# Comparative Analysis of Reactive and Proactive Protocol of Mobile Ad-Hoc Network

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***Abstract*— Mobile ad hoc network "MANET" is a collection of wireless communication nodes which communicates without any fixed infrastructure. The nodes are mobile and forming a dynamic temporary network without any use of existing network. The routing in mobile ad hoc network is a difficult task because nodes are dynamic. This paper will focus on two well known routing protocols of Mobile Ad hoc network these protocols are-1.Reactive Protocol-Ad hoc on demand distance vector routing protocol (AODV), 2.Proactive protocol-Optimized link state routing protocol (OLSR).And the performance of these routing protocols are analyzed and compared on the basis of IEEE 802.11 wireless local area network (WLAN) standard parameters and the parameters are Media access delay, Network load and Through put. In this paper we also present comparison of these protocols by using simulation. We perform widespread simulations using network simulation software.**

***Keywords- MANET; AODV; OLSR;***.

## I. INTRODUCTION

Wireless networking is a promising technology that allows user to access information and services electronically at any rate of their geographic position [1] [2]. Wireless network can be classified in two types-

### A. *Infrastructure network*

This type of network also called as centralized or hub-and-spoke topology. This infrastructure is called fixed (wired) infrastructure that supports two types of communication the first type communication is between mobile terminals and the second is between mobile and fixed terminals. This infrastructure is designed for a large coverage areas and multiple base station (BS) or access point (AP) [3].Figure1 shows an infrastructure network that nodes are connected to the base station.

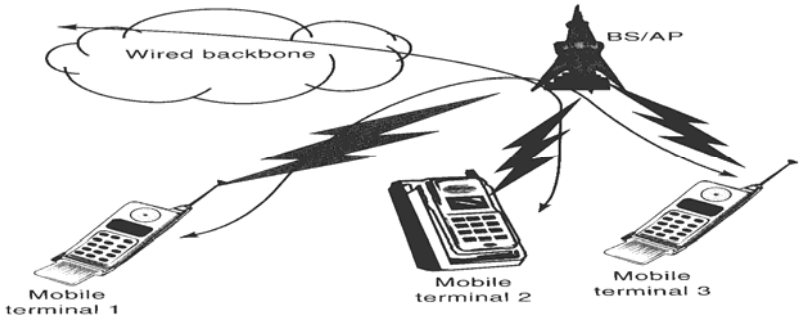



Figure 1. Wired network infrastructure with basic operation [3]

*B. Infrastructure less network*

This network is called as ad hoc network or distributed network. Ad hoc network is a reconfigurable network that can operate without the need for a fixed infrastructure. All nodes work like a router and take part in discovery of routes and maintenance of routes to other nodes in the network [3]. This topology is divided into two variations:-

*Single hop ad hoc network topology:* In Figure2 shows a single-hop ad hoc network every user terminal communicates directly with any of the other user terminals

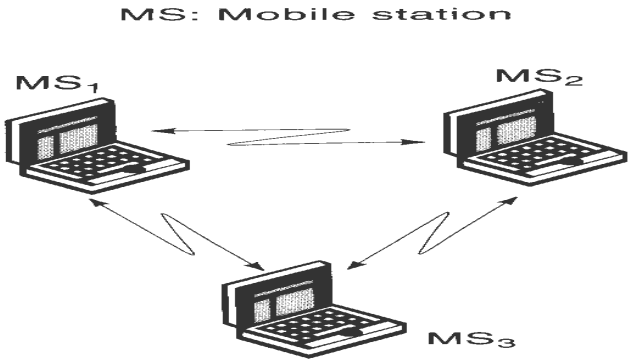



Figure 2. Connected user terminals with single hop network topology [3]

*Multi hop ad hoc network topology:* In some ad hoc network user may be distributed over wide area. So user terminal may be able to reach only a portion of other user in the network due to transmitter signal power limitation. In an ad hoc multi hop network, each terminal should be aware of neighbouring terminals in its coverage range. The multihop network was used in military tactical network. It is provided relive communication under in predictable propagation conditions and over widely varying geographic areas [3].

