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Performance Comparison of DSR and AODV Routing Protocols for Soft Delay Deadlines in Wireless Multimedia Sensor Network

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***Abstract*- Wireless Multimedia Sensor Network (WMSN) is a collection of the vast amount of different types of sensors like camera sensor, video and scalar sensors which are involved in retrieving multimedia data from the large environment. The real-time sending of video and audio content to the destination before a strict playout deadline has been necessary for multimedia environment. Otherwise, it will be dropped at the destination. In WMSN sending real time multimedia data with soft play deadlines is a challenging task to solve this challenge, routing protocols play an important role in WMSN. Routing demands of multimedia content of WMSNs need to be perfect routing protocols to optimize path selection and guarantee communication. This paper presents a performance comparison between two reactive routing protocols; namely AODV and DSR, with soft delay deadlines and efficient utilization of resources in WMSN. The objective is to assess the real-time behavior of these two protocols upon sending multimedia content. Here, we evaluate the performance with respect to the use of these matrices like latency, Average jitter, Average delay and throughput and factors includes are CBR and multimedia traffic with varying packet size and bandwidth. DSR perform better as compared to AODV routing protocol since it discovers the routes more efficiently. AODV is better in term of Jitter than DSR. NS-2 simulator tool used for the purpose of this comparison.**

Keywords: WMSN, AODV, DSR, NS2, Average Delay, Latency, Average Jitter, Throughput.

I. INTRODUCTION

The wireless networks provide portable customers with ubiquitous processing capabilities and data, giving little attention to the user area. They are order in two types: Infrastructure and Infrastructure-less systems (multi-hop). The infrastructure system is associated with covering a lid (one computer) to another sink. In any case, Infrastructure-less has no stable routers, each node may be like a router [5]. All nodes are armed for progress and can be progressively linked in a discretionary manner. The infrastructure-less systems are otherwise called or Mobile-Ad-Hoc Networks (MANET) or Ad-Hoc Networks [13].

Wireless Multimedia Sensor Network (WMSN) are multi-hop networks collective a huge amount of sensor. It may be camera sensors or scalar sensors which scattered with the enormous

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environment to gather multimedia contents by means of different concern like audio, image, and video [10, 15]. Each sensor has the ability to connect with several other sensors to reach a Base Station (BS) that is the whole network escape in the digital world in WMSN [1, 3]. Samples of WMSNs application consist of environmental monitoring, smart health-care, and security surveillance [14]. Therefore, the volume of power consumption, detection coverage area, transmission / reception latency and fault tolerance are most of the characteristics that must be measured in WMSNs [17].

Here we clarify the three primary system models for WMNS in this architecture. Essentially wireless multimedia sensor network (WMSN) arrange engineering. It is comprehensively characterized in three classifications as shown in Fig. 1, relying upon way with focusing on the application [16, 4].

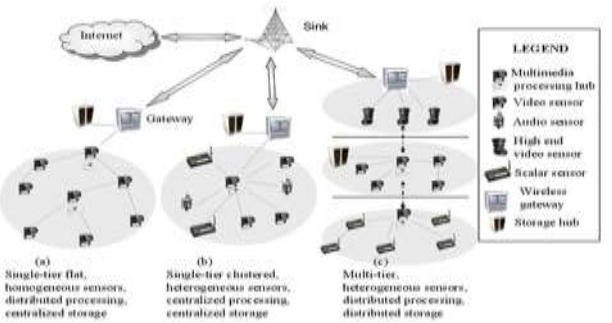

Fig. 1 Architecture of WMSN

The ad hoc routing protocol is divided into the following types. The protocols with flat routing protocol classification are basically alienated into two categories. First, reactive routing protocols. Second Proactive routing protocols. For both protocols, one thing is generic which is every node that is interested in routing plays the same role [7].

In reactive routing protocol route is determine when we need them. When a node tries to transmit a packet, it may have to wait for route discovery. Examples of such schemes are Dynamic Source Routing, Ad-Hoc On-Demand Distance Vector Routing (AODV) etc. However, in the proactive routing protocol, the path is predefined; so the routes are already present whenever needed. Route Discovery overheads are large in such schemes. Examples of such schemes are the conventional routing schemes, Destination Sequenced Distance Vector (DSDV) [12].

