A COMPARATIVE STUDY AND ANALYSIS OF PROACTIVE AND REACTIVE ROUTING PROTOCOLS IN MANET USING NS3

MD NAIM HOSSAIN

MD RATUL HASAN

A THESIS SUBMITTED FOR THE DEGREE OF BACHELOR OF SCIENCE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

EAST WEST UNIVERSITY

September 28, 2022

SUPERVISOR APPROVAL

This thesis book titled "A COMPARATIVE STUDY AND ANALYSIS OF PROACTIVE AND REACTIVE ROUTING PROTOCOLS IN MANET USING NS3", submitted by Md Naim Hossain, ID: 2018-3-55-014, Md Ratul Hasan, ID: 2018-3-55-009, Session: 2019-2020 has been accepted as satisfactory in partial fulfillment of the requirement for the degree B.Sc. in Electronics and Telecommunication Engineering in October, 2022.

Supervisor:

Rizwan Shaikh

Lecturer

Department of Electronics and

Communication Engineering (ECE)

East West University

DECLARATION

This is to certify that the work presented in this thesis paper, titled, “A COMPARATIVE STUDY AND ANALYSIS OF PROACTIVE AND REACTIVE ROUTING PROTOCOLS IN MANET USING NS3”, is the outcome of the investigation and research carried out by the following students under the supervision of Rizwan Shaikh, Lecturer, Department of Electronics and Communication Engineering (ECE), East West University.

It is also declared that neither this thesis book nor any part thereof has been submitted anywhere else for the award of any degree, diploma or other qualifications.

Md Naim Hossain,

ID: 2018-3-55-014

Md Ratul Hasan

ID: 2018-3-55-009

ACKNOWLEDGEMENT

We thank Almighty for His blessings on the successful completion of our thesis. Rizwan Shaikh, Lecturer, Department of Electronics and Communication Engineering, East West University, has our heartfelt gratitude, profound indebtedness, and deep respect for his constant supervision, affectionate guidance, and great encouragement and motivation. His keen interest in the topic and valuable advice throughout the study were extremely beneficial in completing the thesis. We would like to express our heartfelt gratitude to the Department of Electronics and Communication Engineering (ECE) at East West University (EWU) for their unwavering support throughout the thesis process.

Finally, we would like to express our gratitude to our families and classmates for their invaluable assistance, patience, and suggestions throughout the course of our thesis.

ABSTRACT

This thesis presents the comparative study and analysis of two different types of routing protocols Proactive and Reactive in MANET. This two routing protocols are basically part of the networking to improve the transmission of data perfectly. We have set different parameters and observed the result. The experiment shows us in change of nodes and sending packet size how those routing protocols are behave and gives us the best protocol to establish. In case increasing the nodes gives us particular results for different packet size and same for the increasing the packet size we get different results for different nodes. Specifically, we are using AODV from Re-active routing protocols and DSDV, OLSR from Pro-active routing protocols in MANET to observe Throughput, End to End delay, END to END Jitter delay, Average Throughput, Good put, Packet loss ratio, Packet delivery ration and Packet per second. We have the simulation runs for 70 simulated seconds, of which the first 50 are used for start-up time. The number of nodes is 50, 75, 100 and 125. Nodes move according to Random Way point Mobility Model with a speed of 20 m/s and no pause time within a 500x1000 m region. The WiFi is in ad hoc mode with a 2 Mb/s rate (802.11b) and a Friis loss model. The transmit power is set to 7.5 dBm. It is possible to change the mobility and density of the network by directly modifying the speed and the number of nodes. Here we specifically change the nodes and packet size to observe the different scenario. By default, there are 10 source/sink data pairs sending UDP data at an application rate of 2.048 Kb/s each. This is typically done at a rate of 4 64,128,256-byte packets per second. Application data is started at a random time between 50 and 51 seconds and continues to the end of the simulation.

That’s how we observe the Throughput, End to End delay, END to END Jitter delay, Average Throughput, Good put, Packet loss ratio, Packet delivery ration and Packet per second scenario by changing parameters which are nodes and packet size.

TABLE OF CONTENTS

LIST OF FIGURES

List of Table

CHAPTER 1

INTRODUCTION

1.1 Background and Motivation

We know how much the demand of sending data from one place to another place is increasing the demand to establish more network protocols to be used as a new future. If talk about it in a critical situation such as war, then it should be better than other to maintaining the communication with outer the region and in region. That's where ad-hoc network which we call MANET are gives us the better solution. There are some case such as pro-active, re-ctive and hybrid routing protocols in MANET. Table-driven routing protocols are proactive. Each mobile node has its own routing table that contains information about the routes to all possible destination mobile nodes. Reactive routing is an on-demand routing protocol. The route is discovered only when it is required/needed in this type of routing. The route discovery process is carried out by flooding route request packets throughout the mobile network. It is divided into two major phases: route discovery and route maintenance. We have AODV from Re-active and DSDV, OLSR from Pro-active routing protocols in MANET. By calculating Throughput, End to End delay, END to END Jitter delay, Average Throughput, Good put, Packet loss ratio, Packet delivery ration and Packet per second (lamda) we observe increasing nodes helps to transmitted with less time and increasing packet size gives better performance in low nodes and in our case we can less nodes and less packet size gives more specific output with high end to end delay at AODV. At OLSR and DSDV we can see more improvements. Where increasing nodes helps to transmitted with less time and increasing packet size gives better performance in low nodes and less nodes and less packet size gives more specific output with low end to end delay at AODV.

We have some specific parameters which are Parameters:

Number of nodes: 50, 75. 100 and 125

No of sinks: 10

Mobility Model:

Propagation Model: Constant Speed Propagation Delay

Propagation Loss Model: Friis loss model

Position Allocator: Random Rectangular Position Allocator

Mac: AdhocWifiMAC

Mac Standard: 802.11B

Bps: 2Kbps

Total Simulation Time: 70 seconds

Node speed: 20m/s

Node pause time: 0

Protocol: AODV. DSDV and OLSR

So in case of different routing protocol, we have use same input parameters to make them more similar.

1.2 Objective

Our main objective is to observe the AODV, DSDV and OLSR routing protocols for different types of nodes and different size of packet size in MANET using network simulator 03. In case of all these three routing protocols we have Propagation Model: Constant Speed Propagation Delay, Propagation Loss Model: Friis loss model and Position Allocator: Random Rectangular Position Allocator to simulate the exact scenario of physical demonstration where we will observe their behavior for different scenario. So, we can easily change parameters such as nodes and packet size.

1.2.1 Thesis overview

i. In chapter 02 we will discussed about Mobility model characteristic and epuations.

ii. In chapter 03 we will discussed about AODV characteristic and working. Also the advantages and disadvantages of AODV.

iii. In chapter 04 we will discussed about DSDV characteristic and working. Also the advantages and disadvantages of DSDV.

iv. In chapter 05 we will discussed about OLSR characteristic and working. Also the advantages and disadvantages of OLSR.

v. In chapter 06 we will discussed about throughput and goodput at 50,75,100, and 125 nodes by sending 4 64,128, and 256 byte data.

vi. In chapter 07 we will discussed about comparative results and discussion at 50,75,100, and 125 nodes by sending 4 64,128, and 256 byte data.

vii. In chapter 08 we will finalize all the simulated values with specific conclusion and future work for particular routing protocols.

CHAPTER 02

MOBILITY MODEL

2.1 Random waypoint mobility model

In mobility mangemnet, the random waypoint model is a random model for the movement of mobile users, and how their location, velocity and acceleration change over time. Mobility models are used for simulation purposes when new network protocols are evaluated. The random waypoint model was first proposed by Johnson and Maltz. It is one of the most popular mobility models to evaluate mobile ad hoc network (MANET) routing protocols, because of its simplicity and wide availability.

In random-based mobility simulation models, the mobile nodes move randomly and freely without restrictions. To be more specific, the destination, speed and direction are all chosen randomly and independently of other nodes. This kind of model has been used in many simulation studies.

In NS3 each object starts by pausing at time zero for the duration governed by the random variable "Pause". After pausing, the object will pick a new waypoint (via the PositionAllocator) and a new random speed via the random variable "Speed", and will begin moving towards the waypoint at a constant speed. When it reaches the destination, the process starts over (by pausing).

This mobility model enforces no bounding box by itself; the PositionAllocator assigned to this object will bound the movement. If the user fails to provide a pointer to a PositionAllocator to be used to pick waypoints, the simulation program will assert.

The implementation of this model is not 2d-specific. i.e. if you provide a 3d random waypoint position model to this mobility model, the model will still work. There is no 3d position allocator for now, but it should be trivial to add one.

Random Waypoint Mobility Model is accessible through the following paths with Config::Set and Config::Connect in NS3.

The main Attributes is this:

Speed: A random variable used to pick the speed of a random waypoint model.

Pause: A random variable used to pick the pause of a random waypoint model.

PositionAllocator: The position model used to pick a destination point.

Attributes defined in parent class ns3::MobilityModel:

Position: The current position of the mobility model.

Velocity: The current velocity of the mobility model.

No TraceSources are defined for this type.

TraceSources defined in parent class ns3::MobilityModel

CourseChange: The value of the position and/or velocity vector changed. Size of this type is 160 bytes (on a 64-bit architecture).

2.2 Friis Propagation Loss Model

An important aspect of any network simulation that models wireless networks is the design and implementation of the Propagation Loss Model. The propagation loss model is used to determine the wireless signal strength at the set of receivers for any packet being transmitted by a single transmitter. There are a number of different ways to model this phenomenon, and these vary both in terms of computational complexity and in the measured performance of the wireless network being modeled. In fact, the ns -- 3 simulator presently has 11 different loss models included in the simulator library. For our model we used Friis Propagation Loss Model.

Friis free space propagation model is used to model the line-of-sight (LOS) path loss incurred in a free space environment, devoid of any objects that create absorption, diffraction, reflections, or any other characteristic-altering phenomenon to a radiated wave. It is valid only in the far field region of the transmitting antenna and is based on the inverse square law of distance which states that the received power at a particular distance from the transmitter decays by a factor of square of the distance.

The Friis equation for received power is given by,

$$\mathbf{P_r}(d) = \mathbf{P_t}\frac{P_t G_r \lambda^2}{(4\pi d)^2 L}$$

where, $\boldsymbol{P_r}$ is the received signal power in Watts expressed as a function of separation distance ($\boldsymbol{d}$ meters) between the transmitter and the receiver, $\boldsymbol{P_t}$ is the power of the transmitted signal's Watts, $\boldsymbol{G_t}$ and $\boldsymbol{G_r}$ are the gains of transmitter and receiver antennas when compared to an isotropic radiator with unit gain, λ is the wavelength of carrier in meters and L represents other losses that is not associated with the propagation loss. The parameter L may include system losses like loss at the antenna, transmission line attenuation, loss at various filters etc. The factor L is usually greater than or equal to 1 with $L=1$ for no such system losses.

The **propagation path loss** in free space, denoted as P_L, is the loss incurred by the transmitted signal during propagation. It is expressed as the signal loss between the feed points of two isotropic antennas in free space.

$$\mathbf{P_L}(dB) = -10log_{10}\left[\frac{\lambda^2}{(4\pi d)^2}\right] = +20log_{10}\left[\frac{4\pi d}{\lambda}\right]$$

The propagation of an electromagnetic signal, through free space, is unaffected by its frequency of transmission and hence has no dependency on the wavelength λ. However, the variable λ exists in the path loss equation to account for the effective aperture of the receiving antenna, which is an indicator of the antenna's ability to collect power. If the link between the transmitting and receiving antenna is something other than the free space, penetration/absorption losses are also considered in path loss calculation. Material penetrations are fairly dependent on frequency. Incorporation of penetration losses require detailed analysis.

2.3 Constant Speed Propagation Delay Model

Propagation delay is the amount of time required for a signal to be received after it has been sent; it is caused by the time it takes for the signal to travel through a medium. The fundamental limit on propagation delay is the speed of light(c). Since nothing can travel faster than light and light has a finite speed, there will always be some delay as a signal moves from source to destination. This is true for all signals from small to great and distances from short to vast.

Here our Propagation speed is constant. The propagation speed (m/s) in the propagation medium being considered. The default value is the propagation speed of light in the vacuum.

CHAPTER 03

AD-HOC ON DEMAND VECTOR ROUTING PROTOCOLS (AODV)

3.1 AODV characteristic and working

It is a routing protocol that is reactive/on-demand. It is a dynamic source routing protocol (DSR) extension that helps to eliminate the disadvantages of the dynamic source routing protocol. When the source mobile node sends a data packet to the destination mobile node after route discovery, it includes the complete path in its header. As a result, as the network size grows, so does the length of the complete path and the size of the data packet's header, making the entire network slow.

As a result, the Ad-Hoc On Demand Vector Routing protocol was developed as a solution. The main distinction is in how the path is stored; AODV stores it in the routing table, whereas DSR stores it in the data packet's header.

The destination-sequenced distance vector protocol is used to form small ad hoc networks with the cooperation of mobile nodes. This protocol's main disadvantage is that it must wait for all nodes to update their tables before sending a packet from source to destination. The regular advertisement of update packets wastes bandwidth, increases overhead, and causes delay. Latency will be reduced even before the first packet is sent because all nodes in the network must keep their routing tables up to date. The disadvantages listed above can be overcome by utilizing on-demand routes in ad-hoc networks.

There will be no delay and no need to wait for regular advertisements of update packets in this case. As a result, to reduce broadcasts, an ad hoc on demand distance vector was proposed. This protocol's main goal is to only broadcast update packets when they are required. Ad-hoc on-demand distance vector protocol, among other things, is an excellent choice for battlefield communications, conferencing, and emergency services.

Nodes not on active paths will not actively transmit update packets or attempt to update their AODV routing tables. Unless another node attempts to communicate with this node, nodes in an AODV-enabled mobile ad hoc network are required to keep track of the costs to each destination.

A broadcast route discovery mechanism is used by AODV. In this mechanism, a route request packet is sent to find a route to the destination. After receiving the route request packet, the destination sends a route reply packet back to the source node. All routes are kept in the form of routing tables by AODV. Only the nodes on active paths will keep their routing tables. These routing tables are linked to a timer, and if a table hasn't been used in a while, that entry is removed from the table. AODV, like DSDV, keeps the destination sequence number in its routing tables to avoid the count-to-infinity problem.

In the AODV protocol, each node in the network keeps two counters: sequence number and broadcast id. The broadcast id is a unique number that is incremented each time a new route request packet is sent by the source node. The route request packet has the following format: source address, source sequence number, broadcast id, destination address, destination sequence number, hop count. The destination sequence number will be empty if the source node is unaware of the destination while transmitting the route request packet. The hop count is the number of hops required to send data from source to destination.

When the destination receives the route request packet, it will reply with the following information: source address, destination address, destination sequence number, hop count, and life time. When sending the route reply packet, the destination node will include the destination sequence number. Lifetime mentions the veracity of this path information. Duplicate packets will be discarded by the intermediate nodes. If this intermediate node has a higher sequence number than the source node, it will send a route reply back to the source node. If the sequence number of the intermediate node is less than that of the incoming packet, this route request packet will be broadcasted again.

3.1.1 Advantages of AODV routing protocol

i. Only the necessary routes are stored in routing tables in this type of routing protocol..

ii. It gives us lowest packet loss and highest packet delivery compare to DSDV and OLSR.

iii. It gives us the highest throughput in changing of nodes and packet size.

iv. When a link in the network's active routes fails, there will be a quick response.

v. The use of a destination sequence number aids in the prevention of route looping.

vi. Because there is no periodic advertisement of routes, bandwidth is not wasted in this case.

vii. Connection setup takes less time.

3.1.2 Disadvantages of AODV routing protocol

i. The route may become inconsistent if the intermediate nodes are very old..

ii. When a node receives multiple route request packets in response to only one route request packet, there is a possibility of significant control overhead.

iii. AODV have highest end-to-end delay

CHAPTER 04

DESTINATION SEQUENCED DISTANCE VECTOR ROUTING PROTOCOL (DSDV)

4.1 DSDV characteristic and working

Each node in an ad-hoc network keeps a routing table with information such as a list of destination nodes, distance to the destination node, next hop in the path, and the sequence number generated by the destination node. Ad-hoc networks use these routing tables to send data packets. Because ad-hoc networks have inconsistencies in their topologies, these routing tables are updated on a regular basis or when the topology changes in order to maintain routing tables across the network. It broadcasts or multicasts routing information and updates its routing tables when it detects topology changes.

This update packet with metric ONE is sent to all directly connected nodes. This indicates that the distance between the source and adjacent nodes is one metric or one hop. The neighbor's routing table is updated and the metric is incremented by one as soon as the update packet is received.

The update packet is then resent to their neighboring nodes. The update packet will be retransmitted until all nodes in the mobile network receive it. This data will be stored for a period of time before another update packet is sent. When a node is waiting for an update packet for a specific destination, the packet with the highest sequence number will be preferred. This updated data will be transmitted with that sequence number throughout the ad hoc network.

The sequence number aids in distinguishing between old and new routes. If the sequence number for all of the multiple update packets received by a node is the same, the packet with the least metric is chosen, and the routing table of that node is updated with this metric for the destination.

The update packet of a node whose route is ready to change is delayed until the best route to the destination is found. Delaying these unstable routes will dampen fluctuations in the route tables, resulting in a lower number of rebroadcasting the routes with the same sequence number. To maintain consistency with the network's ever-changing topology, the elements of each node's routing table will be dynamically changed.

To achieve this level of consistency, routing information should be transmitted or broadcast in a timely and frequent manner, and each node should be able to identify all other nodes in the ad-hoc network. Data packets should be relayed by each node using the updated routing tables upon request.

4.1.1 Advantages of DSDV routing protocol

i. Less delay in data transmission from source to destination because paths are readily available for all network destinations.

ii. The use of the sequence number ensures loop-free paths.

iii. It have the lowest end-to-end delay.

4.1.2 Disadvantages of DSDV routing protocol

i. Because of the high overhead, the performance of mobile ad-hoc networks will suffer.

ii. When the mobile network is idle, the regular updates of the routing information waste bandwidth and battery power.

iii. DSDV is not appropriate for large networks and is best suited for small networks of up to 200 nodes.

iv. When the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables.

v. Over DSDV we can see the highest loss packets and lowest packet delivery.

CHAPTER 05

Optimized Link State Routing Protocol (OLSR)

5.1 OLSR characteristic and working

The OLSR protocol is a proactive routing protocol designed for mobile ad hoc networks. Because of its proactive nature, the protocol inherits the stability of a link state algorithm and has the advantage of having routes available immediately when needed. OLSR is a mobile ad hoc network-specific optimization of the traditional link state protocol.

OLSR reduces the overhead caused by control traffic flooding by retransmitting control messages from only a subset of nodes. This technique reduces the number of retransmissions required to flood a message to all nodes in the network significantly. Second, in order to provide shortest path routes, OLSR only requires a partial link state to be flooded. The bare minimum of link state information required is that all nodes chosen as multipoint relays MUST declare the links to their multipoint relays selectors. Additional topological information, if available, may be used for redundancy purposes, for example.