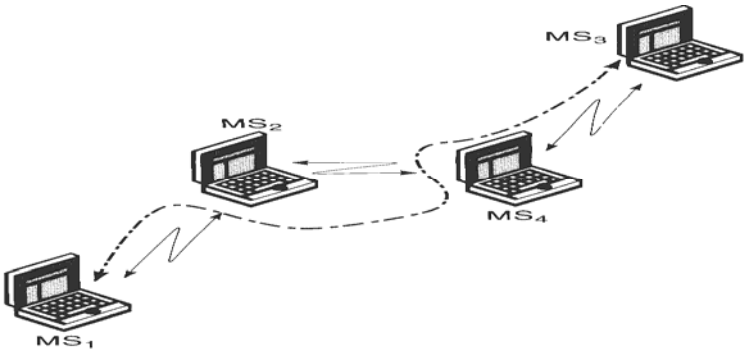



Figure 3. Multi hop ad hoc network topology [3]

*C. Mobile Ad Doc Network (MANET)*:

Mobile Ad-hoc networks are self-organizing and self-configuring multihop wireless networks where, the structure of the network changes dynamically. This is mainly due to the mobility of the nodes [4][5]. The nodes in the network works as host as well as routers that route data to from other nodes in network.

*Types of MANET:*

- Vehicular Ad-Hoc Networks (VANET's).
- Intelligent Vehicular Ad-Hoc Networks (In VANET's).
- Internet Based Mobile Ad-Hoc Networks (I MANETs).

## *II. CLASSIFICATION OF ROUTING PROTOCOLSOF MOBILE AD HOC NETWORK*

In wireless mobile ad hoc network nodes are mobile means not fixed. Then routing in ad hoc network is difficult task. There are different categories in ad hoc network-

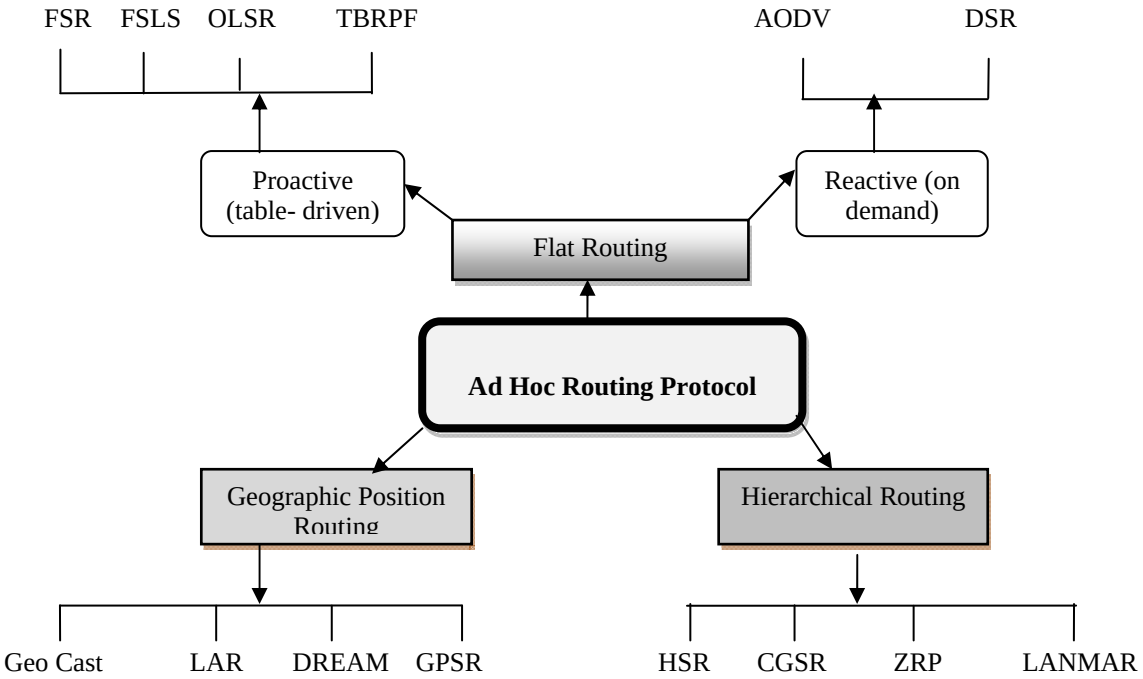



Figure 4. Classification of Routing protocols [5]

In this paper we will compare only two protocol of ad hoc network.