The real-time sending of video and audio contents to the destination before a strict playout deadline has been necessary for multimedia environment. Otherwise, it will be drop by destination. In WMSN, it is challenge task to provide soft delay deadlines for optimization of multimedia data. To solve the soft play deadlines challenge routing protocols, play an important role in WMSN. For this purpose, routing protocols are use to maintain the routes and communication in the network to choose potential forwarding nodes for soft play deadlines. Therefore, satisfy routing demands of multimedia contents need to be perfect routing protocols for WMSNs, for path selection.

To understand the importance of real-time sending of multimedia contents in this paper, we have built comparison of performance for reactive routing protocols for soft delay deadlines with use of efficient resources are AODV and DSR in WMSNs. These protocols performed the diverse type of behaviors and performance in different mobility rate of packet size in the WMSN. Here, we evaluate the performance with respect to measuring performance metrics like latency, average jitter, average delay and throughput using CBR and multimedia traffic in the above comparison of these two protocols. We compare the performance by using of NS-2 simulator tool.

The remainder of the paper is organized as follows: section 2 describes two routing protocols AODV and DSR of MANETs. Section 3 describes working methodology. The simulations and results of simulations present in section 4. Finally, section 5 concludes the paper.

II. LITERATURE REVIEW

We briefly explain the studied routing protocols in this section and discussed the detail of working the routing protocols that we used in this paper.

A. Ad-Hoc On-Demand Distance Vector (AODV)

The Ad-hoc on-demand distance vector (AODV) routing algorithm is a routing protocol designed for Ad-hoc mobile devices. AODV is a combination of DSR and DSDV. It has a basic on-demand mechanism of Route Discovery and Route Maintenance similar to DSR, and the use of hop by hop routing, sequence numbers and periodic beacons similar to DSDV. It does not keep routes from each node to each of the other nodes in the network, but is discovered when needed, and is maintained only when needed. The AODV used an algorithm for creation of unicast routes. At a point, during the sending the packets to the target center, the node will have checked the entries in the routing table to confirm that it is available some routes to the target center in the routing table then if there, it will send the information of packets to the right next node near the goal. If it is not available, it used the route discovery method for finding the routes. AODV send a packet, Route Request

(RREQ) and Route Reply (RREP) by using the route discovery method [18]. AODV occupies less overhead on a simple protocol. It keeps up the complete routes in its table for the source host to the target host has some greatest advantages for this protocol. The packet of RREQ and RREP messages responsible for routing discovery where it cannot significantly increase the overhead of these control messages. The routing maintenance is the responsibility of Hello messages that are inadequate. So, it doesn't make needless overhead in the network [8]. The details of elementary operations with respect to AODV routing protocol are describe including routing creation, deletion, and maintenance.

B. Dynamic Source Routing (DSR)

Dynamic source routing (DSR) is refined instances of on-demand routing protocols based on source routing concepts. The nodes keep the routing cache that contains the source route it knows and updates the entries when learning new routes in the routing cache [9]. It is specifically intended for multi-hop and self-organizing networks for mobile nodes. This allows the network to fully self-organize and self-configuration. It does not need slightly current network organization and management. DSR routing protocol does not utilize periodic routing messages (such as AODV) and dipping overall network bandwidth, redeemable battery power and evading a huge number of routing apprises. Route Discovery and Route Maintenance are two routes contained by DSR routing protocol. It is effort both for sense to the node. It keeps up the source routes from randomly to the last stop goal is an exclusive advantage of it. It detects the routes as rooting is part itself, can be detected directly [2,6]. It works when there is demand available, where data does not send like path announcements occasionally. Due to this traffic produced by DSR protocol may be reduced. Therefore, overhead packets evaded. It has only two main stages: the first one is route discovery and second is route maintenance.

III. WORKING METHODOLOGY

In this section, the research work will have performed using from the start to selection of techniques and framework for network performance to explain as well.

A. Simulation Model

We use the different network parameters SHOWN in table 1 for our simulation by using the NS-2. Network Simulator (NS-2) is an acknowledge the correct development of every node, correct act of

every node started to record, and additionally the correct time for every adjustment in movement or gathering for simulation shown in Fig. 2.

