of ZRP. So, the analysis concludes that AODV is counted better routing protocol from DSDV and ZRP on the basis of the performance metrics used [10].

Author stated that Wireless Mesh Networks is one of the most talented wireless techniques of the future. Its patience factor against the network breakdown, expediency of set-up and administer ability are one of its key reward. Although WMNs are very alike to ad-hoc wireless networks, the structural design and protocols designed for ad-hoc networks carry out very deprived when practical in WMNs. The cause of their deprived recital is that the ad- hoc networks are planned for elevated mobility while the WMNs are planned for either a fixed or partial mobility. WMNs are typically rich in assets distinct ad-hoc wireless networks. One of the main issues in WMNs is the source organization that acting a vital function in any network's recital. The research has primarily paying attention on the assessment of routing protocols to be used in WMNs. Recital parameters that were used for investigation and study are throughput, holdup and network consignment as these are critical for given that assured End-to-End Quality of Service (QoS) [4].

Author [7] stated that estimate the recital of FSR and DSR protocols in QualNet 6.1, that is a simulator tool, by fixing the packet size of 512 Byte. FSR uses the hierarchical table-driven policy whereas DSR uses the reactive on demand routing approach with dissimilar routing methods. They experiential that the on the whole recital of DSR protocol in the simulation showed that DSR achieve better in provisos of Throughput, End-to-End Delay and Jitter in association of FSR protocols. The simulation was the comparison of FSR and DSR with CBR traffic. They also take into count mobility. Their results shows that DSR is more suitable for big mobile networks where movement is sky-scraping .Researcher examined [5]the recital study of OLSR protocol with the help of OPNET simulator. Their analysis was done in the arbitraly moving environment containing 30,40,and 50 nodes and area was 10000 sq m. Their findings was that OLSR has achieve maximum performance in all aspects of the network. [11]presents the comparison analysis of protocols that support video streaming and their performance metrices that they considered in their research were throughput, PDR, wlan delay. Their findings showed that TORA has performed his best in all aspects.

Author presented [12]their work about DSR, under consider the following metrices end-to-end delay, pdr and routing load. Their findings was that DSR performance will be very good when nodes movement will be low and network traffic also will be low.[13] stated the negative aspects of vanet routing protocols. They stated that hybr is an unicast along multipath routing technique, and is a protocol which is topology base and apply where network load or density is very rich. [14]studied the AODV and DSR protocol with the help of qualnet 5.0, is a simulator. Their consideration aim was to examine these protocols by considering the wormhole attack also compare their recital without considering it. Their findings was that by considering wormhole protocols recital goes down. [15] studied the OLSR AODV in vanet using the ns3, that is a simulator. Their findings was that PDR of AODV is very small than the OLSR but OLSR has much better throughput than AODV. However the delay was high than standards delay that was set in simulation as 1.

3 SIMULATION PARAMETERS USED IN OLSR, DSR AND AODV PROTOCOLS SCENARIO

Simulator Parameters	
Protocols	OLSR, DSR, AODV
Simulator Model	OPNET 14.5
MAC Protocol	IEEE 802.11
Traffic Type	FTP
Node Speed	10, 20, 30 m/s
Pause Time	100, 200, 300 sec
No of Nodes	15, 30, 45
Topology	Radom Way Point
Simulation Time	3600 sec
Mobility Speed	10 m/s
Area Size X	1500 meters
Area Size Y	1500 meters
Node Mobility	Randomly

Fig 2: Simulation Parameters

3.1 OLSR, DSR AND AODV THROUGHPUT VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the throughput of OLSR, DSR and AODV routing protocols. In the first scenario throughput of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario throughput is observed by varying pause time (10,20, 30 meter per second). The following figure shows the throughput of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the throughput of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