OLSR MAY improve reactivity to topological changes by reducing the maximum time interval for transmitting periodic control messages. Furthermore, because OLSR continuously maintains routes to all destinations in the network, it is useful for traffic patterns in which a large subset of nodes communicate with another large subset of nodes, and the [source, destination] pairs change over time. Because of the optimization done with multipoint relays, the protocol is particularly well suited for large and dense networks. When compared to the classic link state algorithm, the larger and denser a network, the more optimization can be achieved.

OLSR is intended to be completely decentralized and autonomous from any central authority. Control message reliability is not required for this protocol. Because each node sends control messages on a regular basis, some loss of such messages is tolerable. As a result of collisions and other transmission issues, such losses are common in wireless networks.

Furthermore, OLSR does not require message delivery in order. Each control message has its own sequence number, which is incremented with each message. This allows control message recipients to easily see which information is more up-to-date, even if the messages were reordered during transit.

5.1.1 Advantages of OLSR routing protocol

i. OLSR has less average end-to-delay

ii. User friendly and a flat routing protocols which doesn't need any central administrative system ti handle its routing process.

iii. If we rapidly change the source and destination pairs OLSR increase the protocol's suitability for an ad-hoc network

5.1.2 Disadvantages of OLSR routing protocol

i. It maintain the routing table for all the possible routes because of the nature of proactive routing protocols.

ii. The overhead from the control messages increases during the number of mobile hosts increase.

iii. It take time re-discover a broken link.

iv. It takes more processing power than other protocols during discovering an alternate route.

CHAPTER 06

THROUGHPUT, GOODPUT AND LAMDA

Throughput and Goodput

Throughput and goodput are different in that goodput is only concerned with usable data while throughput measures all data traveling across a link, regardless of whether it is beneficial or not. The type of data traveling across the interface cannot be determined by throughput measurements, such as those provided by router interface statistics; all that can be determined is that bits have passed. Because throughput can include unwanted data like data retransmissions or overhead material like protocol wrappers, throughput is not the same as goodput.

Lamda

Lamda is a unit which we assign to configure which we are sending from source to destination, and it's basically shows us the packet per seconds for every single node as we are taking different scenario such as 50,75,100 and 125 nodes where we are sending four 64,128 and 256 bytes of data per second.

6.1 Specific Parameters

Number of nodes: 50, 75. 100 and 125

No of sinks : 10

Mobility Model:

Propagation Model: Constant Speed Propagation Delay

Propagation Loss Model: Friis loss model

Position Allocator: Random Rectangular Position Allocator

Mac: AdhocWifiMAC

Mac Standard: 802.11B

Bps: 2Kbps

Total Simulation Time: 70 seconds

Node speed: 20m/s

Node pause time: 0

Protocol: AODV. DSDV and OLSR

6.2 OUTPUT AT DIFFERENT SCENARIO

6.2.1 AT 50 NODES

6.2.1.1 THROUGHPUT

USING 64 BYTES AT 50 NODES

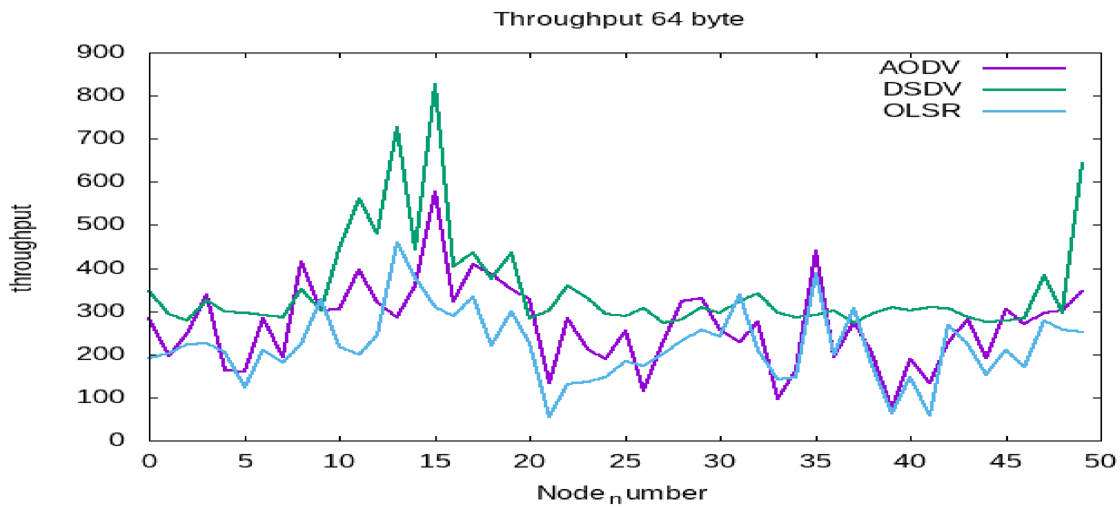

FIGURE 01: THROUGHPUT USING 64 BYTE AT 50 NODES

USING 128 BYTES AT 50 NODES

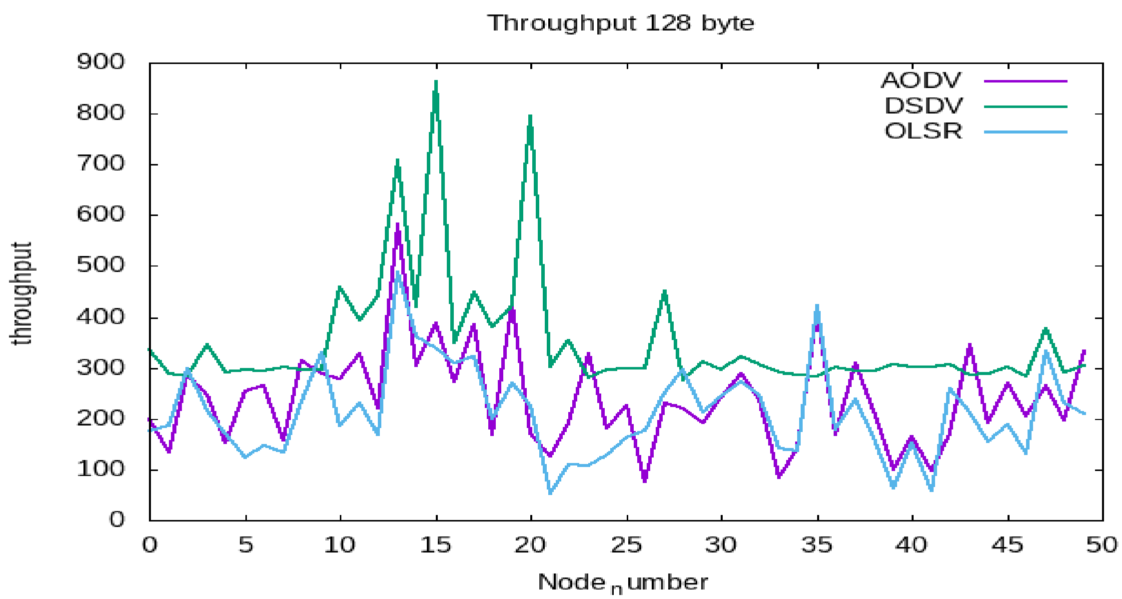

FIGURE 02: THROUGHPUT USING 128 BYTE AT 50 NODES

USING 256 BYTES AT 50 NODES

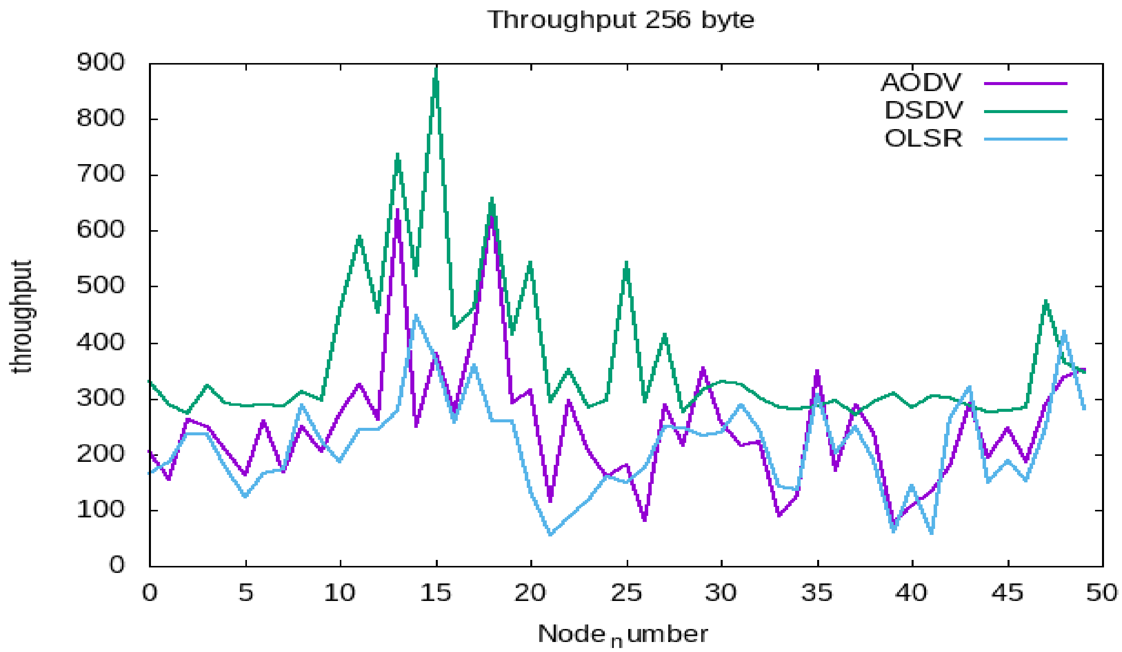

FIGURE 03: THROUGHPUT USING 128 BYTE AT 50 NODES

We have taking 50 nodes and send 64, 128 and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see DSDV have the better throughput than AODV and OLSR. But it's happened because of the overhead of the DSDV. When DSDV overhead we already know it's suffer to perform well and when the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables.

So in this case AODV is second and OLSR is the last one. Because AODV stored only the necessary routing paths in routing tables. In case of OLSR, it stored routing table for all the possible routes because of the nature of proactive routing protocols and that's why it's give a poor performance.

6.2.1.2 GOODPUT

USING 64 BYTES AT 50 NODES

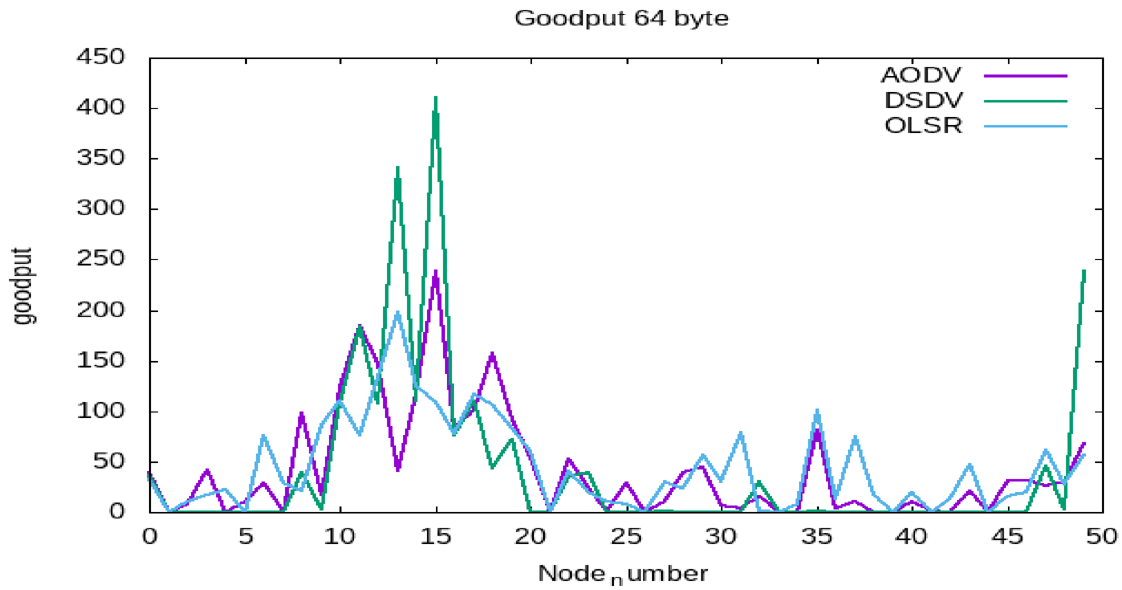

FIGURE 04: GOODPUT USING 64 BYTE AT 50 NODES

USING 128 BYTES AT 50 NODES

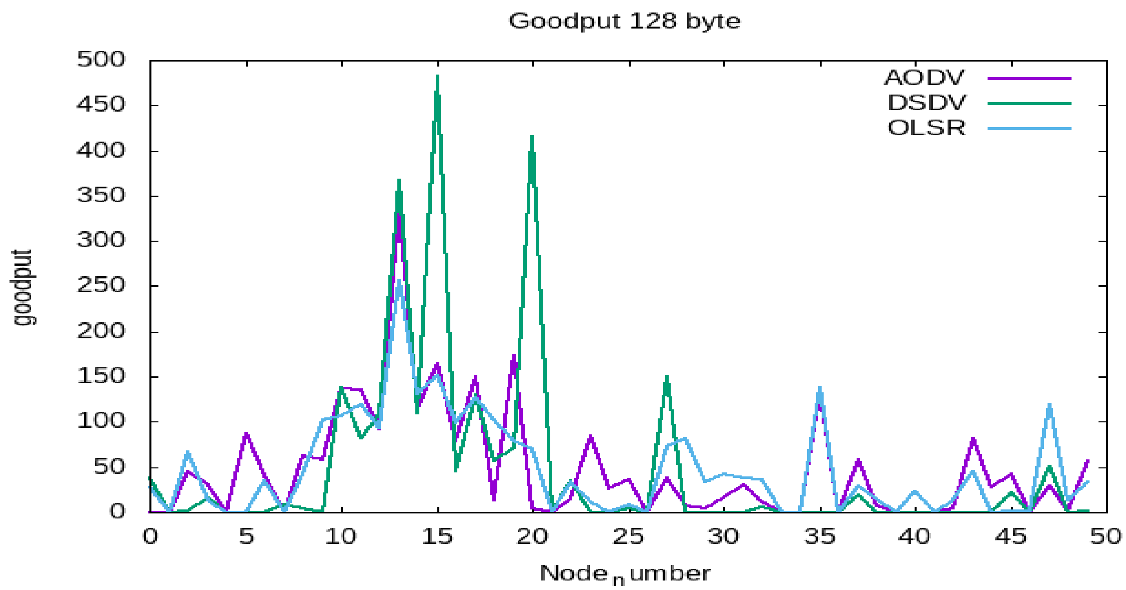

FIGURE 05: GOODPUT USING 128 BYTE AT 50 NODES

USING 256 BYTES AT 50 NODES

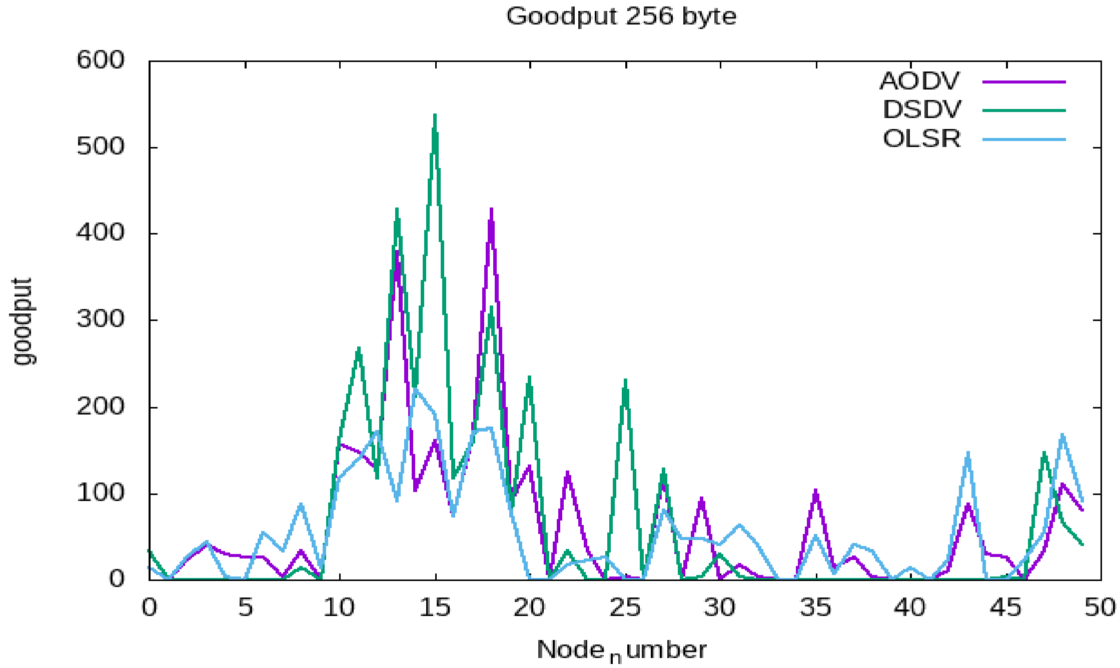

FIGURE 06: GOODPUT USING 256 BYTE AT 50 NODES

We have taking 50 nodes and send 64, 128 and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see OLSR have the better goodput than AODV and DSDV. It's happened because of OLSR is a flat routing protocols. If we rapidly change the source and destination pairs OLSR increase the protocol's suitability for an ad-hoc network. When DSDV overhead we already know it's suffer to perform well and when the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables.

So in this case AODV is second and DSDV is the last one. AODV is stored only the necessary routing paths in routing tables.

