Achieving Optimized Data Flow Rate for Quality of Services Data Transmission in AODV and DSR Routing Protocol

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***Abstract*— Mobile Ad hoc Networks (MANETs) are getting to be more vital to wireless communications due to expanding ubiquity of mobile devices. The principle challenge for future wireless systems is the quality of service for consumer satisfaction. The tool is supporting us with moment video transmissions such as video conferences and webinars. Various network systems are vital to deliver and exchange information's across a network. Every Mobile node additionally executes as a router which forwards the packets to their closest hop and consequently at last the packet compasses to the destination. At first, express the uniqueness of Mobile Ad hoc Networks (MANET) and its Routing protocols, and second a mobile ad hoc network which contains of set mobile wireless nodes and one other fixed wireless server are design with NS-2. The main problem occurs in video transmission related to data rate; lack of making decision for selecting the data rate. In this research paper we focus on optimizing data rate so that we can reduce the data loss. Proposed work is about optimizing the network communication for video transmission by performing the static examination over the network nodes. Here we simulate the two MANET routing protocols AODV and DSR on the basis of performance parameters Packet Delivery Ratio (PDR), End-to-End delay (E-to-E), Throughput and Packet Drop Rate.)**

Keywords— MANET, AODV, DSR and PDR, E2E Delay, Throughput.

I. INTRODUCTION

Mobile ad Hoc Network (MANET) is a group of communication devices or nodes that wish to communicate without any permanent infrastructure and fixed Organization of available links. MANET offers the freedom to use mobile

Devices and move independently of the location of base stations (and outside their coverage) with the help of other network devices [Bouras C., 2013]. These kinds of networks are very flexible, thus they do not enquire any vacant infrastructure or essential administration. Fig 1 shows an example of mobile ad hoc network which is an infrastructure less network. A mobile ad hoc network (MANET) comprises of wireless mobile nodes rapidly shaping a network topology without utilizing any central organization for the use of communication. MANET is a suitable solution in scenarios where infrastructures is impossible or is so costly to be conveyed. The nodes in MANET themselves are responsible for dynamically discovering other nodes to communicate [Rhaiem B.O, 2013].The Wireless networks are generally simple to install, on the other hand wired network are not. Video transmission over wireless networks to numerous mobile users has remained a testing issue because of potential restrictions on bandwidth and the time-varying nature of wireless channels.

It is possible to achieve higher aggregated data transmission rate while choosing several spatially distributed paths, thus benefitting from the spatial reuse of a wireless channel. Multiple paths have uncorrelated the loss patterns that decrease the chance of video interruption. [Cikovskis L, 2012]. MANET normally has restricted transmission range due to which some nodes cannot communicate directly with each other. Multi-interface, Multi-channel technology can greatly improve the throughput and basically guarantee the supply of video transmission. It is good news for video transmission. However, there is certain relationship between the video frames and frames, so the throughput is not an absolute guarantee to improve the quality of the video transmission; it also refers to compression of quantitative parameters, data packet length and packet error rate [Adam, G., 2011]. At the point when Multiple Description Coding (MDC) is utilized with such a network, it utilizes these corrupted frames as a kind of reference frame and through movement pay it contrasts the current frame with the reference frame and prompts error propagation all through the network which bring results in video quality corruption degradation [Shalini E., 2013]. Real-time video streaming is delay sensitive and also resource intensive. Video streaming over a network requires availability of a significant amount of bandwidth and demands QoS requirements such as delay and frame rate. Compared to wired connections, wireless links are vulnerable and data trans¬mission over wireless medium is prone to errors. Achieving target QoS for video streaming is even more challenging in a relatively unpredictable MANET [Khediri S.EL, 2014]..

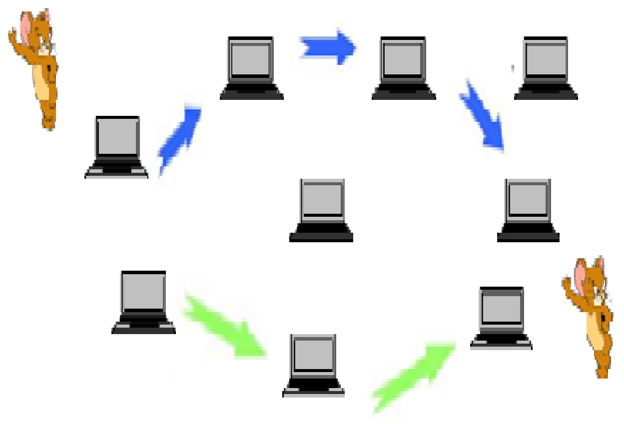

Fig 1:Example of Mobile Ad Hoc Network

I.1 MANETS ROUTING PROTOCOLS

MANETs routing protocols for ad hoc networks are broadly classified into three different categories according to their functionality. Fig2 illustrates MANET routing protocol classification.