TABLE I
SIMULATION PARAMETERS

Parameter	Details
Simulator	NS-2.35
Area of simulation	1800 m * 840 m
MAC protocol	802.11
Radio Propagation model	Two Ray Ground
Routing Protocol	AODV, DSR
Traffic Type	CBR, Multimedia
Number of nodes	22
Network interface Type	Phy/wirelessphy
Channel type	Channel/Wireless channel
Interface queue type	QueuelDrop Tail
Antenna	Antenna/omni antenna
Maximum packet in ifq	50
Packet size	1000 to 8000
Bandwidth	54Mb, 108Mb,300Mb

Trace files are create made for every time of simulation as shown in Fig 2 is stored on disk and examined utilizing different scripts, specifically a record file named (* .tr) consist of the quantity of packets effectively conveyed and the length of the packet path and other information of each execute script. Use AWK and perl files and Microsoft Excel files to further analyzed this data to generate charts [7].

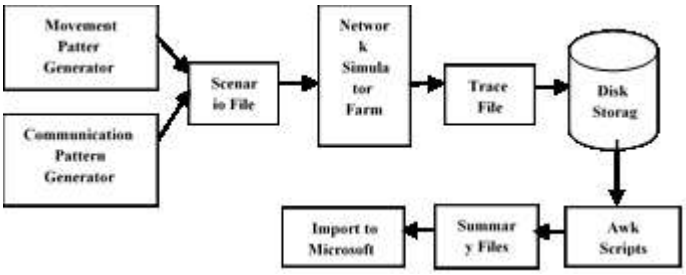

Fig. 2 Model of NS-2

The Network Simulator tool (NS-2) version 2.35 used to build the simulation model. There are create three cases run at a nominal bit rate with 54Mbps, 108Mbps, 300Mbps. The experiments conducted with use of packet size are 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000. There is 22 fixed number of source nodes and 50 queue size takes for every simulation used by simulation. A packet rate transmits the packet to 54Mb, 108Mb and 300Mb were takes. The area for this simulation used is 1800m x 840m with 22 stations expected as to consistently scattered in the area. CBR and multimedia traffic are use for this simulation. Alike CBR and Multimedia traffic are also use for both protocols to get fair results. Testbed model that we used to perform the simulation results are shown in Fig. 3 below.

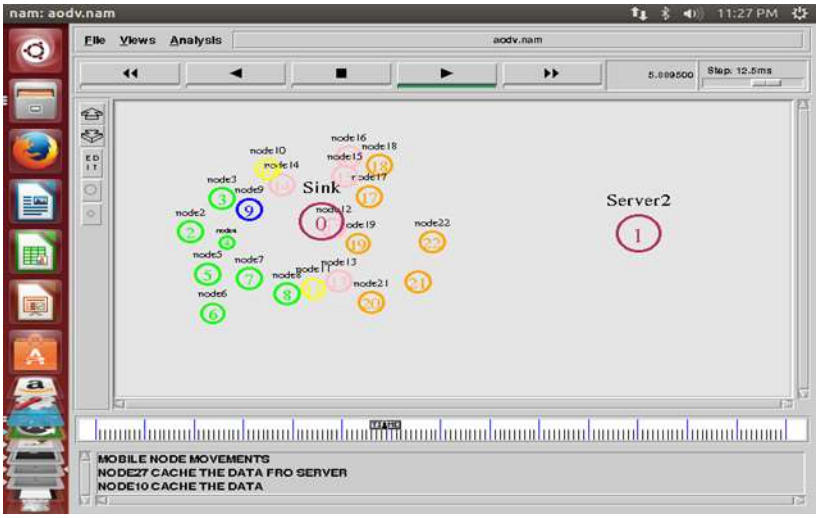

Fig. 3 Testbed Model of NS-2

B. The Simulation Scenarios

The following assumptions are made when we wrote the Tcl script.