6.2.1.3 Lamda

USING 64 BYTES AT 50 NODES

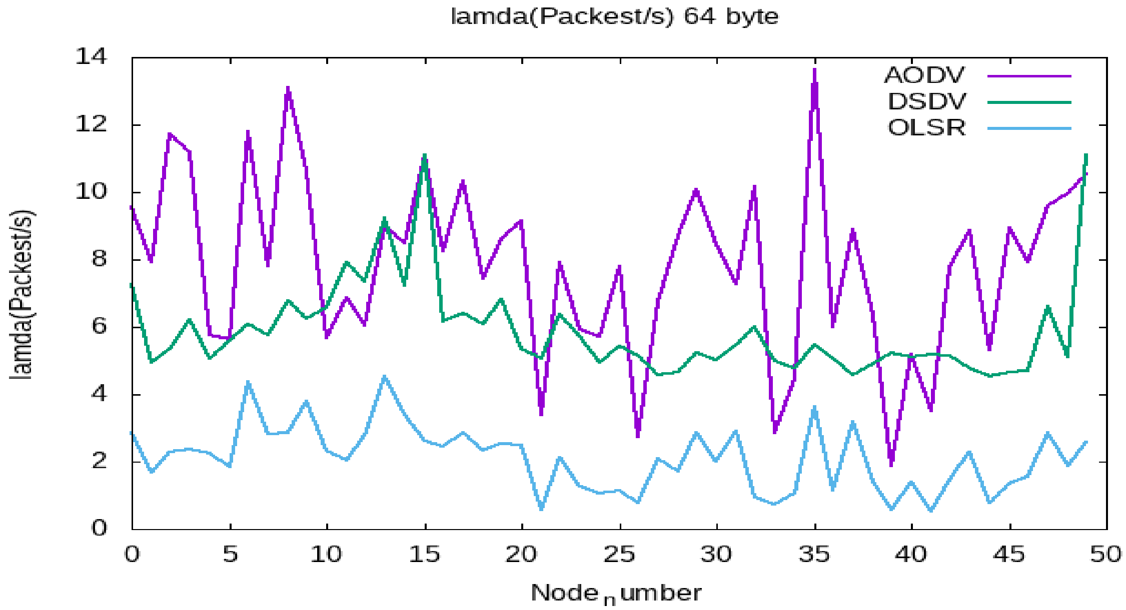

FIGURE 07: LAMDA USING 64 BYTE AT 50 NODES

USING 128 BYTES AT 50 NODES

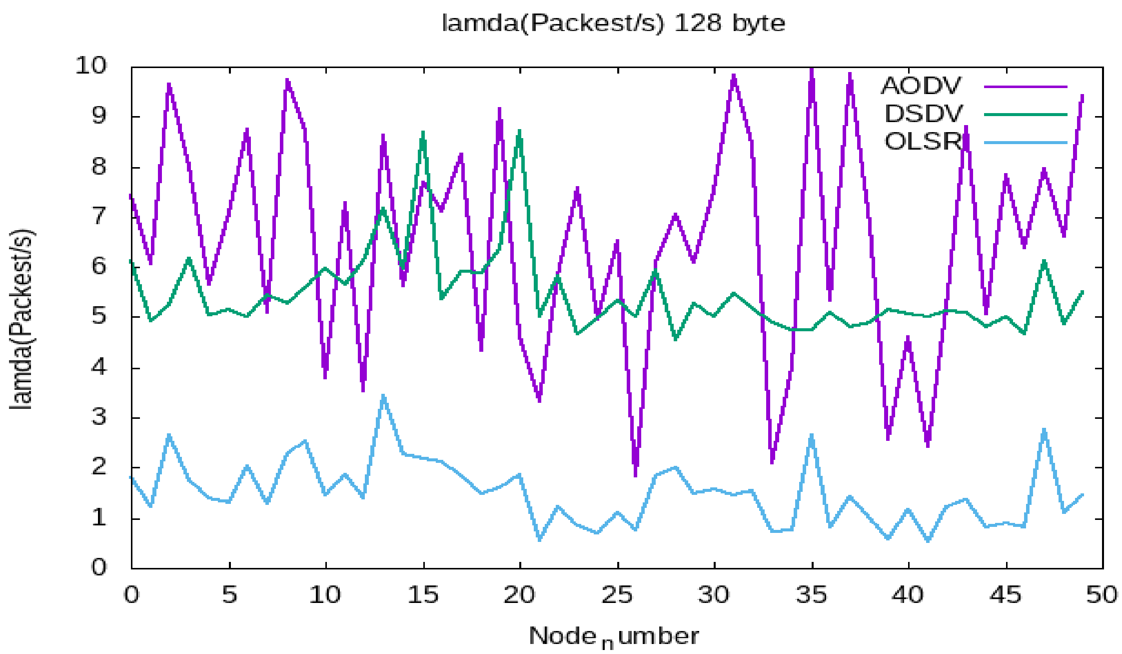

FIGURE 08: LAMDA USING 128 BYTE AT 50 NODES

USING 256 BYTES AT 50 NODES

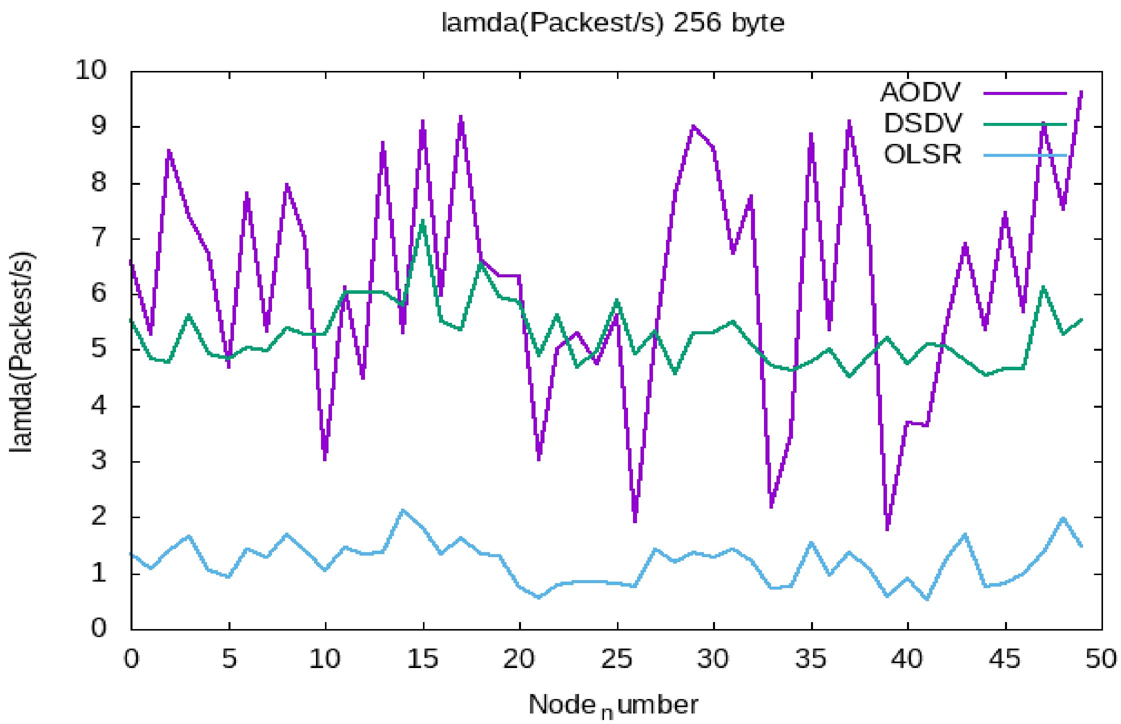

FIGURE 09: LAMDA USING 256 BYTE AT 50 NODES

We already know that DSDV is a flat routing protocols and a proactive routing protocols. In AODV when a link in the network's active routes fails, there will be a quick response and the use of a destination sequence number aids in the prevention of route looping. Because there is no periodic advertisement of routes, bandwidth is not wasted in this case. That's why we can see AODV have the have the highest value in lamda than OLSR and DSDV in case of packet size 64, 128 and 256 byte.

6.2.2 AT 75 NODES

6.2.2.1 THROUGHPUT

USING 64 BYTES AT 75 NODES

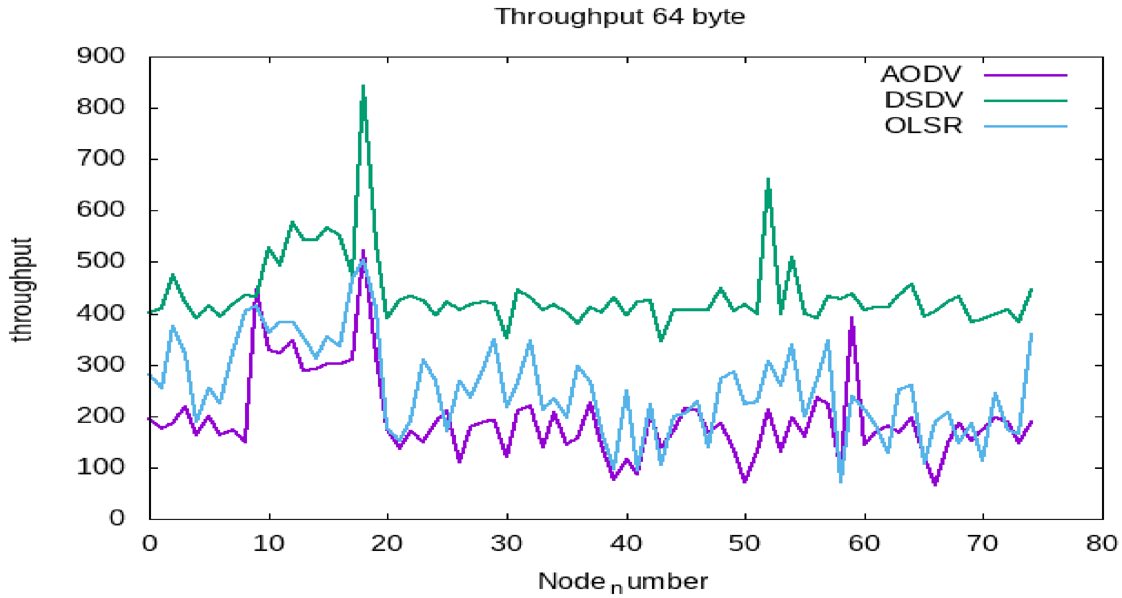

FIGURE 10: THROUGHPUT USING 64 BYTE AT 75 NODES

USING 128 BYTES AT 75 NODES

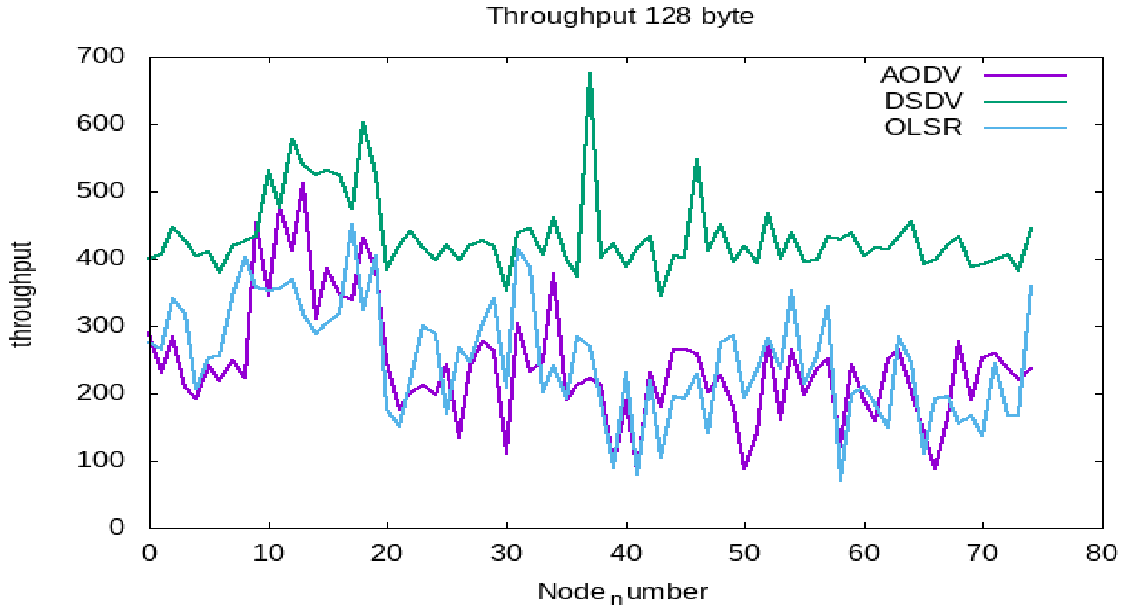

FIGURE 11: THROUGHPUT USING 128 BYTE AT 75 NODES

USING 256 BYTES AT 75 NODES

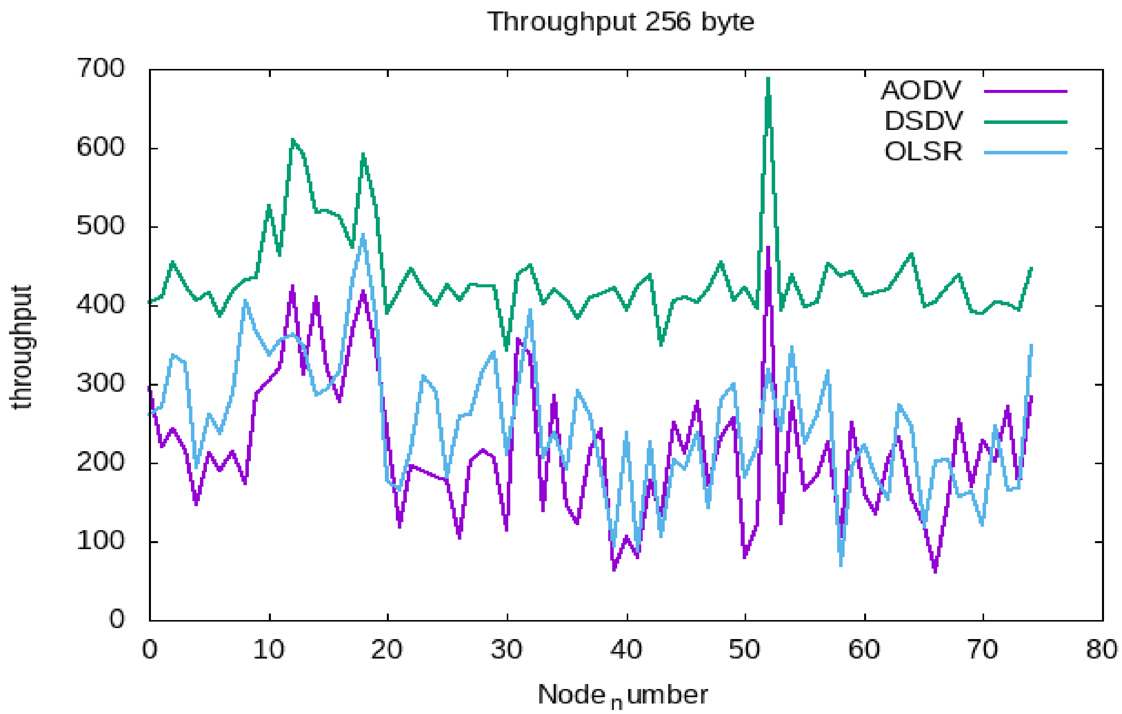

FIGURE 12: THROUGHPUT USING 256 BYTE AT 75 NODES

We have taking 75 nodes and send 64,128 and 256 byte UDP data from source to destination with 10 sinks node. Same as here the result we can see DSDV have the better throughput than the AODV and OLSR. It's happened because of the overhead of the DSDV. When DSDV overhead it's suffer to perform well and When the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables. So in this case OLSR is second and AODV is the last one. Because of increasing nodes AODV and the nature stored only the necessary routing paths in routing tables. In case of OLSR stored routing table for all the possible routes because of the nature of proactive routing protocols and that's why it's give a poor performance.

6.2.2.2 GOODPUT

USING 64 BYTES AT 75 NODES

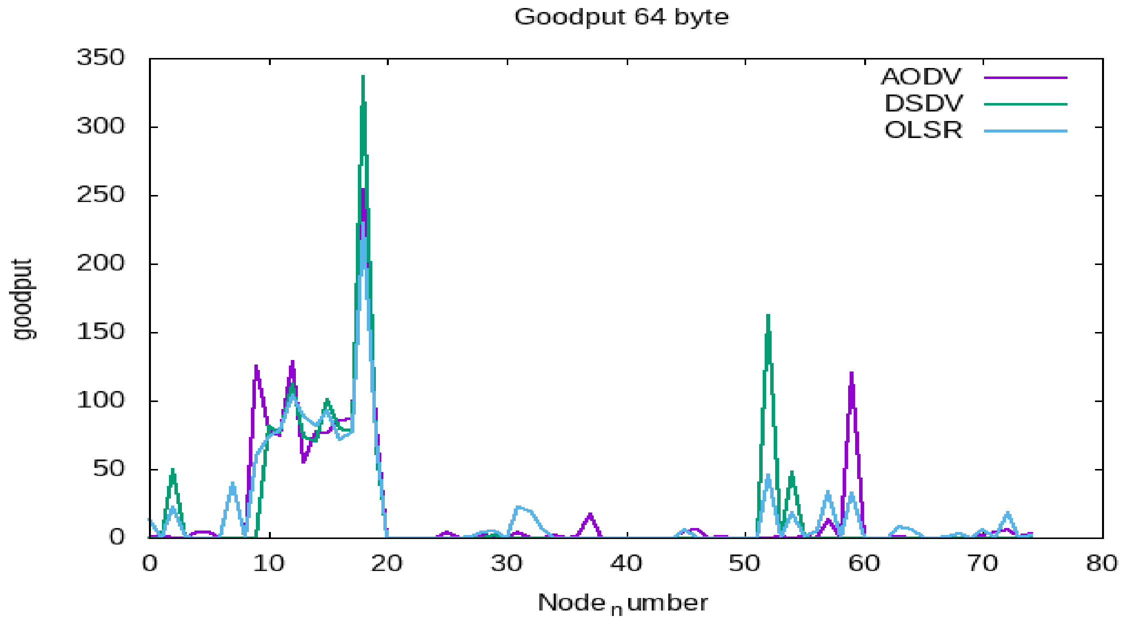

FIGURE 13: GOODPUT USING 64 BYTE AT 75 NODES

USING 128 BYTES AT 75 NODES

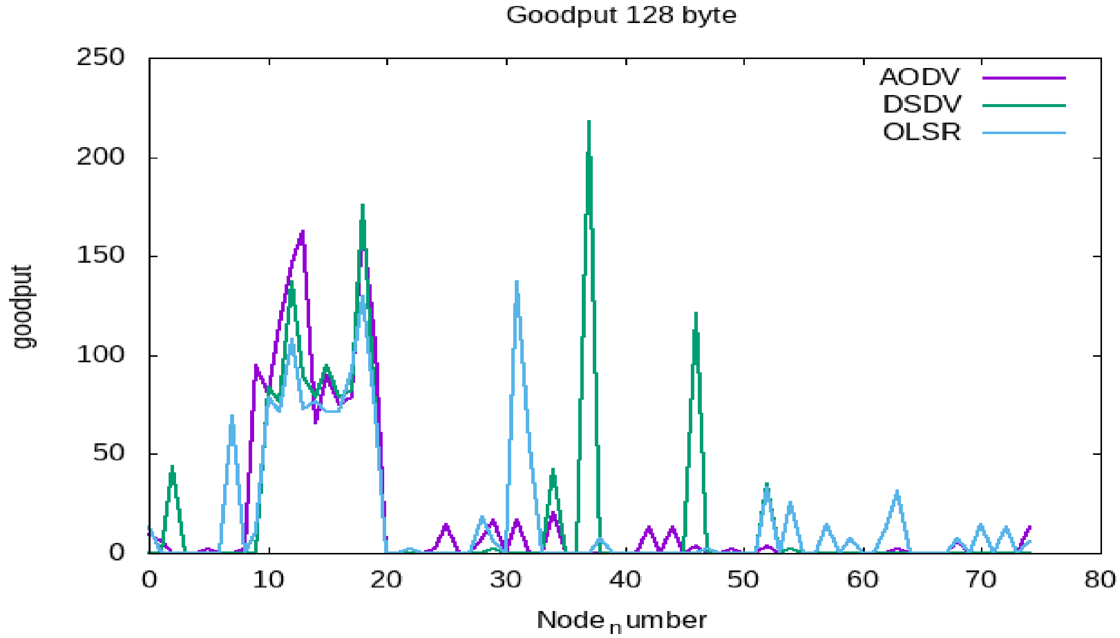

FIGURE 14: GOODPUT USING 128 BYTE AT 75 NODES

USING 256 BYTES AT 75 NODES

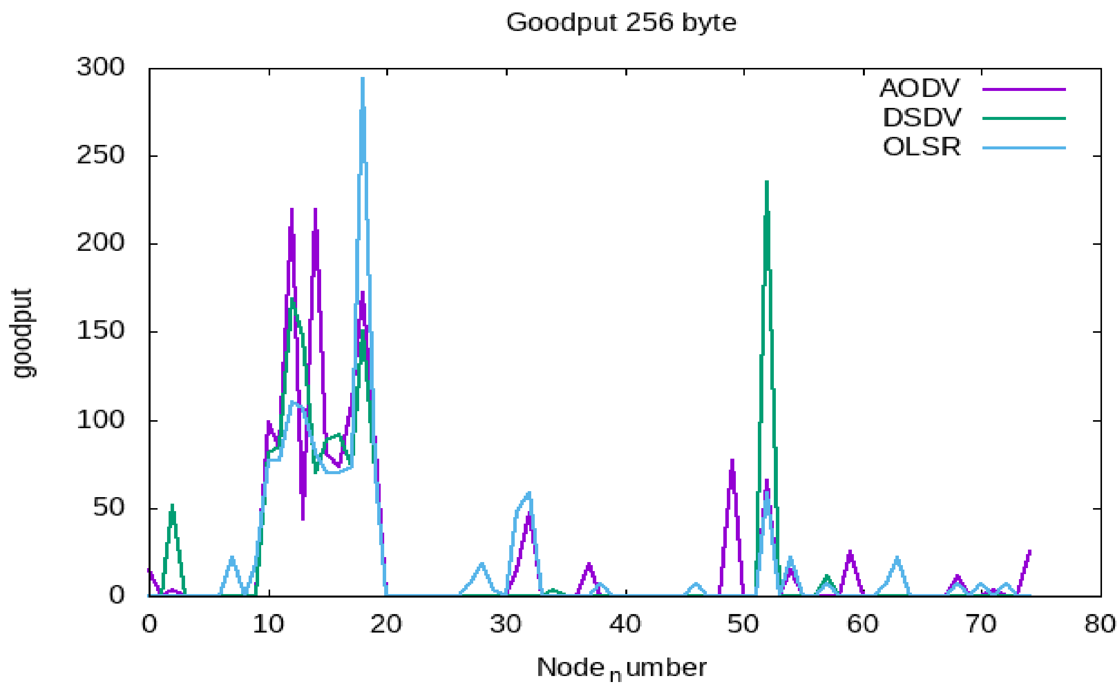

FIGURE 15: GOODPUT USING 256 BYTE AT 75 NODES

We have taking 75 nodes and send 64,128, and 256 byte UDP data from source to destination with 10 sinks node. But the situation of goodput is not so good over 75 nodes. Same as here we can see OLSR have the better goodput than AODV and DSDV. It's happened because of OLSR is a flat routing protocols. If we rapidly change the source and destination pairs OLSR increase the protocol's suitability for an ad-hoc network. When DSDV overhead we already know it's suffer to perform well and when the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables. In some we get zero goodput from particular routing protocols.