1. Reactive protocols (i.e. AODV, DSR)

2. Proactive protocols (i.e. DSDV, OLSR)

3. Hybrid protocols (i.e. ZRP)

1. Proactive: At a time when a packet needs to be sent, the route is already known.

2. Reactive: Discover routes when required

3. Hybrid: Every node performs responsively in the region near to its proximity and proactively outside of that region.

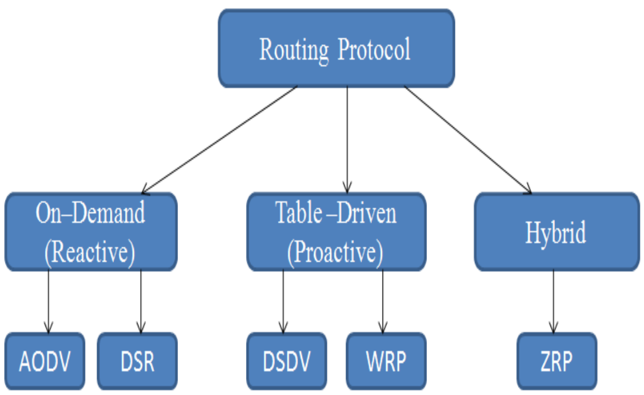

Fig 2: Classification of MANET routing protocols.

A. Ad hoc On-demand Distance Vector routing (AODV)

In AODV [Lalitha M., 2010] routing protocol the node works separately and does not carry any information from adjacent nodes as well as other nodes in the network. When node A desires to send a message to node B, it sends a Route Request message (RREQ) to its neighbor. When neighbor nodes receive the RREQ message they have two options: it is likely that they know a route to the destination or in the node that they will be the destination they can send a Route Replay (RREP) back to node A. Else they will rebroadcast the RREQ to their set of Neighbors. The messages continue getting rebroadcasted until its duration is up. In the event that Node A does not receive a reply in a set measure of time, it will rebroadcast the request yet this time the RREQ message will have a longer duration and a new ID number. All the Nodes use the Sequence Number in the RREQ to assure to facilitate they do not rebroadcast a RREQ.

B. Dynamic Source Routing protocol (DSR)

DSR (Dynamic Source Routing protocol) is a reactive (on-demand) routing protocol i.e. the routes are established only on-demand. It eliminates the concept of table-driven policy. It doesn't make use of hello¬-packet to inform its neighbors' of its existence. DSR [Kyasanur P., 2005] is based on source routing. The routes are stored in a route cache and if route is not accessible, it initiates Route Discovery procedure by broadcasting request message. Destination node or any nearby node having a preferred route, reply with route reply message. In DSR, once the route is established between source and destination node, the sender specifies the entire path on the packet header which tells that the packet needs to traverse in that route to reach the destination. Once the connection is broken between nodes, Route Error messages are generated and sent to all nodes in the network. It maintains several routes per destination.

C. Destination Sequence Distance Vector

DSDV (Destination-Sequenced Distance-Vector Routing) [Tuteja A., 2010] a proactive protocol, is designed according to Bellman-Ford algorithm. In this protocol family, all nodes maintain the information about the next node. DSDV is a table-driven algorithm where all nodes maintain a routing table, in which all the possible destinations inside the network and number of hops toward all destinations are recorded. The only advantage of this protocol is prevention of making routing loops in networks containing mobile routers.

II. RELATED WORK

In [Bouras C. et al, 2013], the work assesses the impact of utilizing multiple interfaces and multiple channels per node in the execution of effectively existing MANET routing protocols during video transmission. In [Rhaiem B.O., and Fourati F.C, 2013], the paper is focused on implementation study of routing protocol over MANET for scalable video streaming. The Scalable Video Codec extension to the H.264 standard (H.264/SVC) is intended to convey the profits described in the previous perfect situation. In [Bourase C. et al, 2011], the aim of the paper is to perform a comprehensive review of the main factors influencing quality of video data transmission over MANET and reveal relationships among several characteristics for choosing optimum conditions for video transmission over the network. The work in paper, focuses on improving peer-to-peer communication in MANETs by supporting real-time multimedia transmission and describe the proposed cross-layer mechanism for video transmission over MANETs. In [Shalini and T.V.P, 2013], this paper describes Multiple Description Coding (MDC), which is an efficient coding way to improve the error flexibility of video transmission over any lossy network. At a time when MDC is jointed with multipath transmission, MDC allow activity scattering and it mitigates the error propagation created by the packet losses and consequently decrease the network congestion. In [Khediri S.EL, 2014], many routing protocols have been proposed for MANET. Proactive routing protocol such as Dynamic Destination Sequenced Distance Vector routing (DSDV) and reactive protocol are the Ad-hoc On Demand Distance Vector (AODV) and Dynamic Source Routing (DSR). In [Chaparro et al, 2010], the paper presents DACME- SV (Distributed Admission Control for MANET's - Scalable Video), a novel QoS framework to support scalable video transmission over MANETs. In [Lindeberg M. et al, 2010], the paper displays some challenges like Traditional challenges, Wireless channel challenges, Multi-hop induced challenges, Mobility-induced challenges, Evaluation challenges and survey about existing Coding techniques like Multi-stream coding, Layered coding for streaming over MANETs, MDC for streaming over MANETs, Error concealment and recovery for realizing video streaming over MANETs