1. We take three kinds of cases of bandwidths with 54Mb, 108Mb and 300Mb with the basic rate of 5Mb, 10Mb, and 27Mb.
2. Every sender node has constant bit rate (CBR) traffic and Multimedia traffic (VBR and CBR) with a packet size of 1000, 2000, 3000, 4000, 5000, 6000, 7000 and 8000 the rate of data rate is 54Mb ,108Mb, and 300Mb (number of stations send packet).
3. Two kinds of routing protocol DSR and AODV are used to implement the wireless multimedia sensor network environment and compare with one by one to both traffic model and with all cases of bandwidths with 2.472e9 frequency rate.

4. 22 sensor source nodes and 50 Queue size take are created fixed in every scenario for simulation environment.
5. Comparing all result with other assumption and draw the result with tables and design graphs in MS Excel.

C. *Performance Metrics*

Some important performance metrics discussed in this section for these two routing protocol simulators. These metrics are listed below:

1) Latency

It is the time that is required to distribute the packets in the networks. It is calculated in many diverse points of view like round trip and one way but I use round trip.

2) Throughput

Throughput successfully delivered a number of the message as a per unit of time. The throughput was calculated in bits per second (bps), megabits per second (Mbps) or maybe gigabits per second (Gbps).

3) Average Delay

It is mentioned, the time has taken from source station to destination for transmitting them across the network. It was measured in millisecond and seconds.

4) Average Jitter

The variation in the delay of received packets is called avg jitter. Jitter has been measured in millisecond and second.

Those parameters are explained in detail and clearly plotted with its graphical representation in next section.

IV. SIMULATION AND RESULTS

The Wireless multimedia sensor network (WMSN) simulation performed to evaluate different types of performance metrics for AODV and DSR routing protocols with network simulator (NS-2) tool. The performance matrices are performed in this research are latency, Jitter, throughput, and delay. Latency, jitter and delay parameter is calculating in millisecond unit through awk file in NS-2 and throughput result was shown in kbps. The tables are made against these parameters to displays the corresponding values. Simulation setup and performance metrics description is also given. The

table displays the values of AODV and DSR protocols for varying Packet Size with CBR and Multimedia Traffic, different bandwidths cases with different basic rates for latency, delay, jitter, and throughput. We are analysis and compare the effect of these performance parameters with changing the several packet sizes with varying bandwidths and traffic model. The analysis results display in shape of graphs. Two types of network scenario for CBR and Multimedia traffic are generated.

A. Performance On CBR Traffic

In this section, we analyze the results of AODV and DSR routing protocol in term of latency, jitter, throughput and delay with a varying packet size and 54, 108, 300Mb bandwidths in CBR traffic. We show that results of latency shown in Fig. 4, with 54 bandwidths of AODV and DSR routing protocols below where latency of DSR protocol takes low as compared to other protocol.

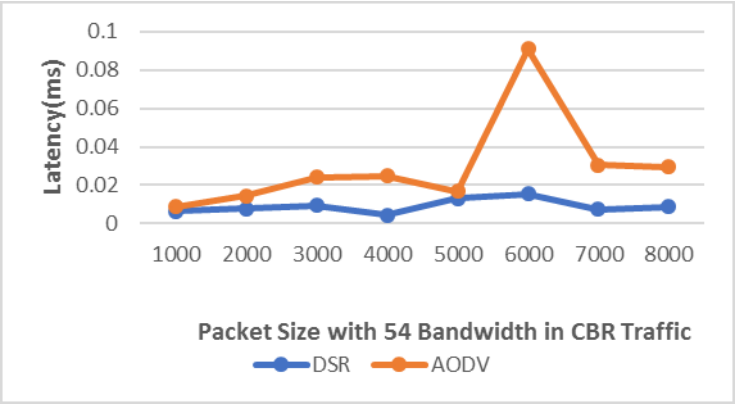

Fig. 4 Latency Vs packet size

We analyze the results of jitter that show in Fig. 5, with 108 bandwidths, which tell the AODV routing protocol is better than DSR protocol.

Fig. 5 Jitter Vs Packet Size

The throughput was better in the DSR routing protocol as shown in Fig. 6, as compared to AODV protocol in form of taking the 54 bandwidths.