So in this case AODV is second and DSDV is the last one. AODV is stored only the necessary routing paths in routing tables.

6.2.2.3 LAMDA

USING 64 BYTES AT 75 NODES

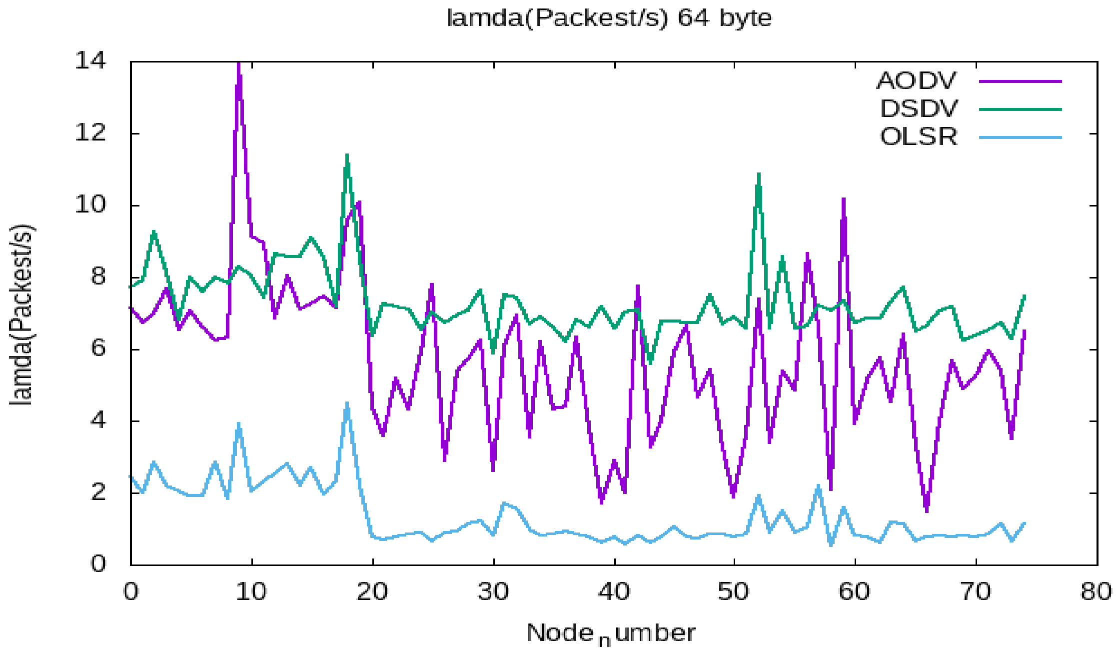

FIGURE 16: LAMDA USING 64 BYTE AT 75 NODES

USING 128 BYTES AT 75 NODES

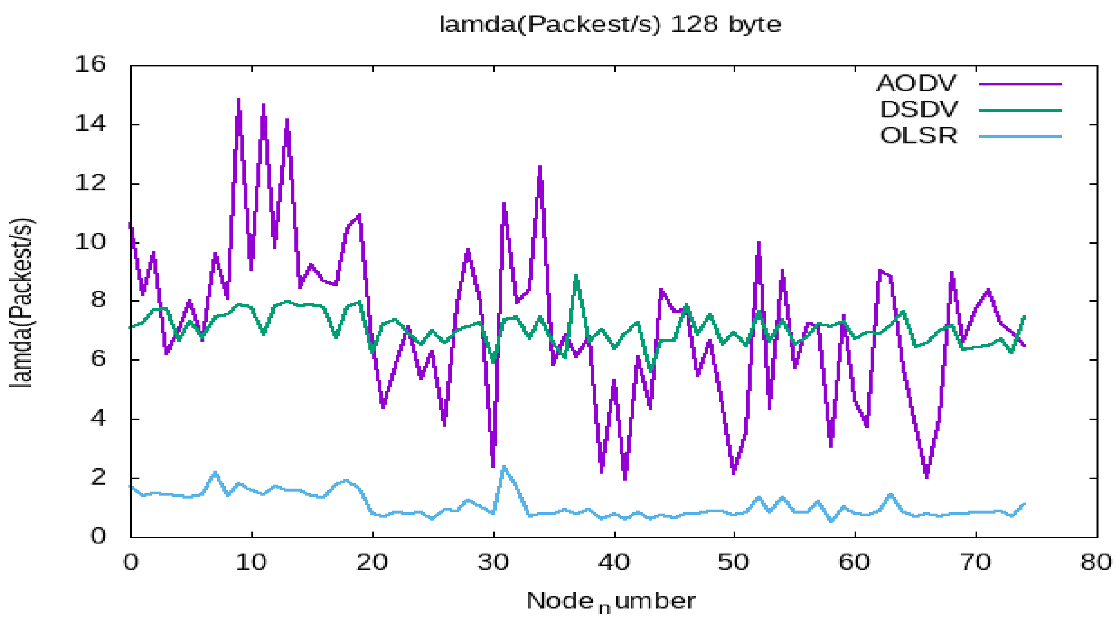

FIGURE 17: LAMDA USING 128 BYTE AT 75 NODES

USING 256 BYTES AT 75 NODES

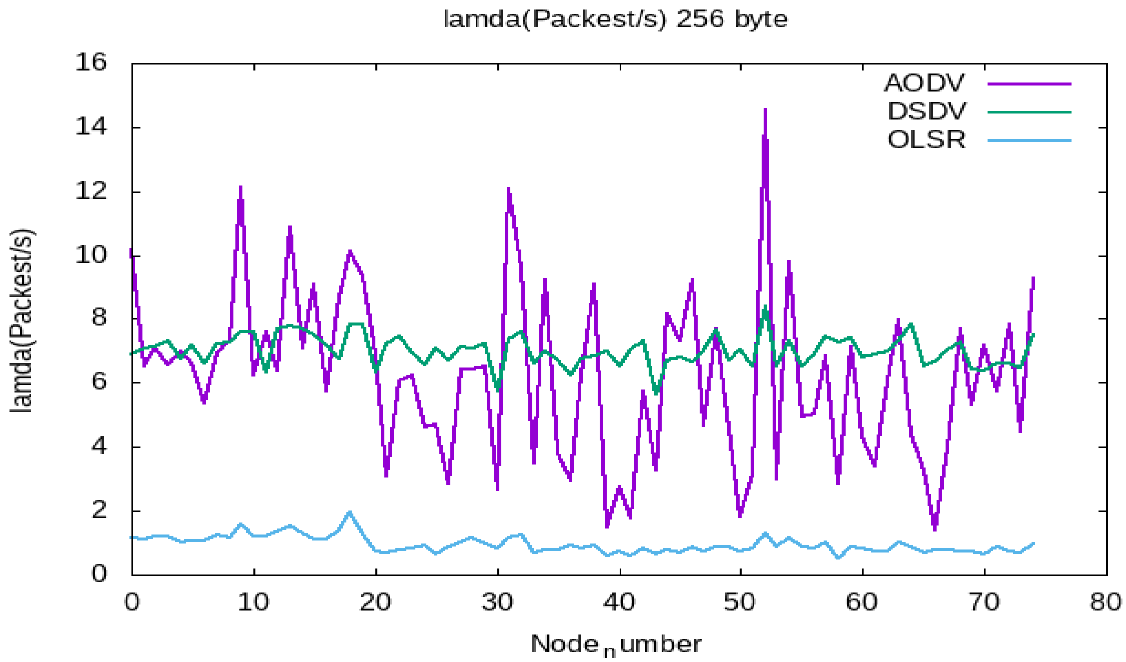

FIGURE 18: LAMDA USING 256 BYTE AT 75 NODES

Here when we sending 64 byte we can see DSDV performed well and AODV aslo is in form. But OLSR sucks. At 128 byte AODV giving better ouput. Because we know it sotred all the necessary routing paths in routing table which helps to send the data quickly when sink node chjange the position. Same for OLSR as we discussed earlier.As we know that DSDV is a flat routing protocols and a proactive routing protocols. In AODV when a link in the network's active routes fails, there will be a quick response and the use of a destination sequence number aids in the prevention of route looping. Because there is no periodic advertisement of routes, bandwidth is not wasted in this case. That’s why we can see AODV have the have the highest value in lamda than OLSR and DSDV in case of packet size 64, 128 and 256 byte.

6.2.3 AT 100 NODES

6.2.3.1 THROUGHPUT

USING 64 BYTES AT 100 NODES

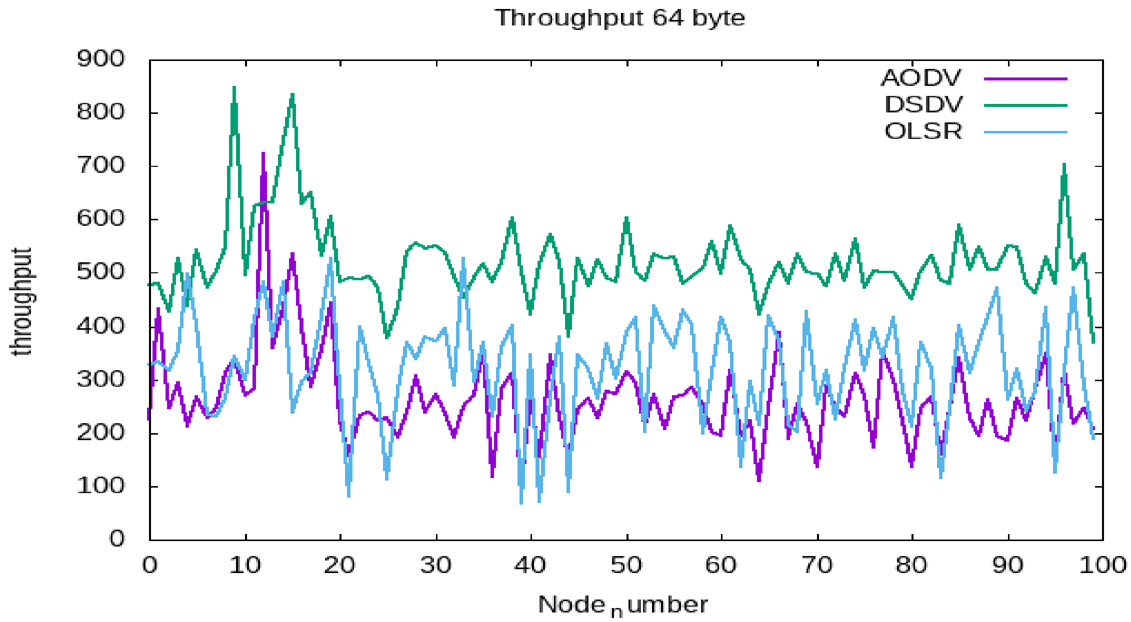

FIGURE 19: THROUGHPUT USING 64 BYTE AT 100 NODES

USING 128 BYTES AT 100 NODES

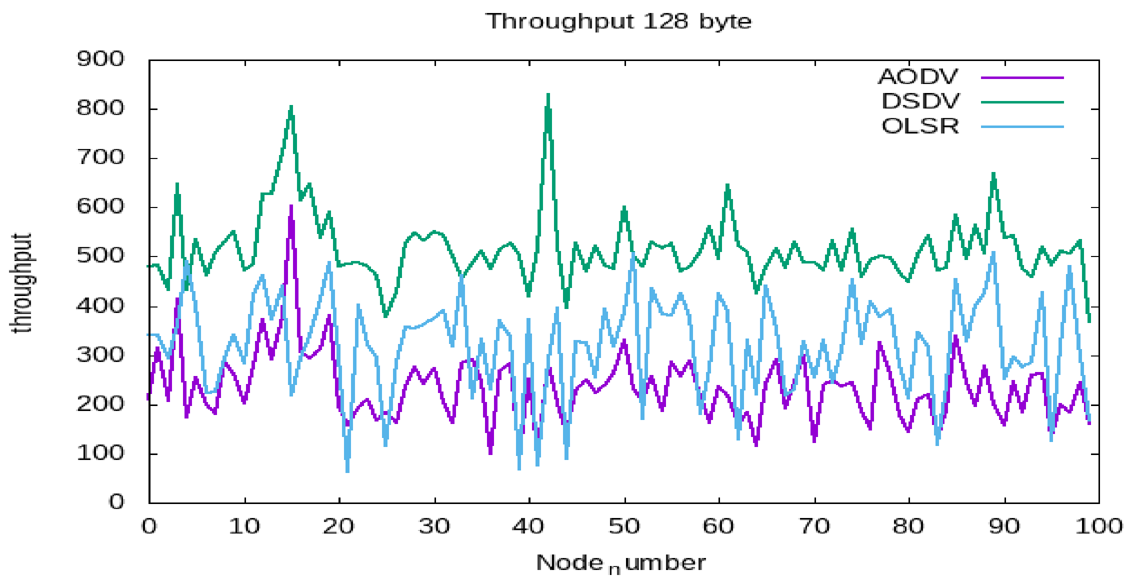

FIGURE 20: THROUGHPUT USING 128 BYTE AT 100 NODES

USING 256 BYTES AT 100 NODES

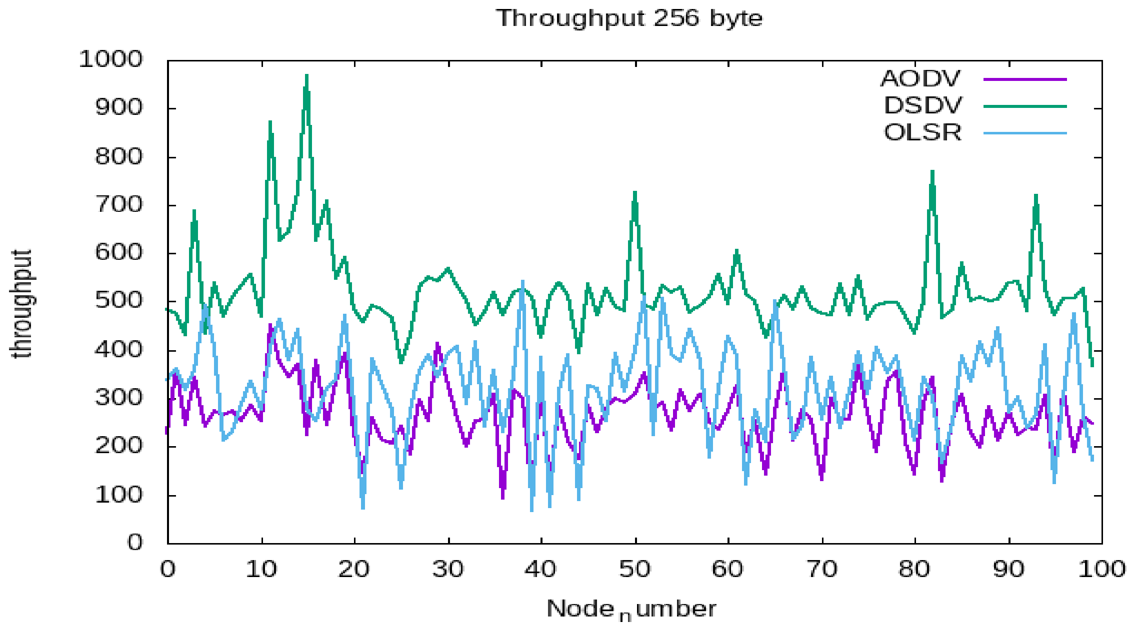

FIGURE 21: THROUGHPUT USING 256 BYTE AT 100 NODES

We have taking 100 nodes and send 64,75, and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see DSDV have the better throughput than AODV and OLSR. But it's happened because of the overhead of the DSDV. When DSDV overhead we already know it's suffer to perform well and When the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables. So in this case OLSR is second and AODV is the last one. This giving a better in case of all node where we are using 100 nodes. AODV is stored only the necessary routing paths in routing tables. In case of OLSR stored routing table for all the possible routes because of the nature of proactive routing protocols and that's why it's give a poor performance.