A. *Proactive Protocol*

Proactive protocols are also called as Table driven routing protocol. It is maintain a routing table before communication start. In this protocol every node in the network maintains a routing table to every other node in the network nodes and node are automatically updating the routing information when topology changes. It is use link state routing algorithm. The proactive protocols are not sutabile for a large network because each and every node maintains all information of every node in routing table. So this protocol is use as dynamic network. E.g. OLSR

- *Optimized Link State Routing Protocol (OLSR)*: Optimized Link State Routing protocol (OLSR), is an optimization of pure link state routing protocol, it is designed for mobile ad-hoc networks. It is a table driven approach i.e. exchanges the information with other nodes of the network [6].

The two key concepts are used in this protocol.

a) Multipoint Relays [MPRS]
b) Optimized link state

*a). Multipoint Relay Selection*:-Multipoint Relay [MRP] broadcast the message for selected nodes during the flooding process. It is reduces the message overhead as compare to flooding. In the flooding mechanism every node retransmits each message when it is receives the first copy of the message. In OLSR, link state Information is generating only by nodes chosen as MPRs [6].

*b). Optimized link state:* optimization is accomplished by minimizing the number of control messages flooded in the network [6]. OLSR provides optimal route to the hops. This protocol is sutabile for a large and dense network.

*B. Reactive protocol*

Reactive protocols are also called on demand routing protocols so these routing protocol are called when they are needed and the routes are built. So they don't any maintain routing information at the network nodes if there is no communication. If a node1 wants to communicate with node2 it is send a packet to node2.then this protocol search route of minimum distance on demand manner. Then the node sends and receive the packet so this protocol is called on demand because it's find a route only when it's needed. In this protocol flooding is used to discover the route. E.g. AODV

- *Ad Hoc on Demand Distance Vector (AODV):* AODV is a reactive protocol that determines the route when it's needed. It is based on distance vector routing protocol. In the AODV the host node know the next hop to every destination node.

AODV uses two types of messages to communicate with each other.

a) Route Request (RREQ).

b) Route Reply (RREP).

When a source host wants to send packet to the destination and cannot get the routes from its routing table it will broadcast a Route Request (RREQ) [4][7].If receiver establish the routes from source to destination then it will unicast a Route Reply (RREP) back to source. Otherwise RREQ will be re broadcast [4]. AODV has a problem of route request flooding.

## *III. SIMULATION ENVIROMENT*

**I**n this section we are using simulation software known as OPNET (optimized network engineering tool).it is a network simulator which is used for to design the multiple networks, manage these networks and also provide applications of these networks. It is also simulate the performance and compare the networks, protocols. Now a day OPNET is a most powerful and useful window based commercial software. the tool is used for simulation is OPNET 14.5 modeler [8][9].The main aim of this paper is to perform the experimental study which is based on OPNET simulation and we also implement some of the solutions e.g. comparative study of routing protocols with respect to different performance metrics parameters which are given below:

- Media access Delay (sec).
- Network load (bits/sec or packet/sec).
- Throughput (bits/sec or packet/sec).

Here we study the comparison of these routing protocols of MANET and analyze the better performance by using different parameters.

### *A. Network Scenario*

This scenario based on OPNET we create a network scenario of 40 nodes with the comparison of Media Access Delay, Network Load and Throughput with respect to AODV and OLSR. The nodes were placed with certain gap from each other in 600*600 m campus environment of 40 nodes respectively. Simulation time is 20 minutes. Table 1 shows the network parameter of AODV and OLSR.

Table1.Network Parameter [8] [9]

| ***Examined Protocols*** | ***AODV and OLSR*** |
|---|---|
| **Simulation time** | 20 minutes |
| **Traffic type** | FTP |
| **Mobility (m/s)** | 30 meter/second |
| **Packet inter-arrival time (sec)** | Exponential (1) |
| **Packet size (bits)** | Exponential(1024) |
| **Mobility model** | Random waypoint |
| **Wireless Mac address** | Auto assigned |
| **Ip** | Ipv4 |

### B. *Traffic Flow Parameters*

Traffic is generate in the network by Configuring user defined application and mobile definition. Table 2 shows the traffic parameter for network simulation.