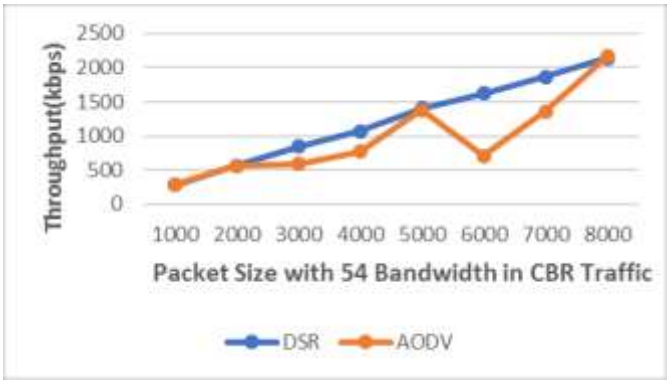

Fig. 6 Throughput Vs Packet Size

In Fig. 7, As the analysis of delay metrics with 300 bandwidths is better for the DSR routing protocols as compared to AODV routing protocol.

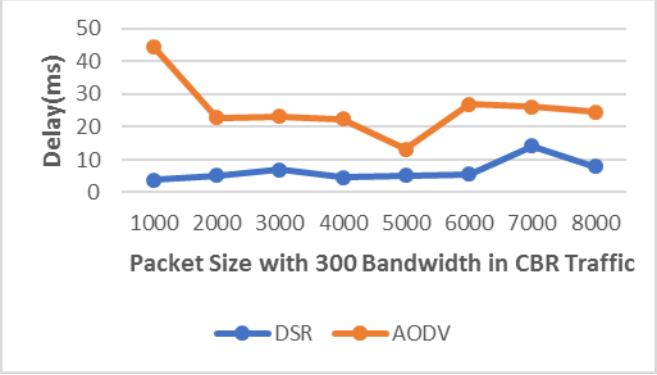

Fig. 7 Delay Vs Packet Size

In this experiment Fig. 8, show that DSR takes low latency as compared to AODV protocol in all cases of bandwidths with CBR traffic and varying packet size. DSR takes less latency to start the process. It has less latency with 300 Mb bandwidths as compared to others bandwidths. DSR routing protocol is better for routing purpose in the matrices of latency.

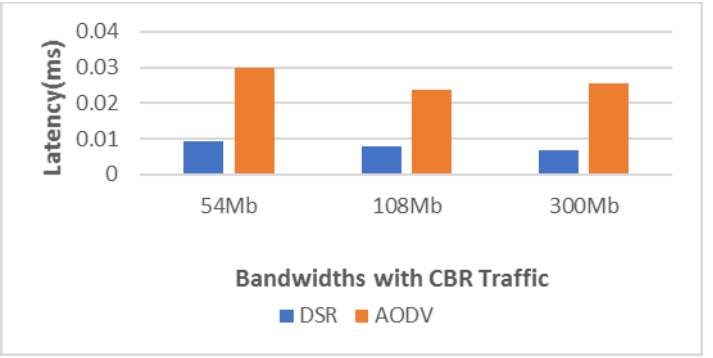

Fig. 8 Latency Vs Bandwidths

In this experiment Fig. 9, shown jitter where AODV takes less jitter as compared to DSR protocol in the all cases of bandwidths in 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000 packet size scenarios. This is because AODV contain routing information in its routing table this reduce the search for new routes. In jitter AODV is best for routing purpose.

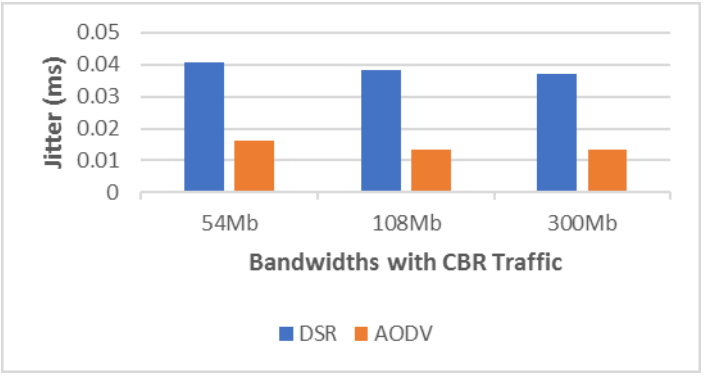

Fig. 9 Jitter Vs Bandwidths

In this experiment Fig. 10 shows where DSR has high throughput as compared with AODV protocol in the all cases of bandwidths with respect to varying packet size. It is observed that throughput for DSR protocol is increases when packet size increase. DSR is better for routing purpose in case of throughput.