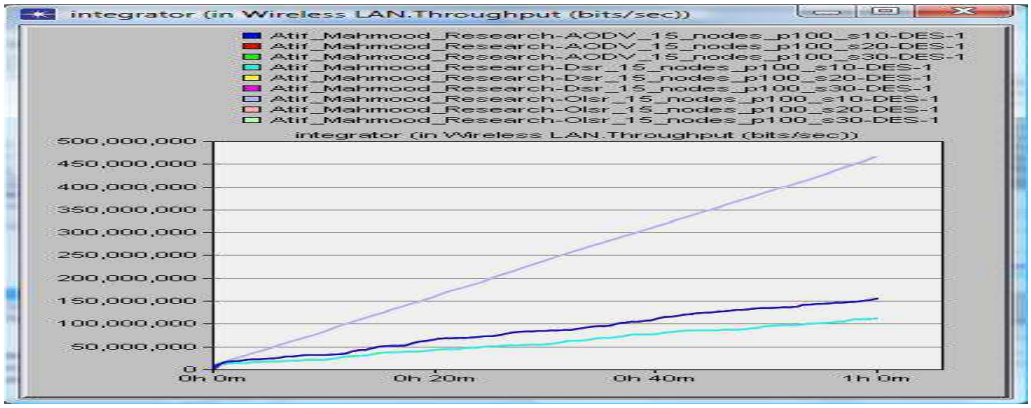

Fig 3: OLSR, DSR and AODV Throughput vs node speed

As shown in fig 3, it is clearly declared by graph that, OLSR throughput is maximum, when node speed is 10 and pause time is 100 seconds.

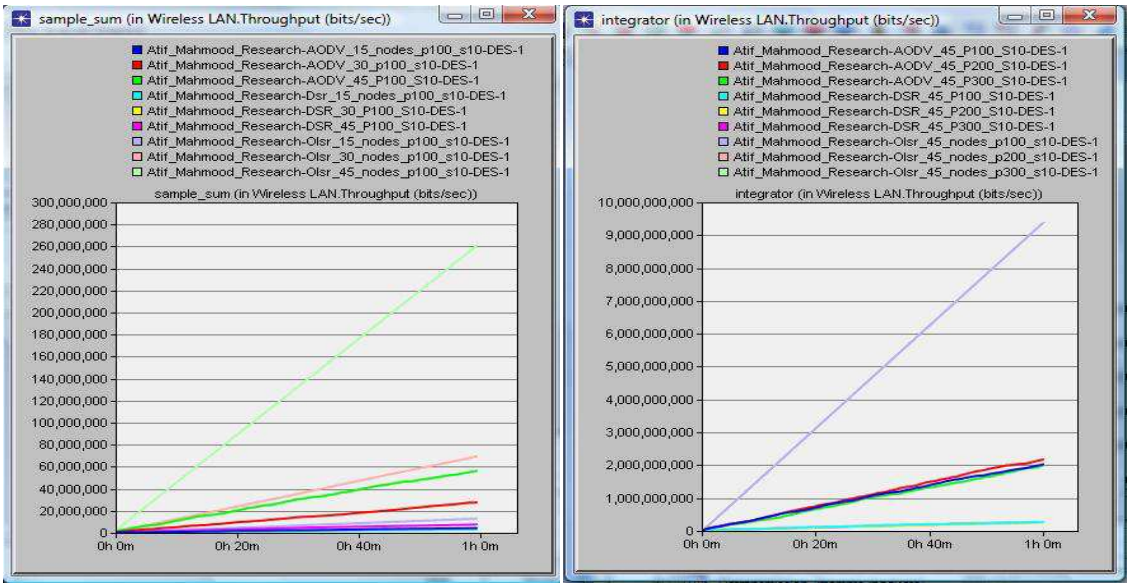

Fig 4, 5: OLSR, DSR and AODV Throughput vs pause time and no of nodes respectively

As shown in fig 4,5; it is clearly declared by graph that, OLSR throughput is maximum , when number of nodes are 45 in both figures and pause time is 100 seconds and node speed is 10 m/s respectively same in both figures.

3.2 OLSR, DSR AND AODV NETWORK LOAD VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the network load of OLSR, DSR and AODV protocols. In first scenario network load of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario t network load is observed by varying pause time (10,20, 30 meter per second). The following figure shows the network load of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the network load of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