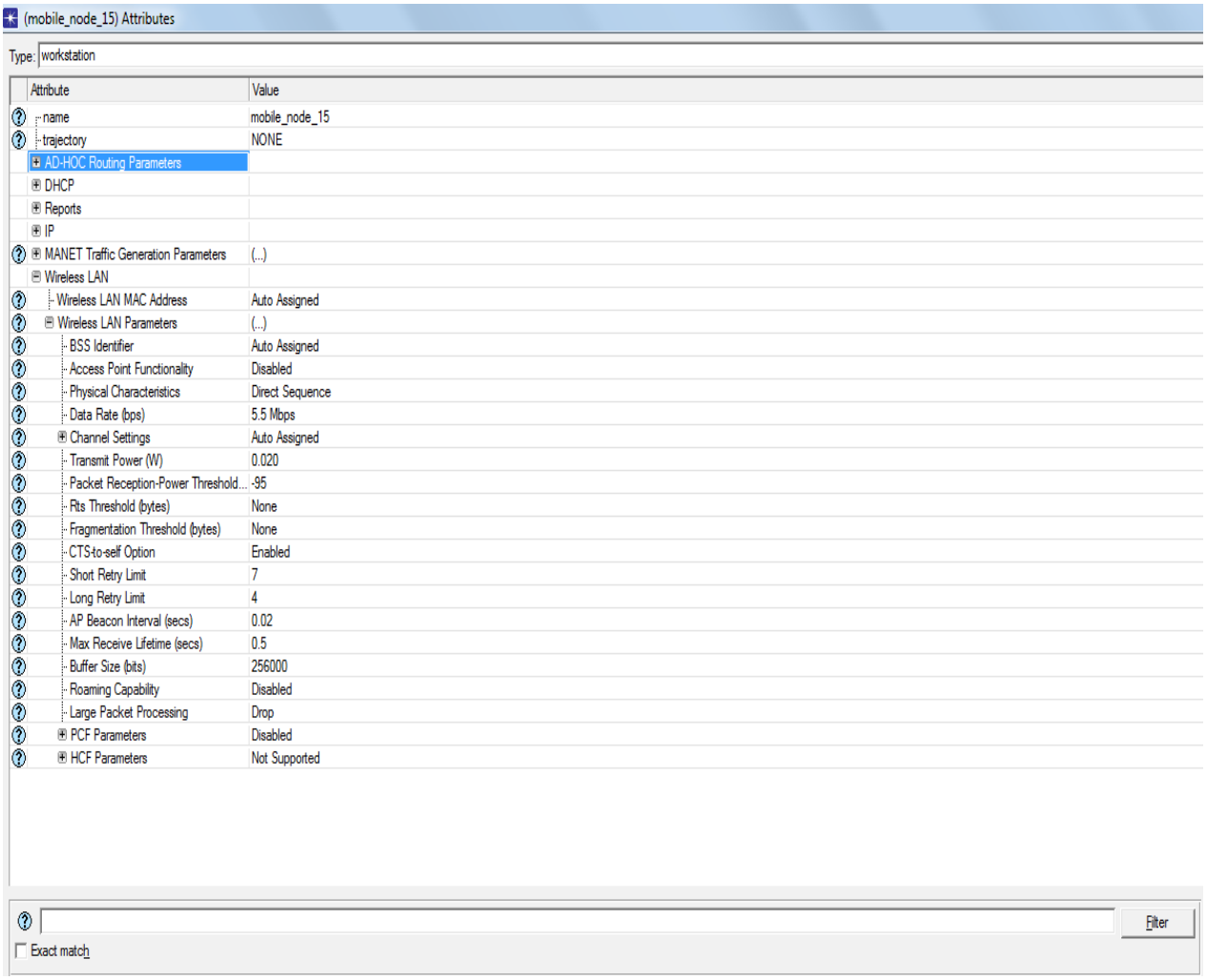
Table 2 Traffic Flow Parameter [8] [9]

| ***Application configuration*** | ***Default*** |
|---|---|
| **Mobile configuration** | Default |
| ***DES Configuration*** | Duration: 20 minutes (1200 seconds) |
| | Seed: 128 |
| | Update Interval: 500000 events |

### C. *Wireless LAN Parameter*

The Wireless LAN parameters were common to all of the both routing protocols as shown in table 3.

Table 3 Wireless LAN parameters [8]




## IV. RESULTS AND ANALYSIS

In this section we create a network of 40 nodes with respect to AODV and OLSR routing protocols. We compare these protocols on the basis of IEEE 802.11 wireless LAN parameters.

### *A. Media Access Delay (sec):*

We simulate AODV and OLSR up to 20 minutes. We look at the Figure5 then we optimized that AODV has a high delay as compared to OLSR.OLSR has a lowest media access delay because it is effectively use a optimized Link State routing algorithm. In Figure5 AODV shows the inferior media access delay due to the process flooding process every time while discovering new routes and determining the changes in the topology. AODV broadcasts RREQ messages to find the route if route is find it's send a RREP message to the host otherwise it rebroadcast the RREQ messages in network [10].