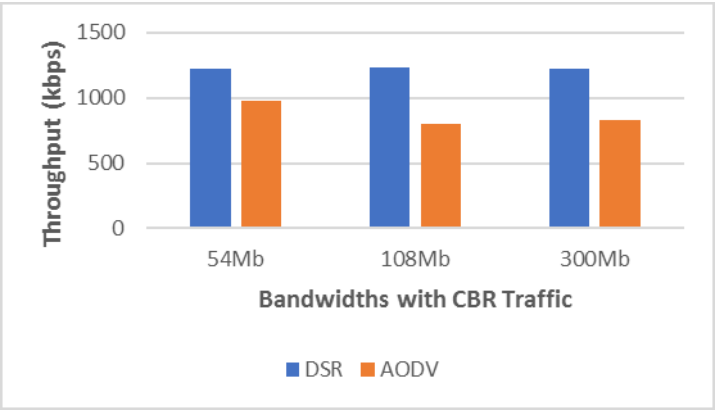

Fig. 10 Throughput Vs Bandwidths

In this experiment Fig. 11 shows variation in delay with respect to 1000, 2000, 3000, 4000, 5000, 6000, 7000 and 8000 packet sizes for variation of routing protocol where DSR has less delay as compared with AODV protocol in the all cases of bandwidths within increases the different packet size because of reactive nature.

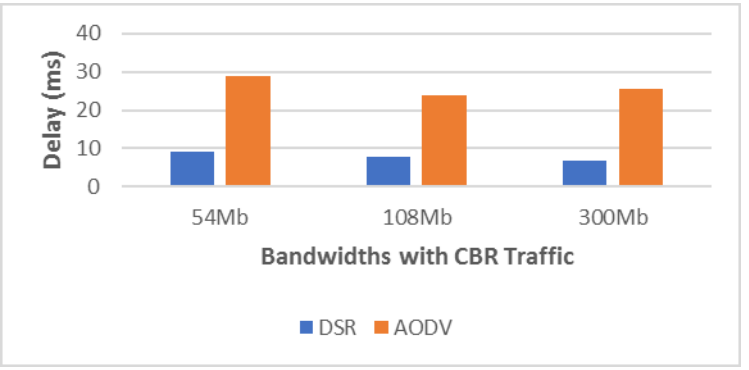

Fig. 11 Delay Vs Bandwidths

B. Performance on Multimedia Traffic

In this section, we compare the performance of AODV and DSR routing protocols for the soft delay in term of multimedia traffic with 54, 108 and 300 Mb bandwidths and varying packet size. Here we use the performance metrics are latency, delay, jitter and throughput for comparing the performance of AODV and DSR protocols in WMSN. In the analysis of latency with multimedia traffic in 300 bandwidths shows in Fig. 12 the results that DSR routing protocol is better than AODV protocols.

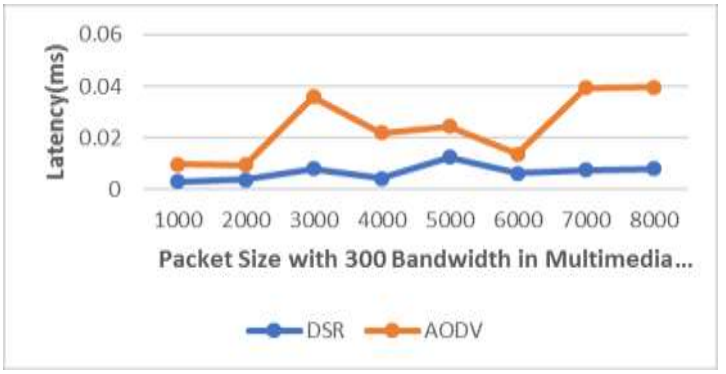

Fig. 12 Latency Vs Packet Size

In this experiment Fig. 13 shown the graph of jitter in millisecond unit not more jitter on DSR side with 54 bandwidths. The DSR has taken high jitter as compared to AODV protocol.