III. METHODOLOGY

The proposed work is about to provide the effective video transmission in case of congested network. Fig.3 shows the flow of work.

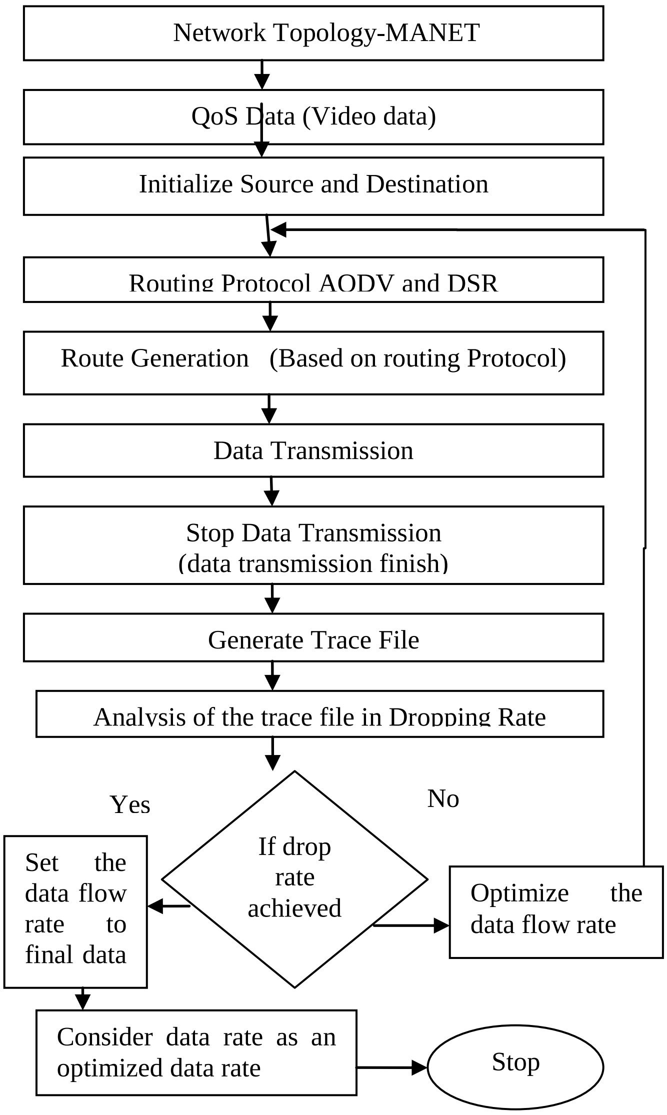

Fig 3:- Flow of work

IV. PERFORMANCE EVALUATION

To simulate the desired work, network simulator 2.35 versions is used. It is open source software for evaluation of the performance of the accessible network protocols and valuation of new network protocols before use. In this section we evaluate the performance of AODV and DSR protocols in NS2. Constant bit Rate (CBR) with 2048 byte data packets is used. The routing protocols were compared based on the following 3 performance metrics: Packet delivery ratio (PDR), End-to-End delay and Throughput.

Packet delivery Ratio:

Packet Delivery Ratio (PDR) is the ratios among the number of packets broadcast by a traffic source and the number of packets received by a traffic destination. It measures the failure rate as seen by transport protocols and specific to both the accuracy and effectiveness of ad hoc routing protocols. A great packet delivery ratio is desired in any network.

$$PDR\ \% = \frac{\sum_i^n \mathrm{CBR_{Request}}}{\sum_i^m \mathrm{CBR_{Sent}}} \times 100$$

Where, n is the amount of received packet and m is the amount of sent packet. Value of i varies from 0 to n.

End-to-End delay:

Calculate the standard time it takes to route a data packet from the source node to the destination. It expressed as:

$$E2E\ Delay = \sum_i^m (CBR\_ST - CBR\_RT)$$

Where, m is the amount of received packets, CBR_ST is CBR sent time and CBR_RT is the CBR receive time. Value of i varies from 0 ton.