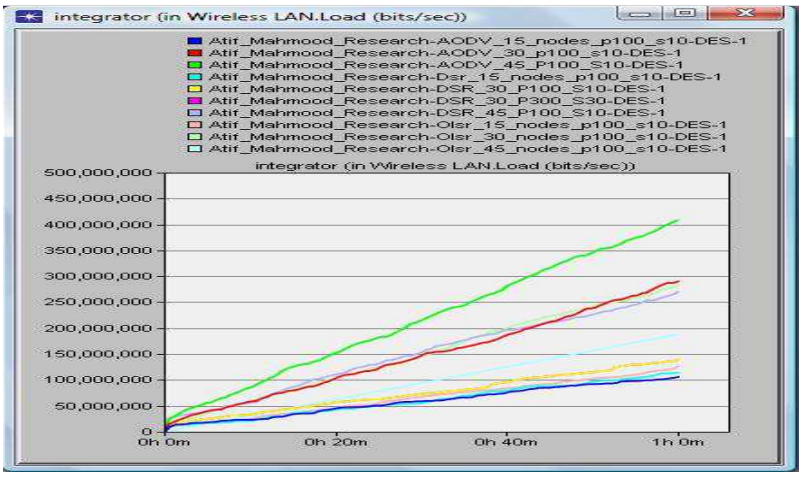

Fig 6: OLSR, DSR and AODV Network Load vs no of nodes

The performance of AODV increases as the nodes increases in count, and the performance of OLSR and DSR are near about same.

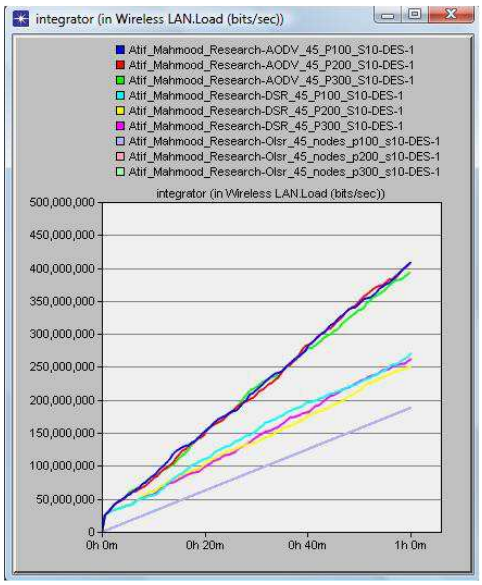

Fig 7: OLSR, DSR and AODV Network Load vs pause time

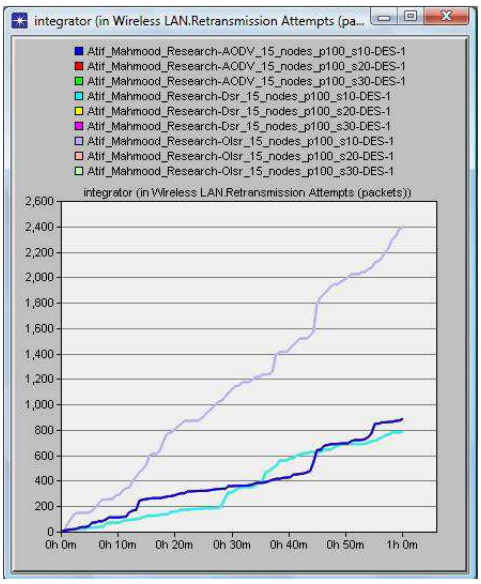

Fig 11: OLSR, DSR and AODV Network Load vs node speed

As shown in figure 7 and 8, it is clear that AODV performance is overlapping in graph versus pause time, and in figure 8 OLSR performance is best with respect to others protocols.

3.3 OLSR, DSR AND AODV RETRANSMISSION ATTEMPT VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the retransmission attempt of OLSR, DSR and AODV protocols. In first scenario retransmission attempt of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario retransmission attempt is observed by varying pause time (10,20, 30 meter per second). The following figure shows the retransmission attempt of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the retransmission attempt of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