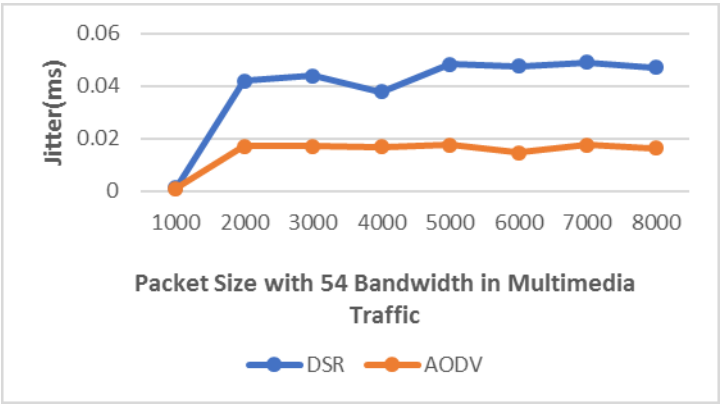

Fig. 13 Jitter Vs Packet Size

In this graph Fig. 14 below for throughput of DSR and AODV routing protocols. It measured for varying of packet sizes 1000, 2000, 3000, 4000, 5000, 6000, 7000 and 8000. The throughput for DSR protocols is high as compare to AODV. DSR has more throughput overall as compared to AODV in data transmit.

Fig. 14 Throughput Vs Packet Size

In this experiment of delay Fig. 15 shows graph below for AODV and DSR protocol with Multimedia traffic and 300 Mb bandwidths. AODV take more delay for transfer data as compare to DSR. DSR protocol is performed well as compared to AODV and has less delay in this experiment.

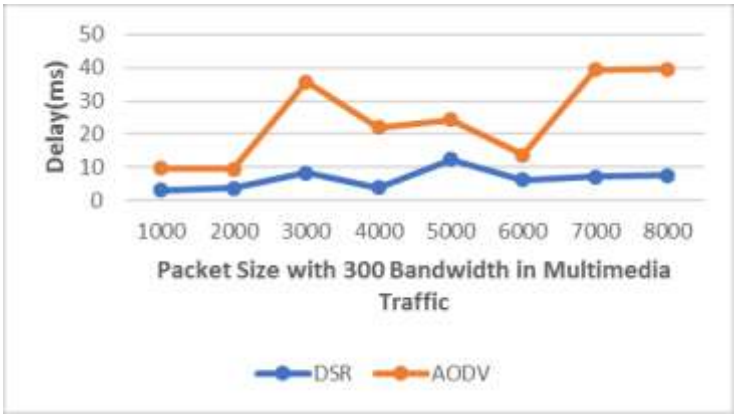

Fig. 15 Delay Vs Packet Size

In this experiment Fig. 16 shown that DSR has less latency as compared with AODV protocol in all cases of bandwidths with varying packet size.

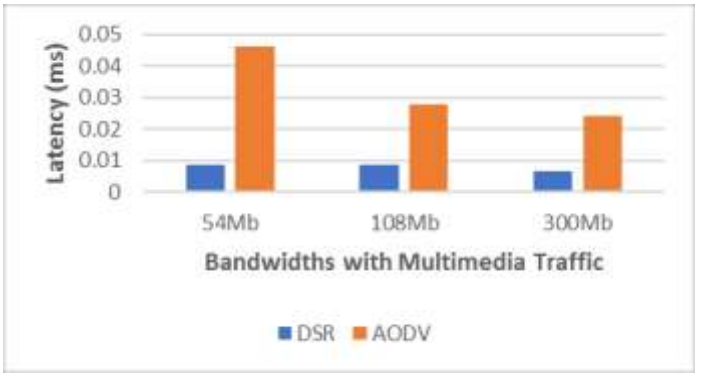

Fig. 16 Latency Vs Bandwidths

In this experiment where AODV has less jitter as compared with DSR protocol in all cases of bandwidths that shown in Fig. 17, DSR take more jitter in 300Mb and 54Mb bandwidth as compared to other bandwidths.