6.2.3.2 GOODPUT

USING 64 BYTES AT 100 NODES

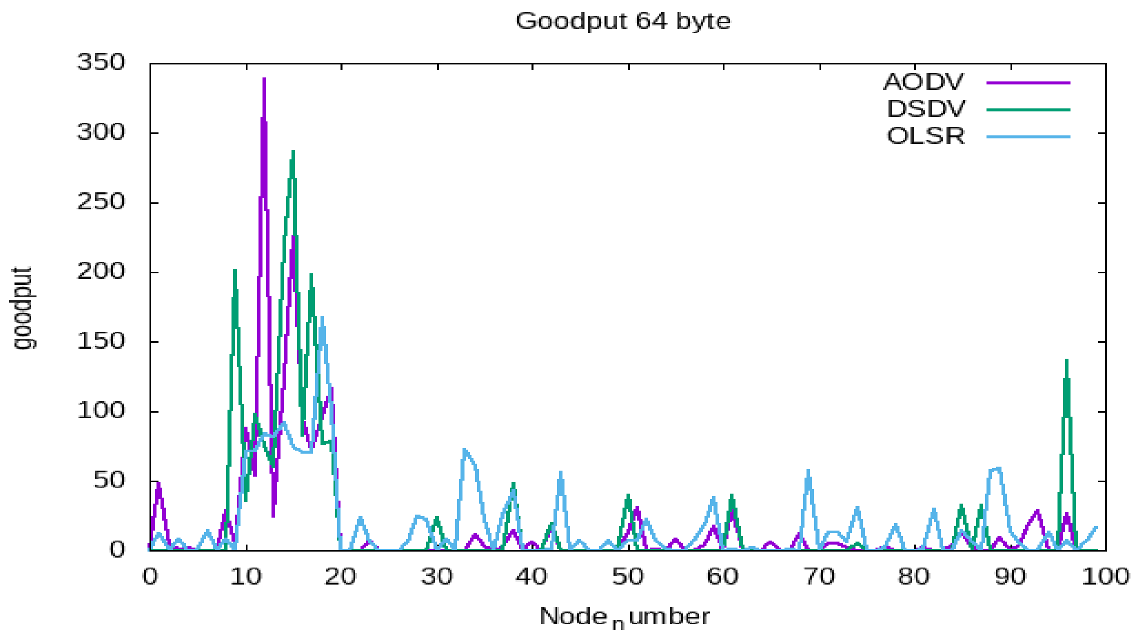

FIGURE 22: GOODPUT USING 64 BYTE AT 100 NODES

USING 128 BYTES AT 100 NODES

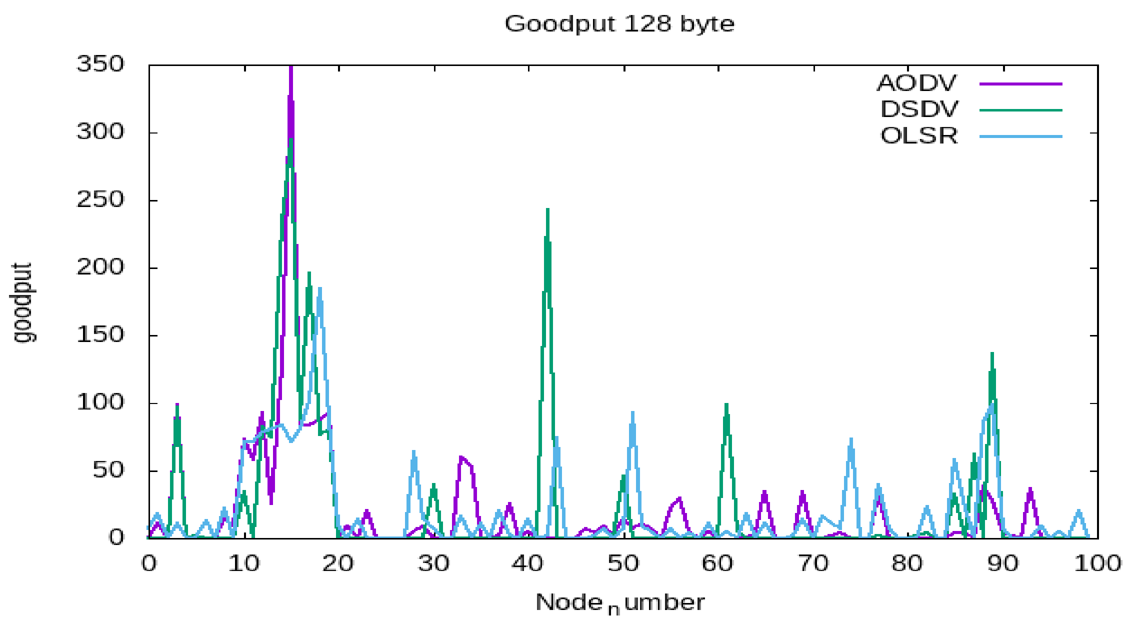

FIGURE 23: GOODPUT USING 128 BYTE AT 100 NODES

USING 256 BYTES AT 100 NODES

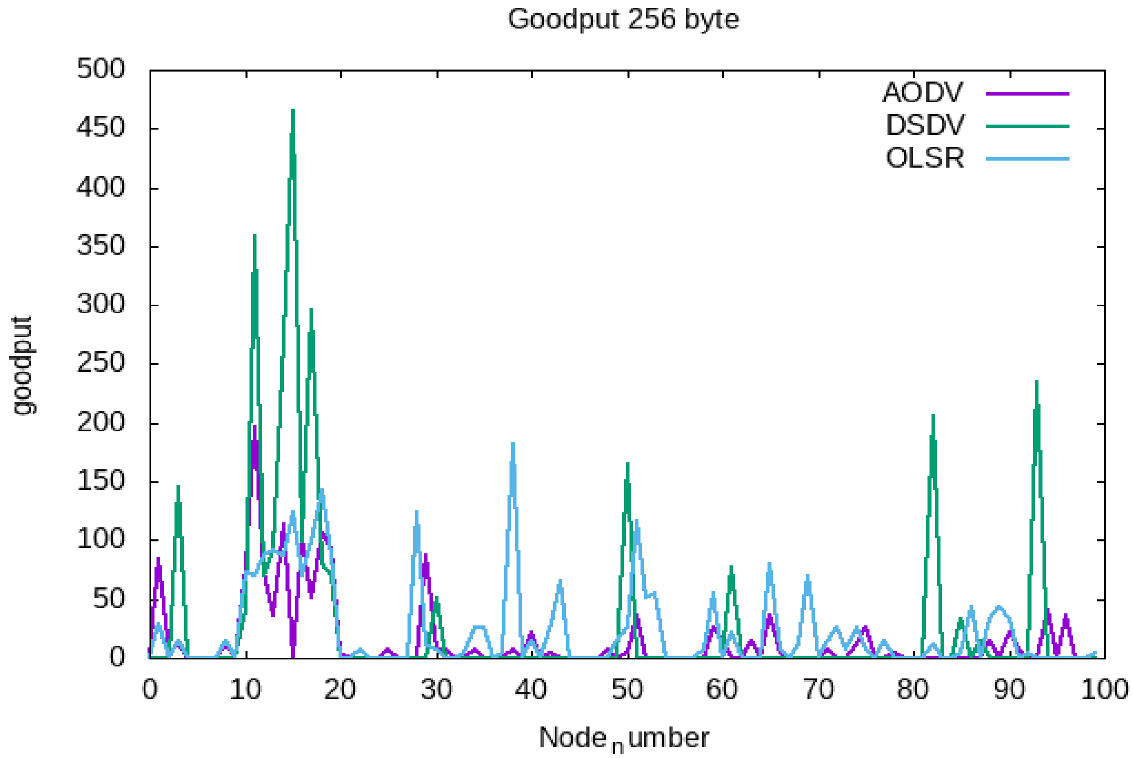

FIGURE 24: GOODPUT USING 256 BYTE AT 100 NODES

We have taking 100 nodes and send 64, 128 and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see OLSR have the better goodput than AODV and DSDV. It's happened because of OLSR is a flat routing protocols. If we rapidly change the source and destination pairs OLSR increase the protocol's suitability for an ad-hoc network. When DSDV overhead we already know it's suffer to perform well and when the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables.

So in this case AODV is second and DSDV is the last one. AODV is stored only the necessary routing paths in routing tables.

6.2.3.3 LAMDA

USING 64 BYTES AT 100 NODES

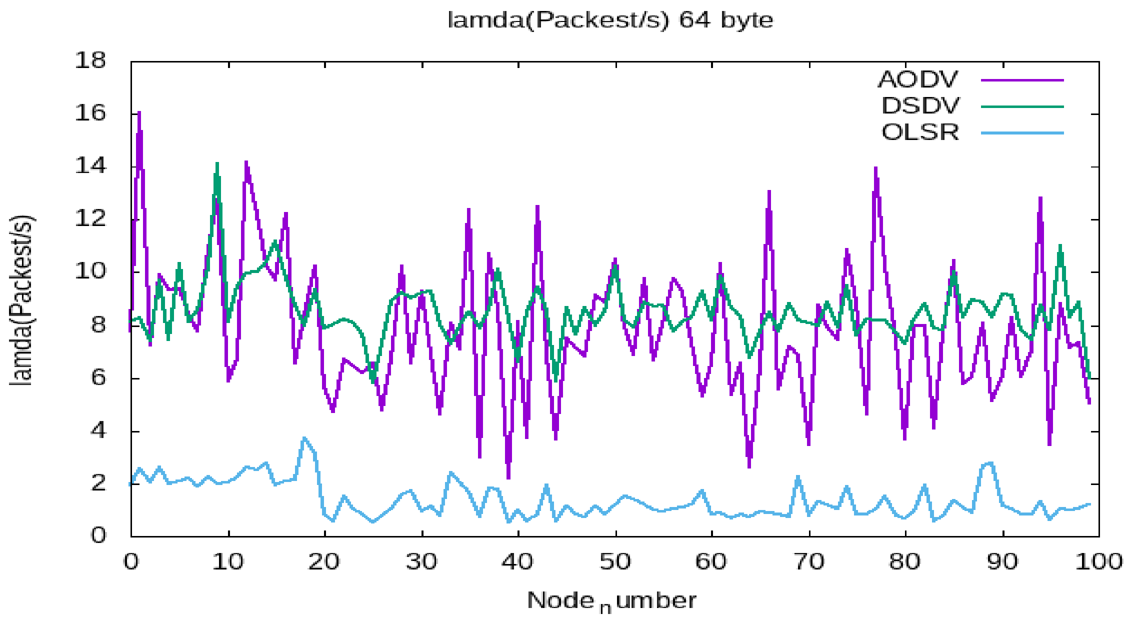

FIGURE 25: LAMDA USING 64 BYTE AT 100 NODES

USING 128 BYTES AT 100 NODES

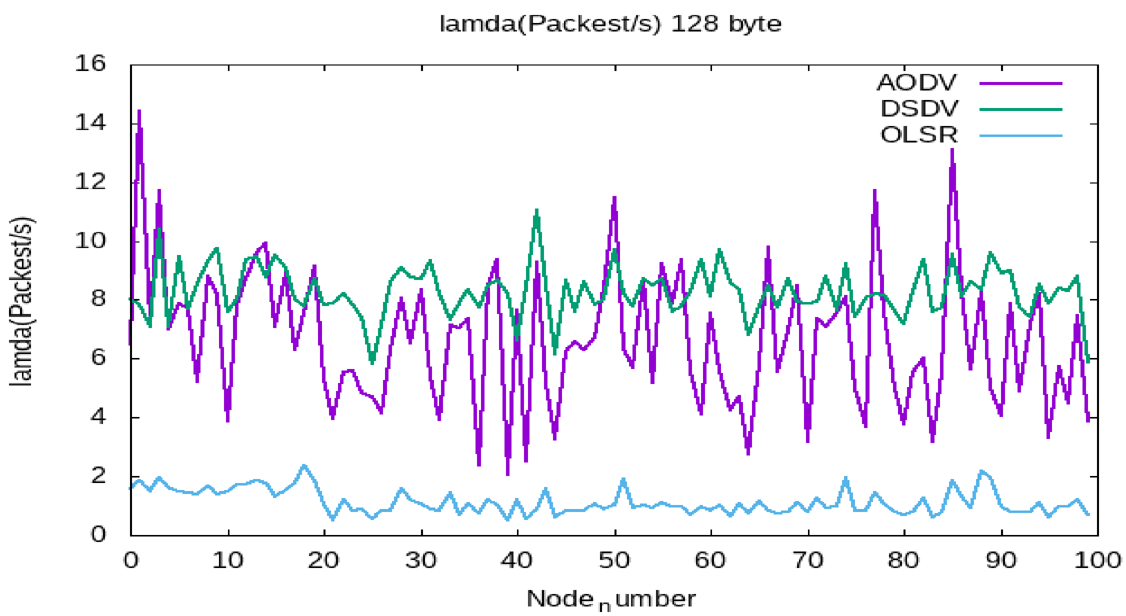

FIGURE 26: LAMDA USING 128 BYTE AT 100 NODES

USING 256 BYTES AT 100 NODES

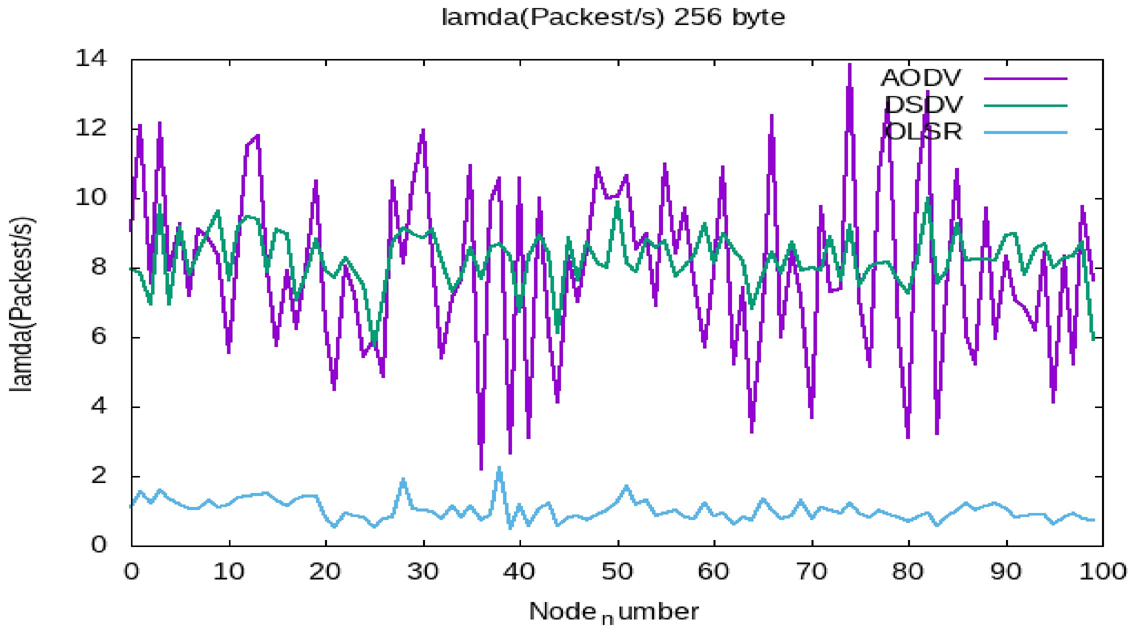

FIGURE 27: LAMDA USING 256 BYTE AT 100 NODES

We already know that DSDV is a flat routing protocols and a proactive routing protocols. In AODV when a link in the network's active routes fails, there will be a quick response and the use of a destination sequence number aids in the prevention of route looping. Because there is no periodic advertisement of routes, bandwidth is not wasted in this case. Because flat routing protocols we can see DSDV have the have the highest value in lamda than OLSR and AODV in case of packet size 64, 128 and 256 byte and AODV saturated a lot.