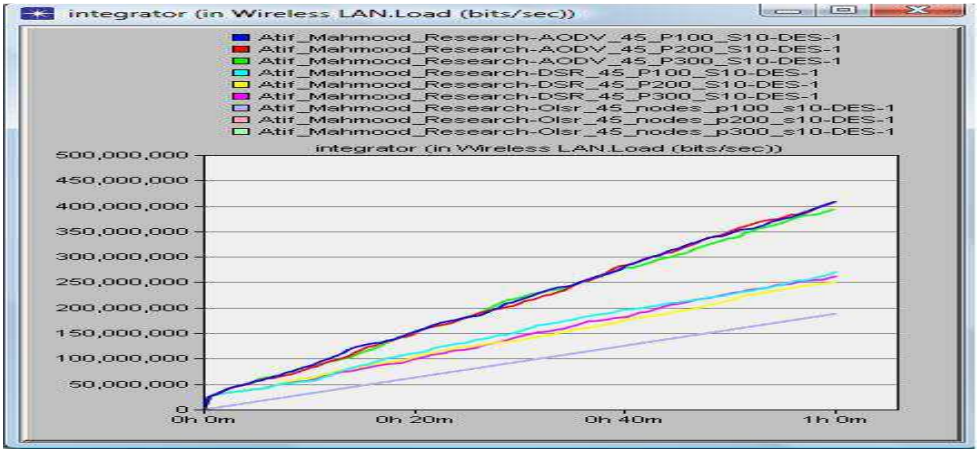

Fig 9: OLSR, DSR and AODV Network Load vs Pause Time

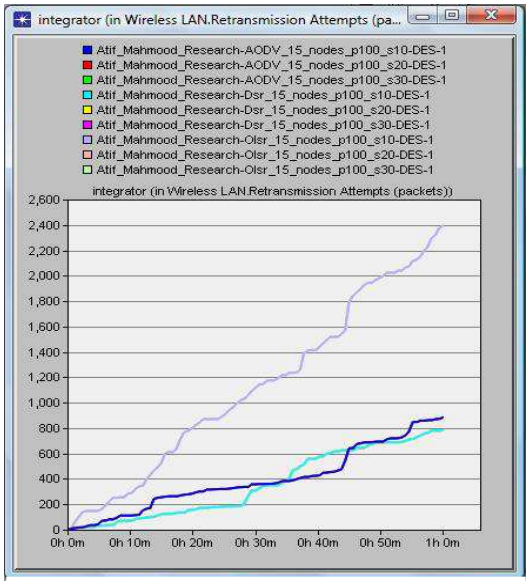

Fig 10: OLSR, DSR and AODV Retransmission Attempt vs Node speed

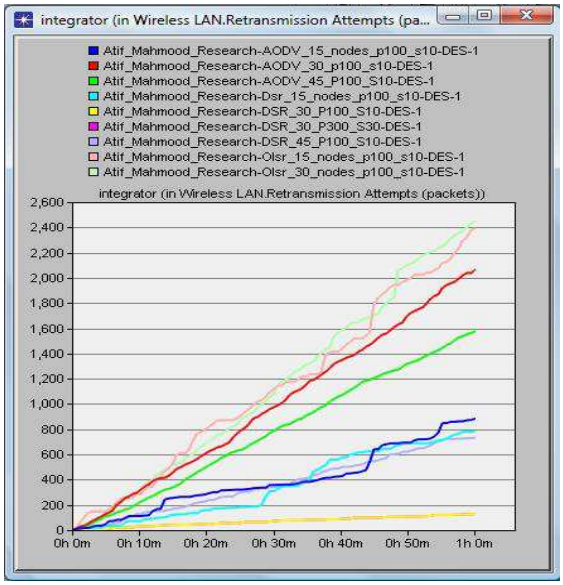

Fig 11: OLSR, DSR and AODV Retransmission Attempt vs # Nodes

Figure shows that the retransmission attempt of OLSR, DSR and AODV. Retransmission attempt is observed by varying nodes speed .The retransmission attempt of AODV is shown in figure by varying nodes speed. It is observed that by increasing nodes speed in the network the retransmission attempt of AODV is decreases. Retransmission attempt is low for high nodes speed.

3.4 OLSR, DSR AND AODV MEDIA ACCESS DELAY VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the media access delay attempt of OLSR, DSR and AODV protocols. In first scenario media access delay of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario media access delay is observed by varying pause time (10,20, 30 meter per second). The following figure shows the media access delay of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the media access delay of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