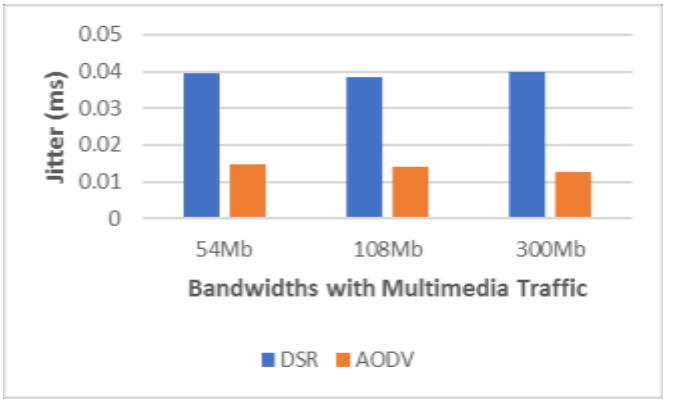

Fig. 17 Jitter Vs Bandwidths

In this experiment Fig. 18 shows throughput for DSR is more as compared to AODV protocol in all cases of bandwidths with multimedia traffic and with varying packet size.

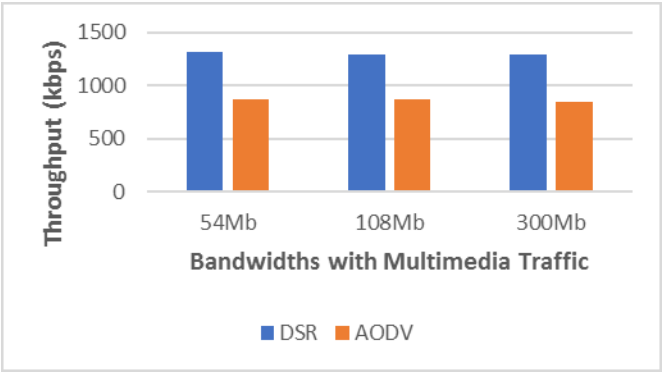

Fig. 18 Throughput Vs Bandwidths

In this experiment, Fig.19 shows where DSR has less delay in all variation of packet size as compared with AODV protocol in all cases of bandwidths. DSR take less delay in 300Mb bandwidth as compared to other bandwidths with respect to multimedia traffic.

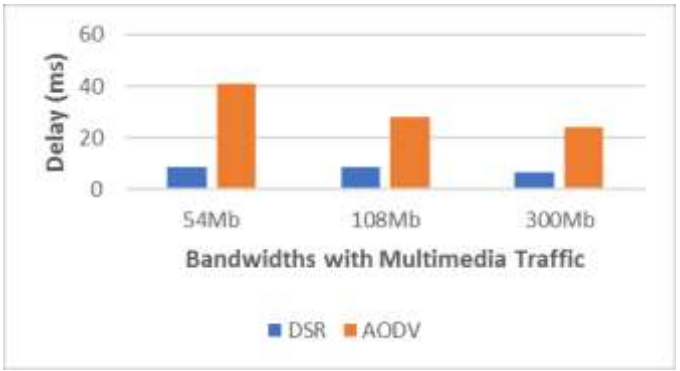

Fig. 19 Delay Vs Bandwidths

In this paper, we analysis that DSR overall is performing well as compared to AODV for routing purpose with respect to performances matrices latency, average delay and throughput with a case of CBR and Multimedia traffic and all scenarios of bandwidths in WMSN for soft playout deadline.

V. CONCLUSION

This paper is an attempt to evaluate the performance of two commonly used mobile ad hoc routing protocols namely AODV and DSR in Wireless Multimedia Sensor Network (WMSN). Performance evaluation did in NS-2 simulator by doing many simulations. The comparison was based on Throughput, Average Jitter, Latency and Average Delay and factors include are CBR and

multimedia traffic with varying packet size and bandwidths. Simulation results are shown in many figures. By using simulation results, we can understand that DSR gives better performance with CBR and Multimedia both traffic simulation conditions as compared to AODV in WMSN. DSR perform better in term of latency, throughput and delay for routing purpose but in case of jitter, it not performs well. To decrease the jitter in case of DSR routing protocol we increase the buffer size to decreases the packet loss. DSR routing protocol is overall best protocol to satisfy the routing demands for multimedia contents for soft play out deadlines in WMSN. In future, a specific type of routing protocols can be designed that provides optimized results with security in all the above performance metrics for WMSN.

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