6.2.4 AT 125 NODES

6.2.4.1 THROUGHPUT

USING 64 BYTES AT 125 NODES

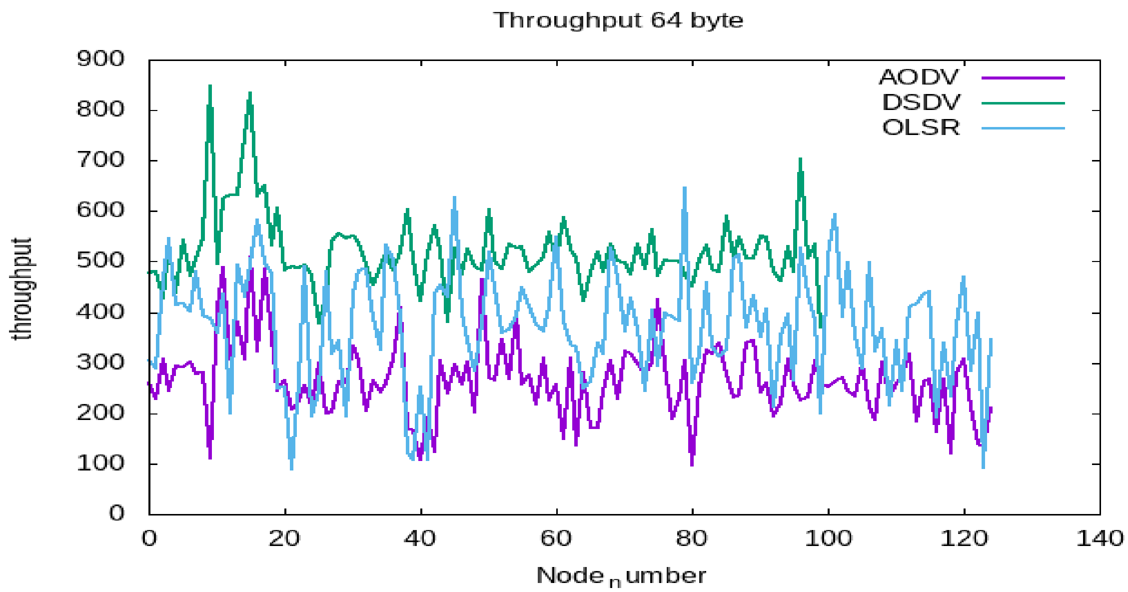

FIGURE 28: THROUGHPUT USING 64 BYTE AT 125 NODES

USING 128 BYTES AT 125 NODES

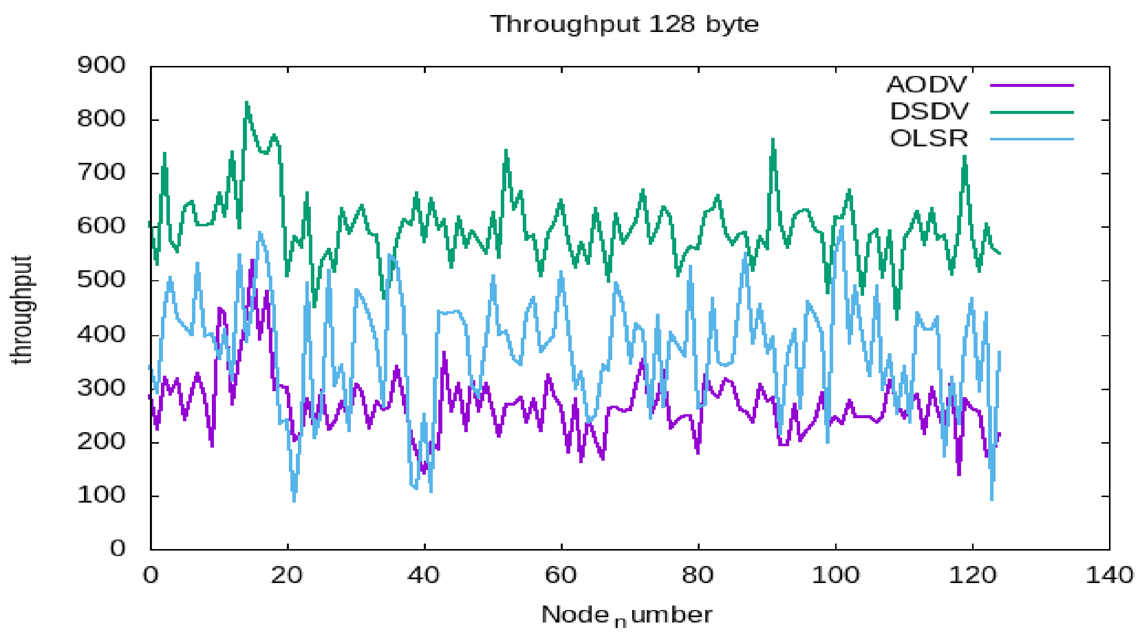

FIGURE 29: THROUGHPUT USING 128 BYTE AT 125 NODES

USING 256 BYTES AT 125 NODES

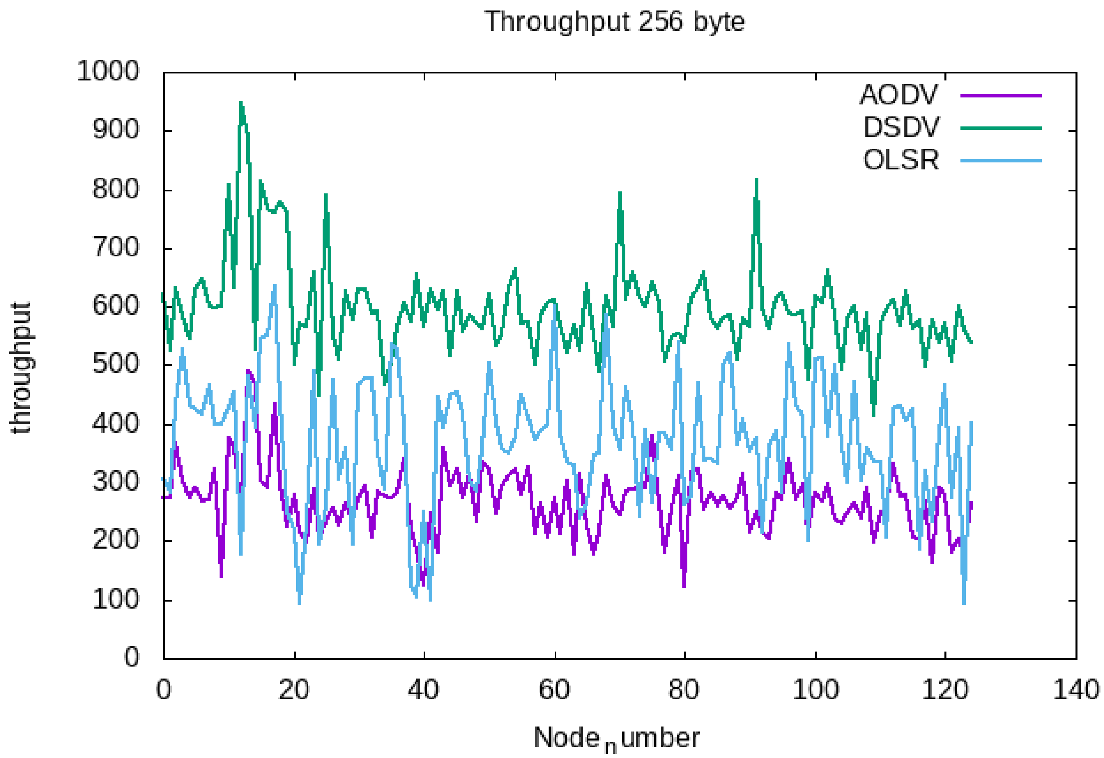

FIGURE 30: THROUGHPUT USING 256 BYTE AT 125 NODES

We have taking 125 nodes and send 64,128 and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see DSDV have the better throughput than AODV and OLSR. But it's happened because of the overhead of the DSDV. When DSDV overhead we already know it's suffer to perform well and When the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables. So in this case OLSR is second and AODV is the last one. It's happened because of using more than 100 nodes in AODV. AODV is stored only the necessary routing paths in routing tables. In case of OLSR stored routing table for all the possible routes because of the nature of proactive routing protocols and that's why it's give a poor performance.

6.2.4.2 GOODPUT

USING 64 BYTES AT 125 NODES

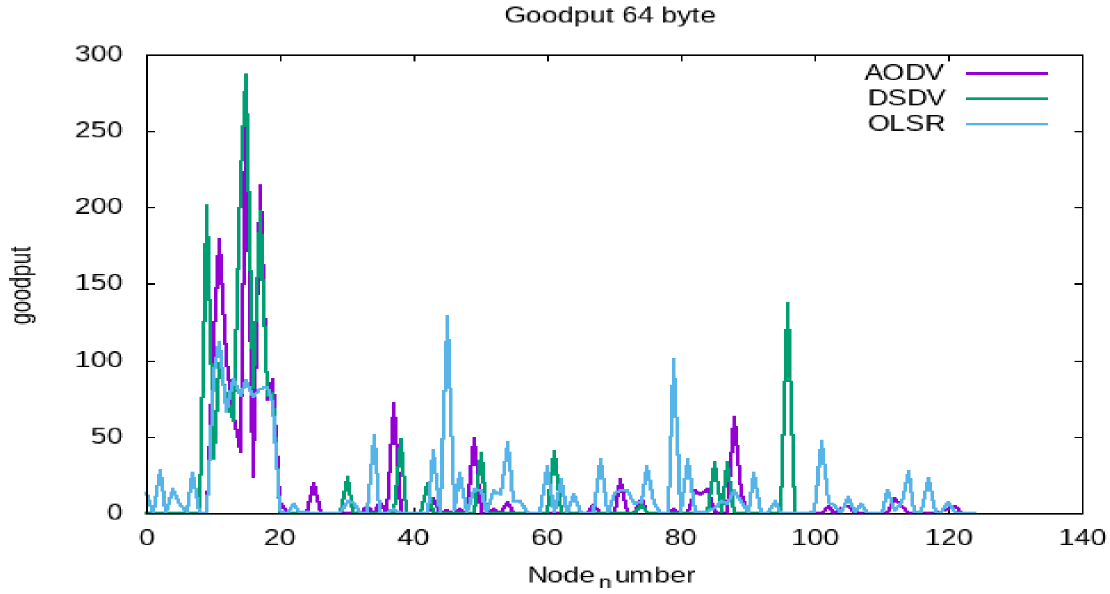

FIGURE 31: GOODPUT USING 64 BYTE AT 125 NODES

USING 128 BYTES AT 125 NODES

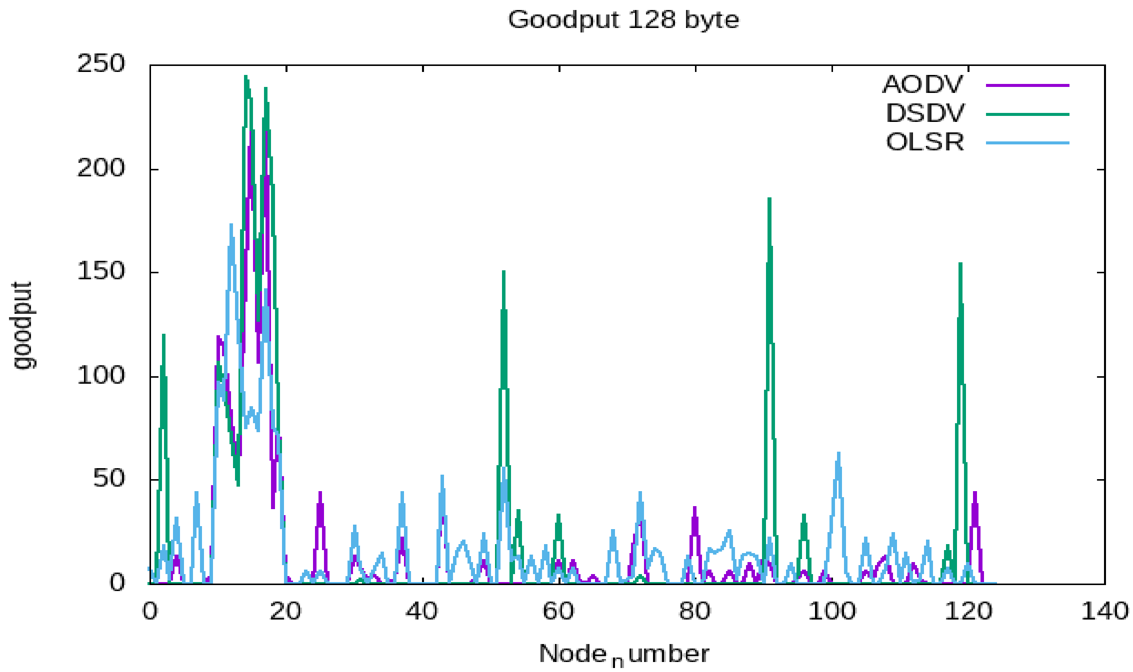

FIGURE 32: GOODPUT USING 128 BYTE AT 125 NODES

USING 256 BYTES AT 125 NODES

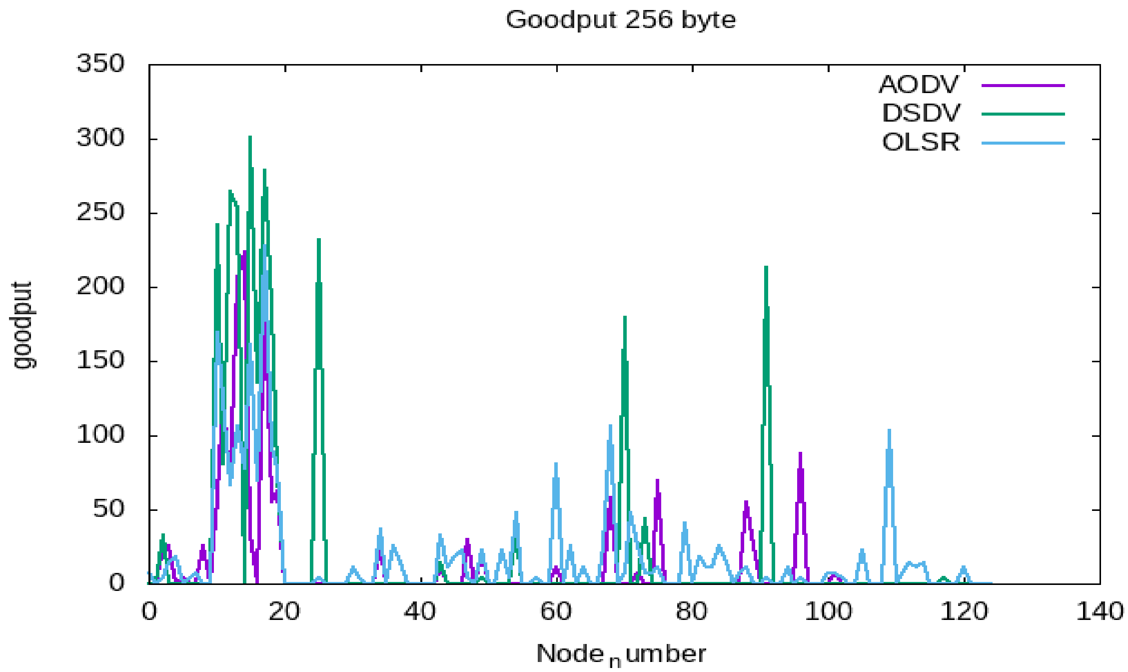

FIGURE 33: GOODPUT USING 256 BYTE AT 125 NODES

We have taking 125 nodes and send 64,128 and 256 byte UDP data from source to destination with 10 sinks node. As a result we can see OLSR have the better goodput than AODV and DSDV. It's happened because of OLSR is a flat routing protocols. If we rapidly change the source and destination pairs OLSR increase the protocol's suitability for an ad-hoc network. When DSDV overhead we already know it's suffer to perform well and when the topology of the mobile ad-hoc network changes, this protocol is unstable until all nodes update their routing tables.

So in this case AODV is second and DSDV is the last one. AODV is stored only the necessary routing paths in routing tables.

6.2.4.3 LAMDA

USING 64 BYTES AT 125 NODES

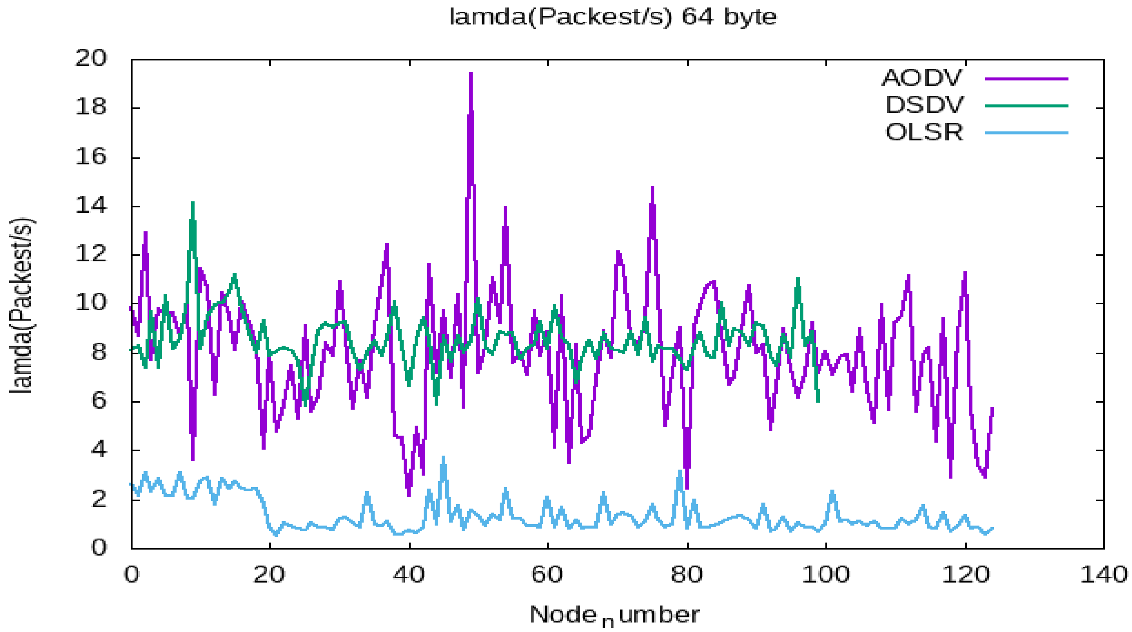

FIGURE 34: LAMDA USING 64 BYTE AT 125 NODES

USING 128 BYTES AT 125 NODES

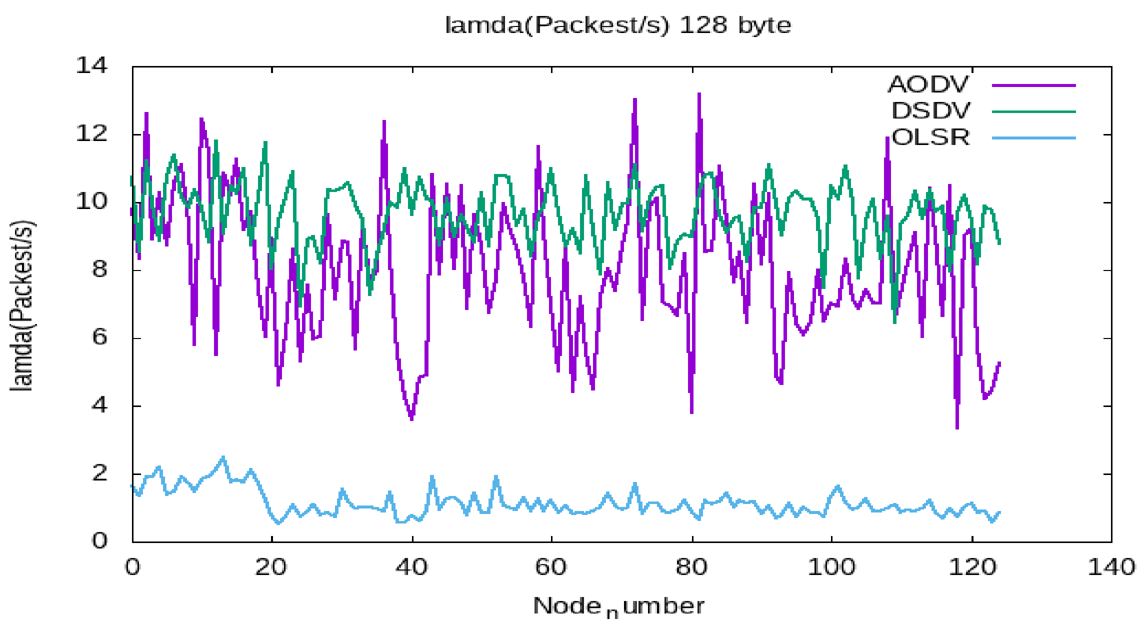

FIGURE 35: LAMDA USING 128 BYTE AT 125 NODES

USING 256 BYTES AT 125 NODES

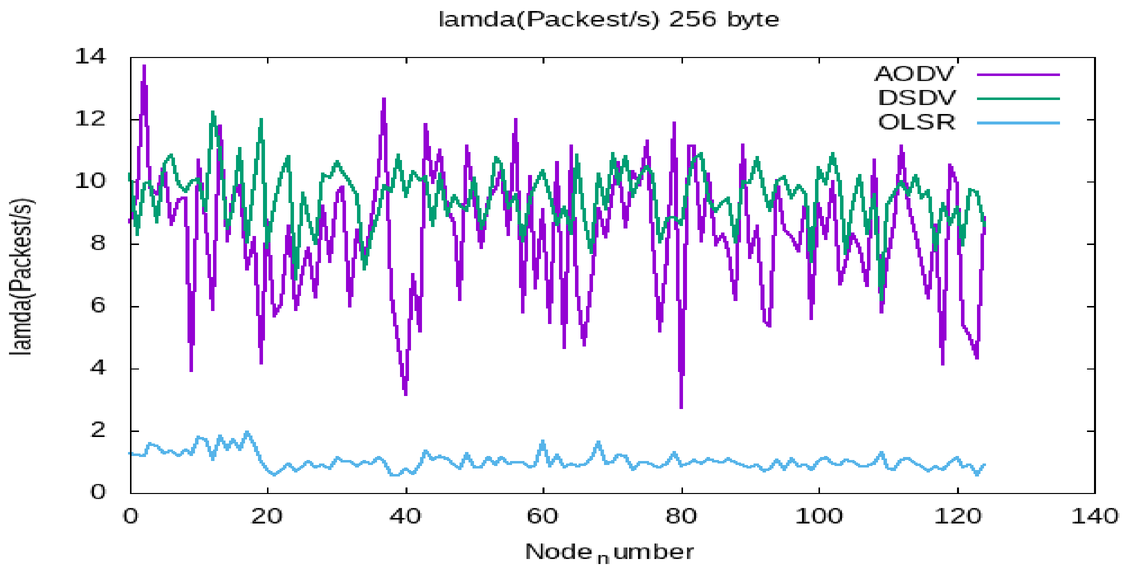

FIGURE 36: LAMDA USING 256 BYTE AT 125 NODES

We already know that DSDV is a flat routing protocols and a proactive routing protocols. In AODV when a link in the network's active routes fails, there will be a quick response and the use of a destination sequence number aids in the prevention of route looping. Because there is no periodic advertisement of routes, bandwidth is not wasted in this case. That's why we can see DSDV have the have the highest value in lamda than OLSR and AODV in case of packet size 64, 128 and 256 byte.