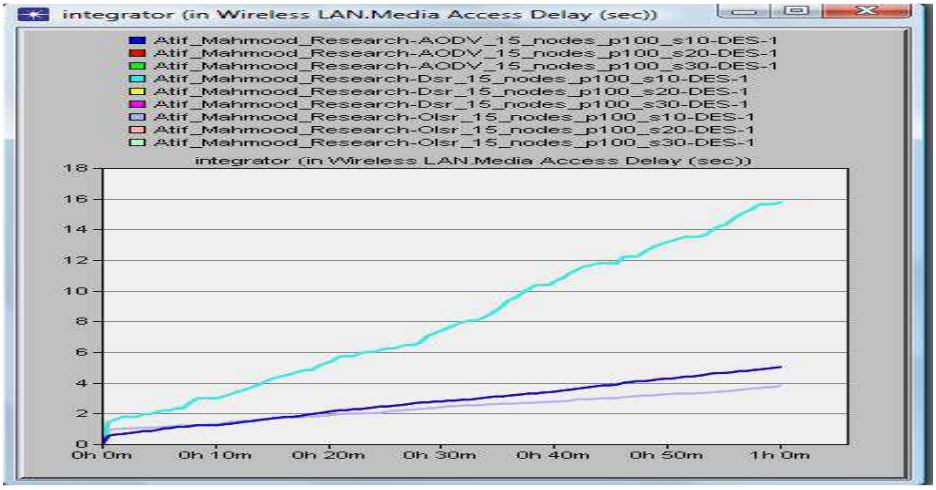

Fig 12: OLSR, DSR and AODV Media Access Delay Vs Node Speed

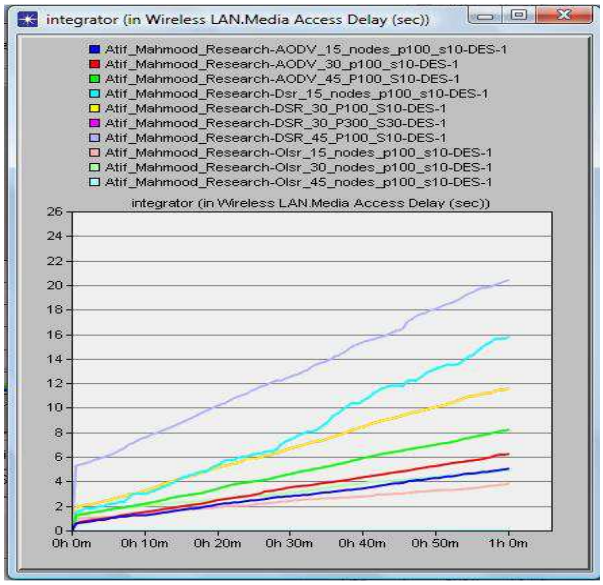

Fig 13: OLSR, DSR and AODV Media Access delay vs no of nodes

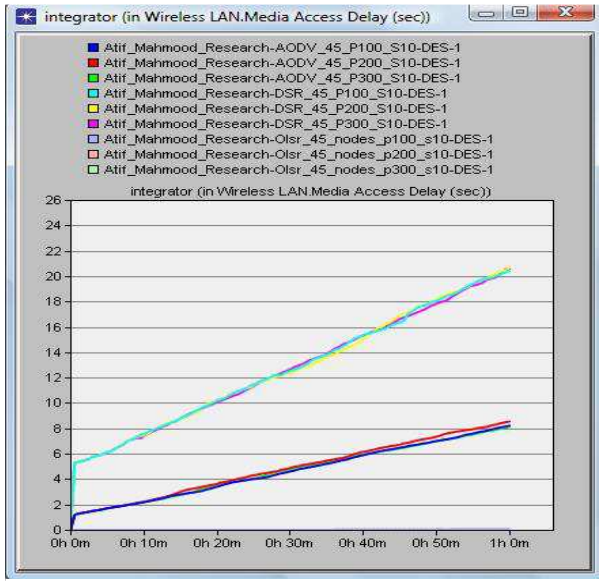

Fig 14: OLSR, DSR and AODV Media Access delay vs pause time

In figure 12 to 14 media access delay is analyzed against various parameters. In figure 12 OLSR perform well, in figure 13 OLSR recital is well when nodes are 45 and in figure 14 OLSR performance overlapping in graph is shown, fist its graph goes towards y-axis then continuously increasing upward toward x-axis.

4 CONCLUSION

Research investigation was based on concrete data concerning functioning and evaluating OLSR, DSR and AODV with OPNET 14.5. MANET being the essentially functional and consistent network for statement with distinctive application, it is essential to examine the recital of proffered MANET routing protocols over FTP traffic. It made a vital position in MANET application. Wireless network encompass an enormous benefit of maintaining huge network infrastructure. In significant section akin to catastrophe, military attacks, flood and hurricane, trembling etc. MANET could be developed easily, automatically configurable, flexible and don't depend on any network structure. It means MANET do not need already existing network infrastructure. A large amount of anticipated routing protocols and estimation made complicated to maintain the expansion and to acquire an impression of the strength and limitations of the protocol. OLSR performance in

throughput regarding all parameters is excellent. In retransmission attempt AODV take maximum network load, and in media access delay scenario DSR performance is excellent.

5 FUTURE DIRECTIONS

This research work may help someone to choose protocol in the MANET. This study may be extended in future for further study with more parameters and protocols, and might develop more complex environments.

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