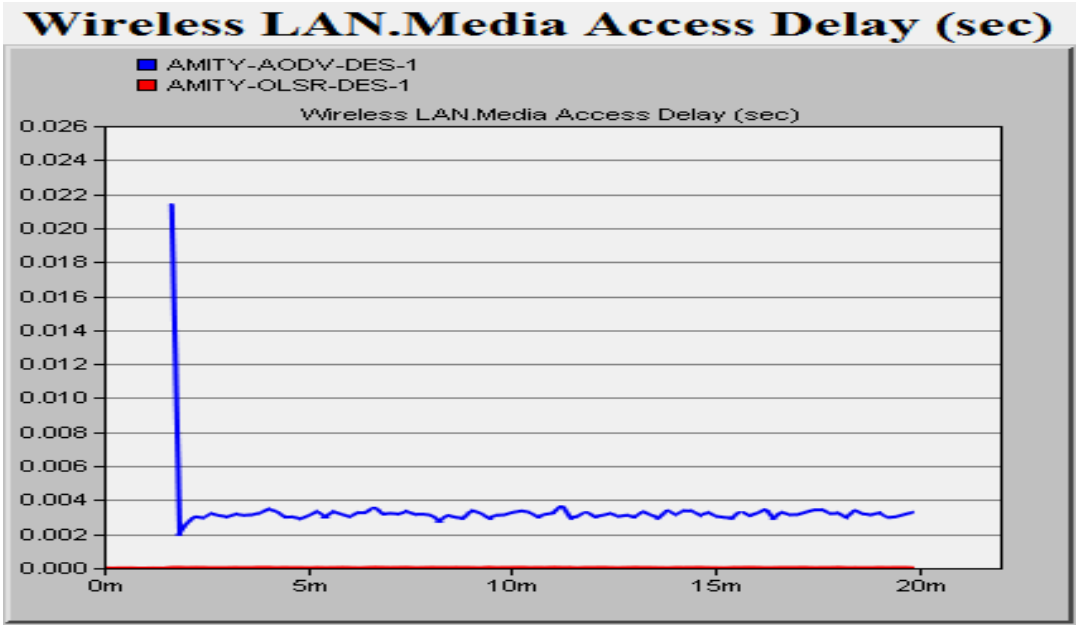



Figure 5. Media access delay between AODV and OLSR

*B. Network Load (bits/sec):*

Figure6 shows that OLSR gives a better performance on network load. For OLSR the network load is down but slowly rises as simulation progresses. The frequent changes in the graph because it changes the link state and MRP nodes due to random mobility. It is table driven approach therefore its maintains route and network load On the other hand AODV has higher network load due to its store the packet in its cache and it's find routes on demand.