CHAPTER 07

COMPARATIVE RESULTS AND DISCUSSION

7.1 COMPARATIVE RESULTS

7.1.1 USING 50 NODES FINDING PARAMETERS SUCH AS PACKET LOSS RATIO, PACKET DELIVERY RATIO, AVERAGE THROUGHPUT, END TO END DELAY, AND END TO END JITTER DELAY

TABLE 1.0: AT 64 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
50	Packet Loss ratio	11%	46%	11%
	Packet delivery ratio	88%	53%	88%
	Average Throughput	2.63577Kbps	1.85357Kbps	2.59966Kbps
	End to End Delay	+531600135711.0ns	+21936769355.0ns	+23127746878.0ns
	End to End Jitter delay	+324727203876.0ns	+15759120794.0ns	+23609061836.0ns

TABLE 1.1: AT 128 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
50	Packet Loss ratio	10%	47%	14%
	Packet delivery ratio	89%	52%	85%
	Average Throughput	3.57153Kbps	1.72857Kbps	2.20524Kbps
	End to End Delay	+424904988141.0ns	+13163977957.0ns	+11473468287.0ns
	End to End Jitter delay	+239502085726.0ns	+12053675590.0ns	+12449430330.0ns

TABLE 1.2: AT 256 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
50	Packet Loss ratio	14%	50%	22%
	Packet delivery ratio	85%	49%	77%
	Average Throughput	3.39274Kbps	1.6239Kbps	1.94754Kbps
	End to End Delay	+467387602452.0ns	+8507953350.0ns	+8093096407.0ns
	End to End Jitter delay	+248117371781.0ns	+6846742797.0ns	+11148851150.0ns

Packet Loss ratio

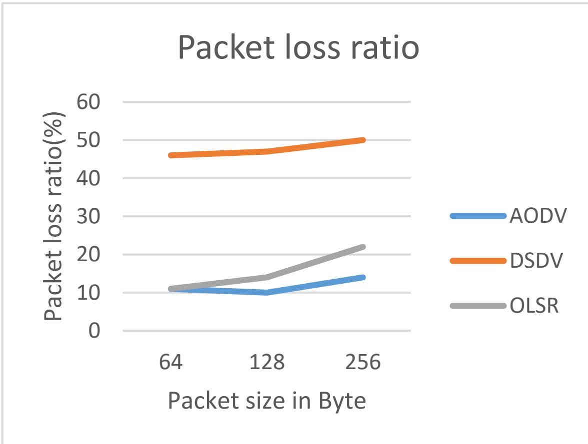

Figure 37: Packet loss ratio

Packet delivery ratio

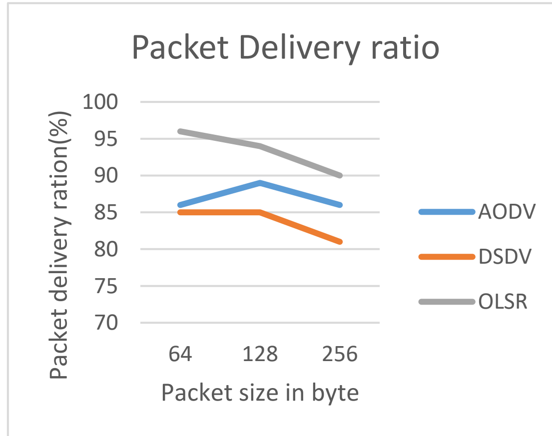

Figure 38: Packet delivery ratio using 50 nodes

Average Throughput using 50 nodes

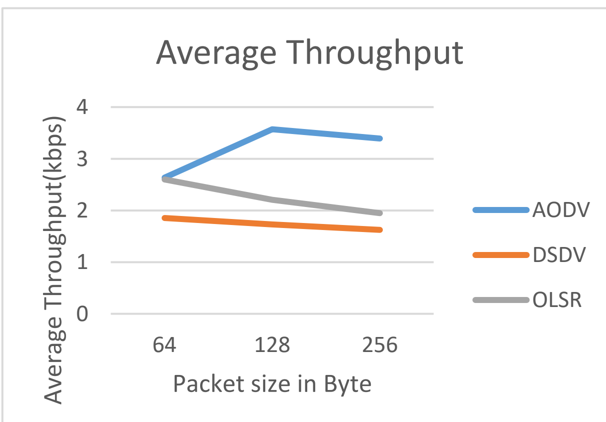

Figure 39: Average Throughput using 50 nodes

End to End Delay

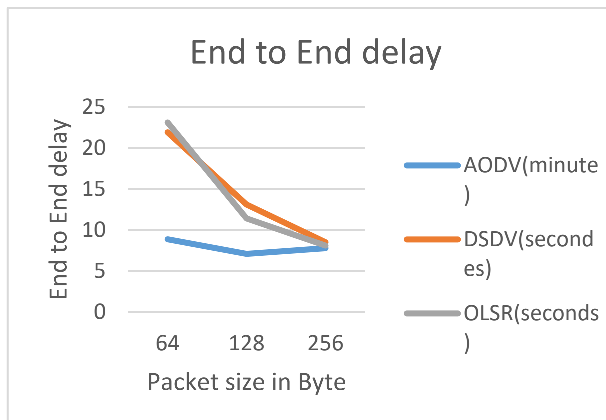

Figure 40: End to End delay using 50 nodes

End to End Jitter delay

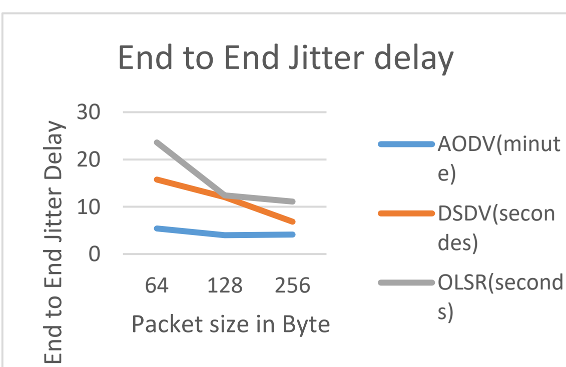

Figure 41: End to End Jitter Delay using 50 nodes

7.2 Discussion

7.2.1 Packet loss ratio

We have 50 nodes and sending 64,128 and 256 byte data rapidly. As we can see most of the packet loosed in DSDV. Then there is OLSR and performed better in AODV routing protocols. Because there is quick response when a link in the networks active routes fails. Because of loop free paths and less delay in transmission, DSDV loosed most packet during the transmission. Because of flat routing protocols OLSR gives less packet loss than DSDV.

7.2.2 Packet delivery ratio

We have 50 nodes and sending 64,128 and 256 byte data rapidly. It is the opposite of packet loss ratio. We can say the reason here which we discussed in packet loss ratio.

7.2.3Average Throughput

We have 50 nodes and sending 64,128 and 256 byte data rapidly. From the graph we can see there is a better performance from AODV. Then OLSR and DSDV. There is no periodic advertisement of routes, that’s why bandwidth is not wasted in AODV. That’s why it’s give better throughput. When the mobile network is idle, the regular updates of the routing information wasted bandwidth in DSDV. That’s why it’s have the worst performance. OLSR increase the protocols suitability for ad-hoc network if we rapidly change the source and destination pairs. That’s why it’s performed better than DSDV.

7.2.4 End to End delay

We have 50 nodes and sending 64,128 and 256 byte data rapidly. It’s showing us the total end to end time particular routing protocols. As we discussed earlier the same scenario is here. Giving more throughput AODV take so much time and similarly DSDV take less AODV. Where OLSR take less than other.

7.2.5 End to End Jitter delay

We have 50 nodes and sending 64,128 and 256 byte data rapidly. Here all the scenario is different than End to End delay. To giving more specified result, AODV have bigger end to end jitter delay. Then there is OLSR and less jitter delay find in DSDV.

7.3 COMPARATIVE RESULTS

7.3.1 USING 75 NODES FINDING PARAMETERS SUCH AS PACKET LOSS RATIO, PACKET DELIVERY RATIO, AVERAGE THROUGHPUT, END TO END DELAY, AND END TO END JITTER DELAY

TABLE 2.0: AT 64 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
75	Packet Loss ratio	13%	14%	3%
	Packet delivery ratio	86%	85%	96%
	Average Throughput	7.16257Kbps	2.57919Kbps	2.80266Kbps
	End to End Delay	+873346778154.0ns	+28482894683.0ns	+3538127195.0ns
	End to End Jitter delay	+342080674183.0ns	+19100929041.0ns	+3647843662.0ns

TABLE 2.1: AT 128 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
75	Packet Loss ratio	10%	14%	5%
	Packet delivery ratio	89%	85%	94%
	Average Throughput	3.07735Kbps	2.57919Kbps	2.37165Kbps
	End to End Delay	+1219161079879.0ns	+28482894683.0ns	+1435919800.0ns
	End to End Jitter delay	+617009480871.0ns	+19100929041.0ns	+1947368997.0ns

TABLE 2.2: AT 256 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
75	Packet Loss ratio	13%	18%	9%
	Packet delivery ratio	86%	81%	90%
	Average Throughput	3.83275Kbps	2.16705Kbps	2.12721Kbps
	End to End Delay	+1060831689779.0ns	+10921077312.0ns	+1624875434.0ns
	End to End Jitter delay	+490144215585.0ns	+12243146405.0ns	+2576731166.0ns

Packet Loss ratio

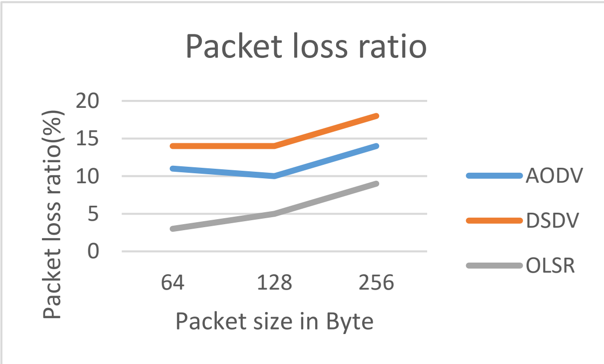

Figure 42: Packet loss ratio using 75 nodes

Packet delivery ratio

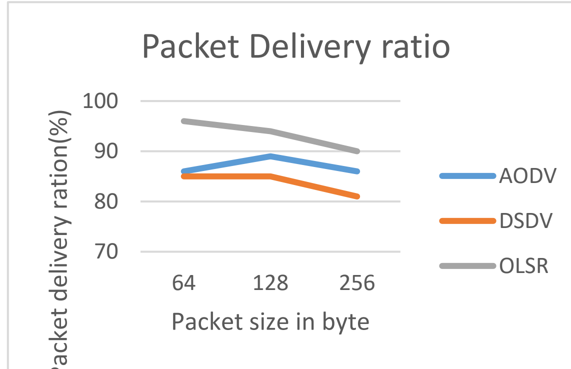

Figure 43: Packet delivery ratio using 75 nodes

Average Throughput

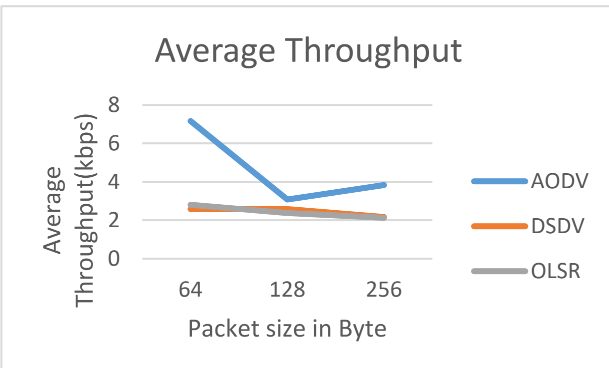

Figure 44: Average Throughput using 75 nodes

End to End Delay

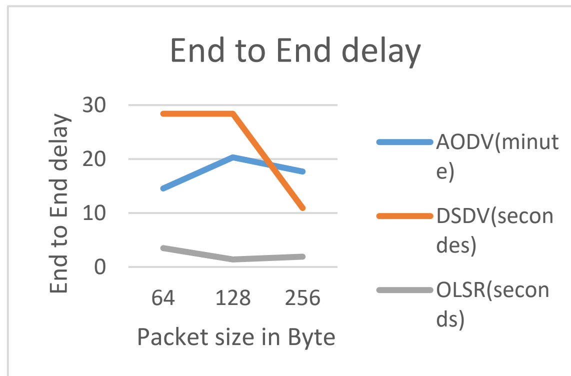

Figure 45: End to End delay using 75 nodes

End to End Jitter delay

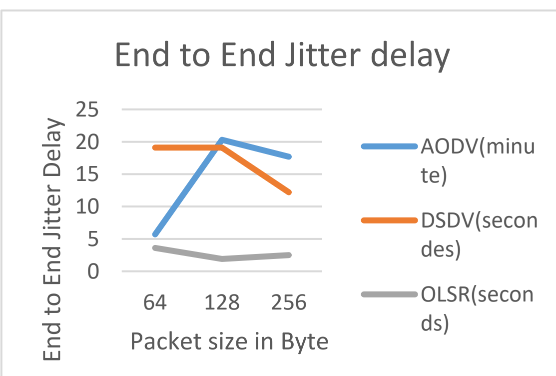

Figure 46: End to End Jitter Delay using 75 nodes

7.4 Discussion

7.4.1 Packet loss ratio

We have 75 nodes and sending 64,128 and 256 byte data rapidly. As we can see most of the packet loosed in DSDV. Then there is OLSR and performed better in AODV routing protocols. Because there is quick response when a link in the networks active routes fails. Because of loop free paths and less delay in transmission, DSDV loosed most packet during the transmission. Because of flat routing protocols OLSR gives less packet loss than DSDV. However using more 50 nodes doesn't effect on the overall performance.

7.4.2 Packet delivery ratio

We have 75 nodes and sending 64,128 and 256 byte data rapidly. It is the opposite of packet loss ratio. We can say the reason here which we discussed in packet loss ratio. However using more 50 nodes doesn't effect on the overall performance.

7.4.3 Average Throughput

We have 75 nodes and sending 64,128 and 256 byte data rapidly. From the graph we can see there is a better performance from AODV. Then OLSR and DSDV. There is no periodic advertisement of routes, that's why bandwidth is not wasted in AODV. That's why it's give better throughput. When the mobile network is idle, the regular updates of the routing information wasted bandwidth in DSDV. That's why it's have the worst performance. OLSR increase the protocols suitability for ad-hoc network if we rapidly change the source and destination pairs. That's why it's performed better than DSDV. However using more 50 nodes doesn't effect on the overall performance.

7.4.4 End to End delay

We have 75 nodes and sending 64,128 and 256 byte data rapidly. It's showing us the total end to end time particular routing protocols. As we discussed earlier the same scenario is here. Giving more throughput AODV take so much time and similarly DSDV take less AODV. Where OLSR take less than other. However using more 50 nodes doesn't effect on the overall performance.

7.4.5 End to End Jitter delay

We have 75 nodes and sending 64,128 and 256 byte data rapidly. Here all the scenario is different than End to End delay. To giving more specified result, AODV have bigger end to end jitter delay. Then there is OLSR and less jitter delay find in DSDV. However using more 50 nodes doesn’t effect on the overall performance.

7.5 COMPARATIVE RESULTS

7.5.1 USING 100 NODES FINDING PARAMETERS SUCH AS PACKET LOSS RATIO, PACKET DELIVERY RATIO, AVERAGE THROUGHPUT, END TO END DELAY, AND END TO END JITTER DELAY

TABLE 3.0: AT 64 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
100	Packet Loss ratio	19%	45%	9%
	Packet delivery ratio	80%	54%	90%
	Average Throughput	4.02987Kbps	1.70891Kbps	2.62676Kbps
	End to End Delay	+2308853590713.0ns	+47459377443.0ns	+22850366939.0ns
	End to End Jitter delay	+987490049436.0ns	+33230977955.0ns	+18183278207.0ns

TABLE 3.1: AT 128 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
100	Packet Loss ratio	18%	49%	10%
	Packet delivery ratio	81%	50%	89%
	Average Throughput	4.70851Kbps	1.55906Kbps	2.27862Kbps
	End to End Delay	+1803076774574.0ns	+36400058668.0ns	+5753109685.0ns
	End to End Jitter delay	+750793519894.0ns	+21221805482.0ns	+7746325085.0ns

TABLE 3.2: AT 256 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
100	Packet Loss ratio	21%	54%	14%
	Packet delivery ratio	78%	45%	85%
	Average Throughput	2.33704Kbps	1.55957Kbps	2.0041Kbps
	End to End Delay	+2304101771288.0ns	+12660935929.0ns	+8185059156.0ns
	End to End Jitter delay	+1067462215400.0ns	+10667570447.0ns	+14967105785.0ns

Packet Loss ratio

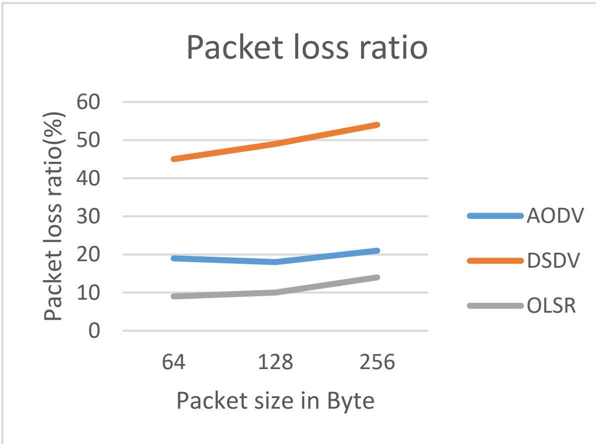

Figure 47: Packet loss ratio using 100 nodes

Packet delivery ratio

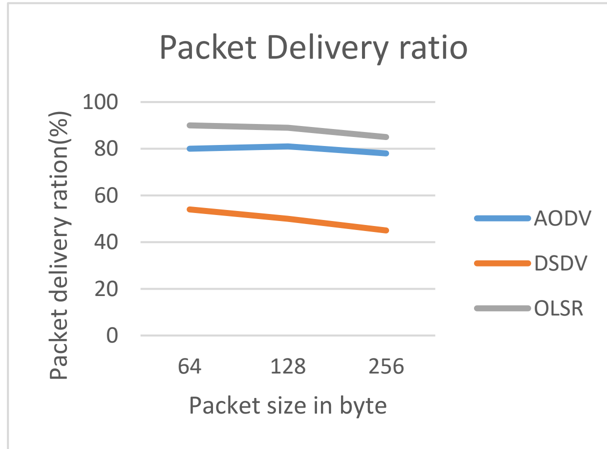

Figure 48: Packet delivery ratio using 100 nodes

Average Throughput

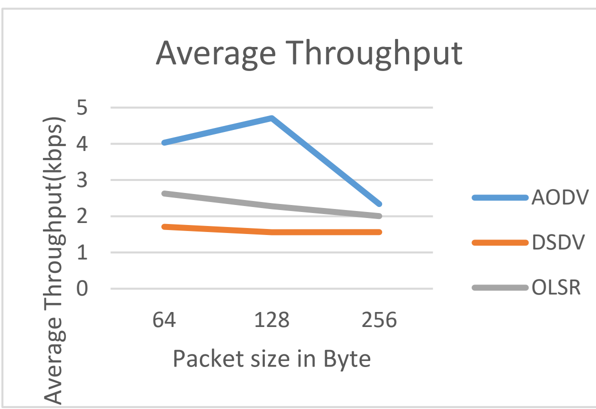

Figure 49: Average Throughput using 100 nodes

End to End Delay

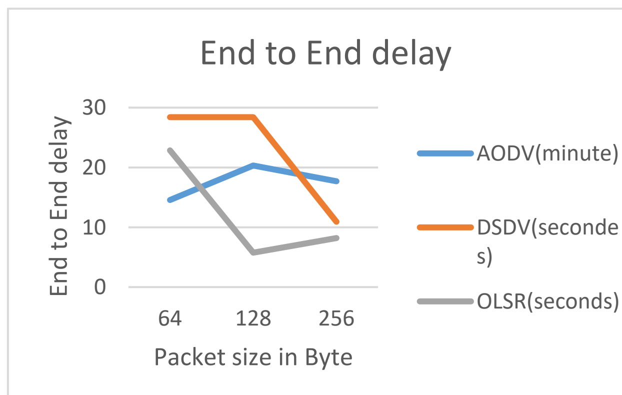

Figure 50: End to End delay using 100 nodes

End to End Jitter delay

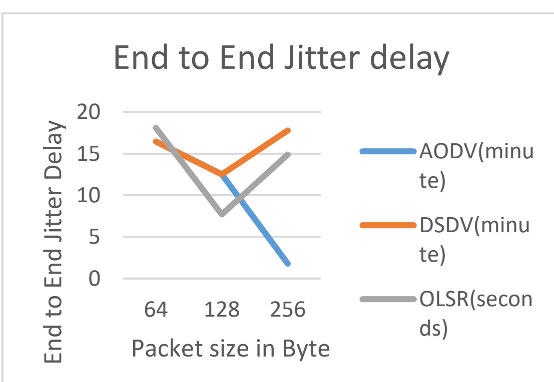

Figure 51: End to End Jitter Delay using 100 nodes

7.6 Discussion

7.6.1 Packet loss ratio

We have 100 nodes and sending 64,128 and 256 byte data rapidly. As we can see most of the packet loosed in DSDV. Then there is OLSR and performed better in AODV routing protocols. Because there is quick response when a link in the networks active routes fails. Because of loop free paths and less delay in transmission, DSDV loosed most packet during the transmission. Because of flat routing protocols OLSR gives less packet loss than DSDV. However using more 75 nodes doesn’t effect on the overall performance.