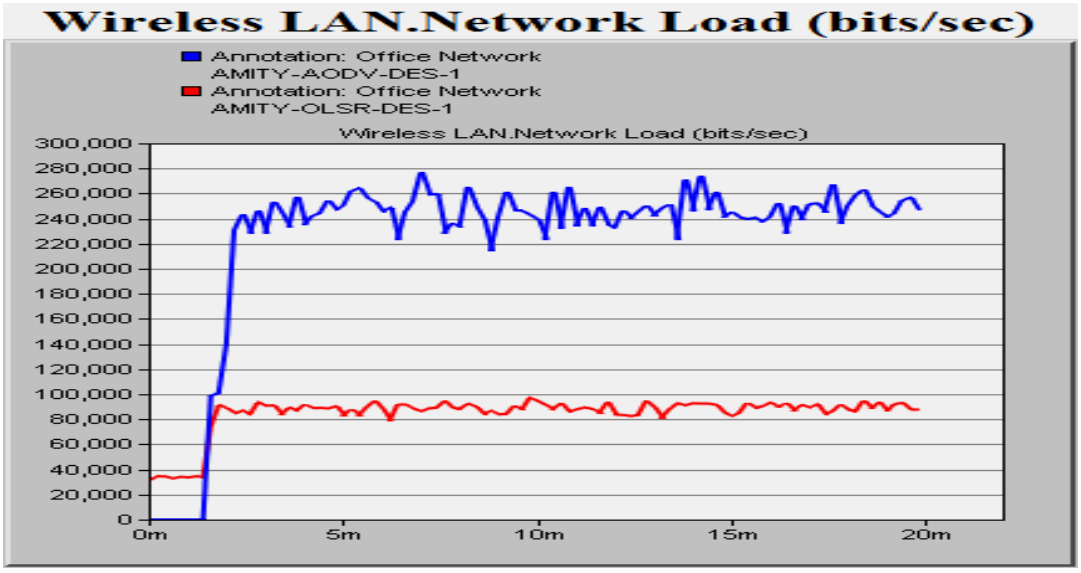



Figure 6. Network Load betwwen AODV and OLSR

*C. Throughput (bits/sec):-*

Throughput is the number of packet received successfully by each routing protocol [1]. When we are comparing the routing throughput OLSR has the high throughput. In the figure7 we show that OLSR gives a more throughput in comparison of AODV. Because OLSR is a reactive protocol it is used a table driven approach. It is using an optimized link state routing algorithm to optimize the control packet in the network.

AODV shows the worse throughput due to the process of on demand routing. In the initial state of simulation AODV cannot receive any packet. A few minutes later of simulation throughput are slowly increased of AODV.

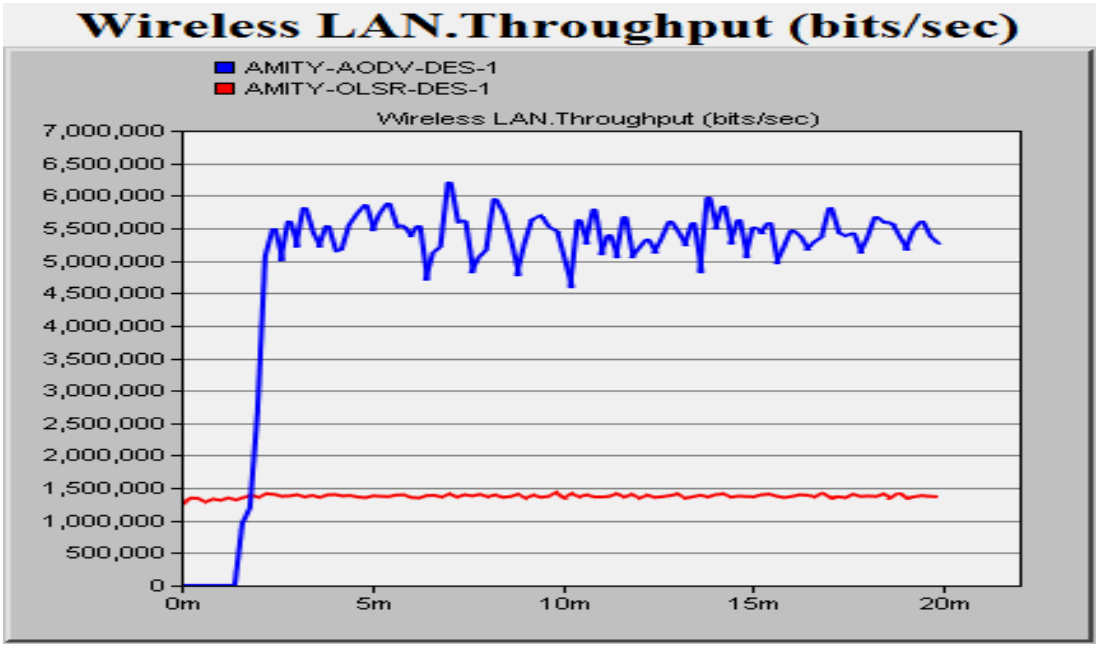



Figure7. Throughputs between AODV and OLSR

## V. CONCLUSION

In this paper we analyze performance of two routing protocols AODV and OLSR using OPNET Modeler 14.5.the protocols (AODV and OLSR) are examine on the same parameters and the parameters were traffic flow, Data rates, transmit power and random mobility.

In Figure5, Figure6 and Figure7 shows that OLSR provided an outstanding performance in all cases. OLSR showed low media access delay and low network load .in comparison of AODV. This is due to OLSR is a proactive protocol it is use Multi point relays to search the route [6]. Throughput is a main factor in overall performance because it is ratio of total data received successfully by nodes. With the overall performance, OLSR is better than AODV but it is not necessary that OLSR is always better. The performance is very from network to network.

## ACKNOWLEDGEMENTS

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