7.6.2 Packet delivery ratio

We have 100 nodes and sending 64,128 and 256 byte data rapidly. It is the opposite of packet loss ratio. We can say the reason here which we discussed in packet loss ratio. However using more 75 nodes doesn’t effect on the overall performance.

7.6.3 Average Throughput

We have 100 nodes and sending 64,128 and 256 byte data rapidly. From the graph we can see there is a better performance from AODV. Then OLSR and DSDV. There is no periodic advertisement of routes, that’s why bandwidth is not wasted in AODV. That’s why it’s give better throughput. When the mobile network is idle, the regular updates of the routing information wasted bandwidth in DSDV. That’s why it’s have the worst performance. OLSR increase the protocols suitability for ad-hoc network if we rapidly change the source and destination pairs. That’s why it’s performed better than DSDV. However using more 75 nodes doesn’t effect on the overall performance.

7.6.4 End to End delay

We have 100 nodes and sending 64,128 and 256 byte data rapidly. It’s showing us the total end to end time particular routing protocols. As we discussed earlier the same scenario is here. Giving more throughput AODV take so much time and similarly DSDV take less AODV. Where OLSR take less than other. However using more 75 nodes doesn’t effect on the overall performance.

7.6.5 End to End Jitter delay

We have 100 nodes and sending 64,128 and 256 byte data rapidly. Here all the scenario is different than End to End delay. To giving more specified result, AODV have bigger end to end jitter delay. Then there is OLSR and less jitter delay find in DSDV. However using more 75 nodes doesn’t effect on the overall performance.

7.7 COMPARATIVE RESULTS

7.7.1 USING 125 NODES FINDING PARAMETERS SUCH AS PACKET LOSS RATIO, PACKET DELIVERY RATIO, AVERAGE THROUGHPUT, END TO END DELAY, AND END TO END JITTER DELAY

TABLE 4.0: AT 64 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
125	Packet Loss ratio	25%	60%	4%
	Packet delivery ratio	74%	39%	95%
	Average Throughput	2.94255Kbps	1.20699Kbps	2.77924Kbps
	End to End Delay	+3260475085983.0ns	+23615091990.0ns	+12709107949.0ns
	End to End Jitter delay	+1411482877639.0ns	+18571893270.0ns	+16960277318.0ns

TABLE 4.1: AT 128 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
125	Packet Loss ratio	26%	45%	8%
	Packet delivery ratio	73%	54%	91%
	Average Throughput	2.70718Kbps	1.70891Kbps	2.29444Kbps
	End to End Delay	+3223941682882.0ns	+47459377443.0ns	+11548005709.0ns
	End to End Jitter delay	+1324525646529.0ns	+33230977955.0ns	+14923366193.0ns

TABLE 4.2: AT 256 BYTE

Nodes	Parameters	AODV	DSDV	OLSR
125	Packet Loss ratio	40%	62%	20%
	Packet delivery ratio	59%	37%	80%
	Average Throughput	1.56176Kbps	1.04698Kbps	1.91151Kbps
	End to End Delay	+3720663181794.0ns	+9763535581.0ns	+4577893720.0ns
	End to End Jitter delay	+1511739271129.0ns	+10880798636.0ns	+7285218382.0ns

Packet Loss ratio

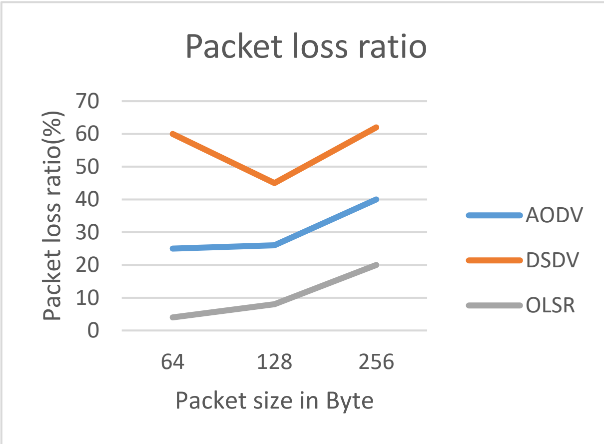

Figure 52: Packet loss ratio using 125 nodes

Packet delivery ratio

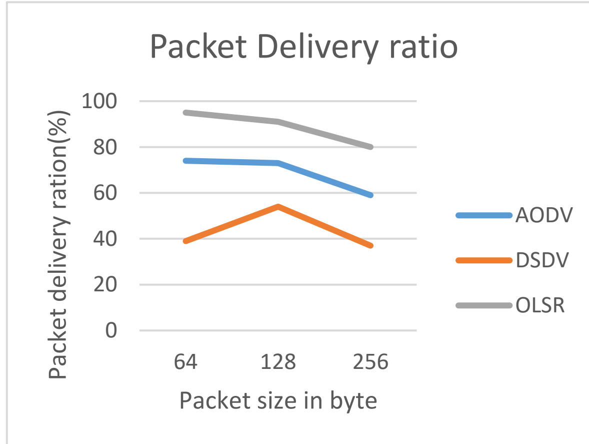

Figure 53: Packet delivery ratio using 125 nodes

Average Throughput

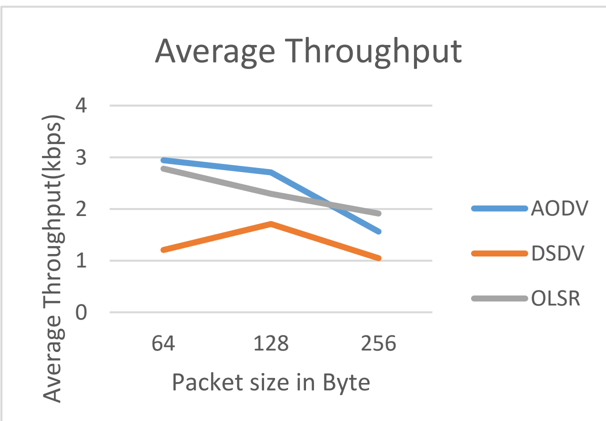

Figure 54: Average Throughput using 125 nodes

End to End Delay

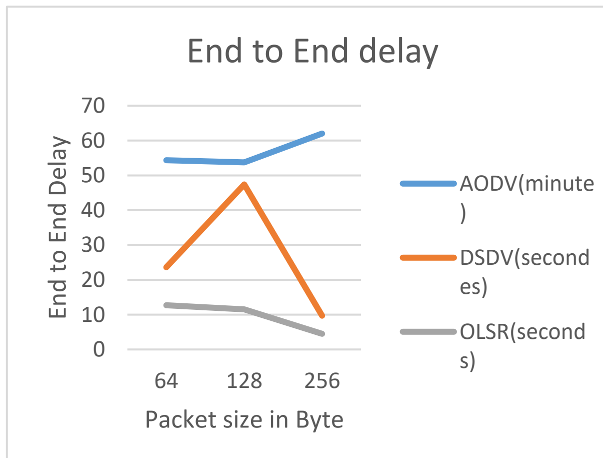

Figure 55: End to End delay using 125 nodes

End to End Jitter delay

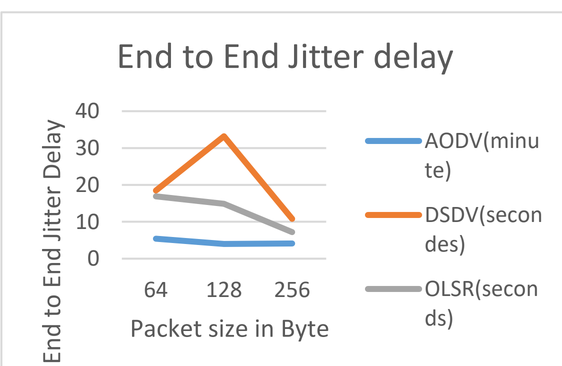

Figure 56: End to End Jitter Delay using 125 nodes

7.8 Discussion

7.8.1 Packet loss ratio

We have 125 nodes and sending 64,128 and 256 byte data rapidly. As we can see most of the packet loosed in DSDV. Then there is OLSR and performed better in AODV routing protocols. Because there is quick response when a link in the networks active routes fails. Because of loop free paths and less delay in transmission, DSDV loosed most packet during the transmission. Because of flat routing protocols OLSR gives less packet loss than DSDV. However using more 100 nodes doesn't effect on the overall performance.

7.8.2 Packet delivery ratio

We have 125 nodes and sending 64,128 and 256 byte data rapidly. It is the opposite of packet loss ratio. We can say the reason here which we discussed in packet loss ratio. However using more 100 nodes doesn't effect on the overall performance.

7.8.3 Average Throughput

We have 125 nodes and sending 64,128 and 256 byte data rapidly. From the graph we can see there is a better performance from AODV. Then OLSR and DSDV. There is no periodic advertisement of routes, that's why bandwidth is not wasted in AODV. That's why it's give better throughput. When the mobile network is idle, the regular updates of the routing information wasted bandwidth in DSDV. That's why it's have the worst performance. OLSR increase the protocols suitability for ad-hoc network if we rapidly change the source and destination pairs. That's why it's performed better than DSDV. However using more 100 nodes doesn't effect on the overall performance.

7.8.4 End to End delay

We have 125 nodes and sending 64,128 and 256 byte data rapidly. It's showing us the total end to end time particular routing protocols. As we discussed earlier the same scenario is here. Giving more throughput AODV take so much time and similarly DSDV take less AODV. Where OLSR take less than other. However using more 100 nodes doesn't effect on the overall performance.

7.8.5 End to End Jitter delay

We have 125 nodes and sending 64,128 and 256 byte data rapidly. Here all the scenario is different than End to End delay. To giving more specified result, AODV have bigger end to end jitter delay. Then there is OLSR and less jitter delay find in DSDV. However using more 100 nodes doesn't effect on the overall performance.

CHAPTER 08

CONCLUSION AND FUTURE WORK

8.1 Future work

All of this MANET research and analysis is focused on security, power management, resource management, routing, and medium access control. Many routing protocols have been proposed in recent years due to their growing importance in multi-hop networks. This section will include several references to the most recent MANET routing developments. Virtual co-ordinate based routing [17], routing protocol based on scalable multi path secure position [18], routing protocol based on secure position [19], fisheye ZRP [20], routing protocol based on gathering [21], QoS routing [24], load balance routing [22], and many others.

Many more efficient routing protocols that are more concerned with service quality and security will be developed in the future. To date, the primary goal of routing protocols proposed has been routing, but a secured routing protocol aware of QoS may be proposed. Taking into account both of these parameters will be difficult for the scientists. In the case of a secure routing protocol, overhead will be higher, resulting in a reduction in service level quality. As a result, the scientists may simply devise a routing protocol that achieves the best possible balance of security and QoS. Future protocols will also prioritize multicasting support. Multicasting is used in large networks to optimize bandwidth utilization.

8.2 Conclusion

As we performing ad-hoc routing protocols over ns3 using different scenario and sending different size of packet which is udp data type over some random mobility model. As we discussed earlier how they work in different scenario.

Now talking about the proactive where we have chosen DSDV and OLSR. Being a flat routing protocols OLSR give better performance over the end to end delay and give less throughput than AODV. But DSDV routing protocols is performed not so good in this. Because we already know DSDV routing protocols a proactive routing protocols.

We have taken AODV routing protocols from reactive routing protocols in MANET. As we already to give a perfect throughput it take so much time which we said end to end delay. Then there is less packet loss than DSDV routing protocols which is proactive routing protocols.

References

[1] "Performance Evaluation of AODV Routing Protocol in MANET Using NS-3 Simulator." *Performance Evaluation of AODV Routing Protocol in MANET Using NS-3 Simulator*, ieeexplore.ieee.org/abstract/document/9392519. Accessed 26 Sept. 2022.

[2] Singh, B., & Hans, R. (2014, April 30). TCP and UDP Based Performance Analysis of AODV, DSR and DSDV Routing Protocols under Different Traffic Conditions in Mobile AdHoc Networks. *International Journal of Future Generation Communication and Networking*, *8*(2), 73–92.

[3] Sholander, P., Oakes, T., & Coccoli, P. (2007). U.S. Patent No. 7,177,295. Washington, DC: U.S. Patent and Trademark Office.

[4] David Oliver Jorg (2003) Performance comparison of MANET routing protocols in different network sized. Computer science project, Institute of Computer Science and Applied Mathematics, Computer Networks and Distributed Systems (RVS), University of Berne, Switzerland.

[5] Abolhasan, M., Wysocki, T. & Dutkiewicz, E. (2004). A review of routing protocols for mobile ad hoc networks. Ad Hoc networks, 2(1), 1-22.

[6] Yefa Mai, et al. "Performance Comparison and Evaluation of the Routing Protocols for MANETs Using NS3." *J. of Electrical Engineering*, vol. 5, no. 4, David Publishing Company, July 2017. *Crossref*.

[7] Zhao Y, Chen Y, Li B, Zhang Q (2007) Hop ID: A Virtual Coordinate – based Routing for Sparse Mobile Ad-hoc Networks. IEEE Transactions on Mobile Computing, Volume 6, Issue 9: 1075 – 1089

[8] Dhakal, D. and Gautam, K. (2013) 'Performance Comparison of AODV and DSR Routing Protocols in Mobile Adhoc Networks: A Survey', International Journal of Engineering Science and Innovative Technology (IJESIT), ISSN: 23195967, Vol. 2, Issue 3, pp. 258-265

[9] Larsson T. and Hedman N. (1998) 'Routing Protocols in Wireless Ad-hoc Networks: A Simulation Study, Master's Thesis, Lulea Tekniska University of Technology, Stockholm.

[10] Maan, F. and Mazhar, N. (2011) ‘MANET Routing Protocols Vs Mobility Models: A Performance Evaluation’ 3rd International Conference on Ubiquitous and Future Networks, IEEE, pp.179-184.

[11] Upadhyay, R.K., Kumar, S. and Rana, M.K. (2019) ‘Impact of Energy and Mobility on MANETs Routing Protocols: AODV and DSR’, International Journal of Innovative Technology and Exploring Engineering (IJITEE), ISSN: 2278-3075, Volume-8, Issue-10, pp. 2346-2352

[12] S., Soumya, et al. “Performance Analysis of Mobile Ad Hoc Routing Protocols in Vehicular Ad Hoc Networks Using NS3 | International Journal of Applied Engineering and Management Letters (IJAEML).” *Performance Analysis of Mobile Ad Hoc Routing Protocols in Vehicular Ad Hoc Networks Using NS3 | International Journal of Applied Engineering and Management Letters (IJAEML)*, 18 Mar. 2021, srinivaspublication.com/journal/index.php/ijaeml/article/view/535.

[13] Muchintala, P. R., & Hash, L. A. (2016, August 1). Routing protocols for Manets. SUNY Open Access Repository (SOAR). Retrieved September 26, 2022.

[14] D. Bhatia and D. P. Sharma, "A comparative analysis of proactive reactive and hybrid routing protocols over open source network simulator in Mobile ad hoc network", Int. J. Appl. Eng. Res., vol. 11, no. 6, pp. 3885-3896, 2016.

[15] M. A. Salem, "A Study And Comparison of AODV and EAODV Approach Routing For Mobile Ad Hoc Networks", *Int. J. Adv. Comput. Eng. Netw.*, vol. 04, no. 10, pp. 69-72, 2016.

[16] Nabou, Abdellah, et al. “The Effect of Transmit Power on MANET Routing Protocols Using AODV, DSDV, DSR and OLSR in NS3 | SpringerLink.” *The Effect of Transmit Power on MANET Routing Protocols Using AODV, DSDV, DSR and OLSR in NS3 | SpringerLink*, 7 Mar. 2019, link.springer.com/chapter/10.1007/978-3-030-11928-7_24.

[17] Zhao Y, Chen Y, Li B, Zhang Q (2007) Hop ID: A Virtual Coordinate – based Routing for Sparse Mobile Ad-hoc Networks. IEEE Transactions on Mobile Computing, Volume 6, Issue 9: 1075 – 1089

[18] Song J-H, Wong VWS, Leung VCM (2007) Secure position – based routing protocol for mobile ad-hoc networks. Ad-hoc Networks, Volume 5, Issue 1: 76 – 86.

[19] Yang C-C, Tseng L-P (2007) Fisheye zone routing protocol: A multi level zone routing protocol for mobile ad-hoc networks. Computer Communications, Volume 30, Issue 2: 261 – 268.

[20] Ahn CW (2006) Gathering based routing protocol in mobile ad-hoc networks. Computer communications, colume 30, Issue 1: 202 – 206.

[21] Bu” r K, Ersoy C (2005) Ad-hoc quality of service multicast routing. Computer Communications, Volume 29, Issue 1: 136 – 148.

[22] Saigal V, Nayak AK, Pradhan SK, MallR (2004) Load balancing routing in mobile ad-hoc networks. Computer Communications, Volume 27, Issue 3: 295 – 3054 Routing in Mobile Adhoc Networks 95.