Throughput:

It determines how fast a node can essentially sent the data during a network. Throughput is the standard rate of successful message delivery over a communication channel.

$$Throughput = \frac{CBR\_Sent \times 8 \times 2048}{Sim\_Time}$$

Where, CBR_Sent is the number of packets sent, 1024 is the packet size in bytes, which is multiplied by 8 to obtain the number of bits. Sim_Time is the duration of simulation. It must be noted that we have calculated sent throughput in our experiment. The entire parameters for the network pattern are listed in table 1.

Packet Delivery Rate:

Packet drop rate in a communication is the difference between the generated and received packets.

Packet Drop rate= Generated_Packets – Received_Packets

V. SIMULATION RESULTS

The simulation has been done for 50 nodes using Network Simulator 2.35 in an area of size 1000 m x 1000 m. The performance metrics such as packet delivery ratio, end to end delay and throughput are evaluated against time for both AODV and DSR Routing protocols and are shown below. The blue color curve represents the AODV protocol while the green color curve represents the DSR protocol. The graphs which are shown below are X-graph. In NS-2 X-graphs are used to show the graphical representation of results. At different pause time the performance metrics are measured. The nodes are set to move within the topology area. At a pause time of 8, 16, 24, 32 and 40 seconds we have measured the packet delivery ratio, throughput level, and end to end delay load for both on demand routing protocols. The parameters taken in this work for network generation are given here under Table 1.

Table 1: Simulation Parameters for MANET

Parameters	Values
Channel type	Wireless channel
Simulator	NS-2.35
Number of Nodes	50
Mobility model	Random Waypoint
Simulation area	1000m x 1000m
Routing protocol	AODV, DSR
MAC protocol	IEEE 802.11
Packet size	1500 bytes
Data rate	512 Kb,1.0 Mb,1.20 Mb
Traffic type	CBR

In fig.4 shows the outcome of data packet transmission in video file communication. Here X- axis represents simulation time and Y-axis represents packet delivery ratio in % over the network. Here the simulation time is plotted against packet delivery ratio. Initially at 8 sec the packet delivery ratio is very less compared to DSR. AODV recorded its lowest packet delivery ratio at 14 % whereas DSR recorded its lowest packet delivery ratio at 23.76%. DSR touched its maximum level of 47.56 whereas AODV protocols maximum packet delivery ratio is 14%. From the graph it is evident that AODV takes less packet delivery ratio in % to deliver packets when compared To DSR. There by the DSR performing better than AODV.

Fig.4: Packet Delivery Ratio Vs Time

In fig.5 shows the outcome of data packet transmission in video file communication. Here X- axis represents simulation time and Y-axis represents end-to-end delay over the network. Here the simulation time is plotted against end-to-end delay. Initially at 8 sec the end-to-end delay is very less compared to AODV. AODV recorded its lowest as well as highest end-to-end delay at 52.53 ms whereas DSR recorded its lowest end-to-end delay at 14.36ms. DSR touched its maximum level of 36.55ms. From the graph it is evident that DSR takes less time to deliver packets when compared to AODV . There by the DSR performing better than AODV.

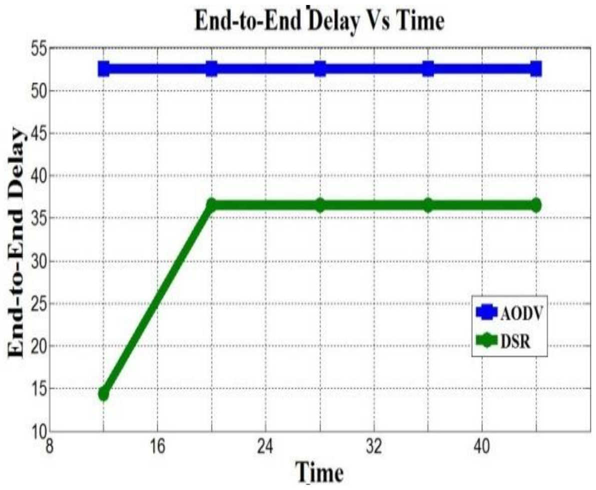

Fig.5: End-to-End Delay Vs Time

In fig.6 the simulation time is plotted against throughput. Initially the throughput is very high in AODV and as well as simulation time increases the throughput level decreases. Throughput level cannot be measured when the nodes are in motion. All nodes randomly move within the topology area and stop at a time when simulation time end. Same as AODV in DSR the throughput level decreases when simulation time is increases and finally touches the lowest level of throughput at 12.69 kbps. DSR touches the maximum level of throughput at 98.63 kbps. AODV recorded its lowest level the throughput at 39.06 kbps and highest level the throughput 195.31kbps. There by the DSR performing better than AODV.

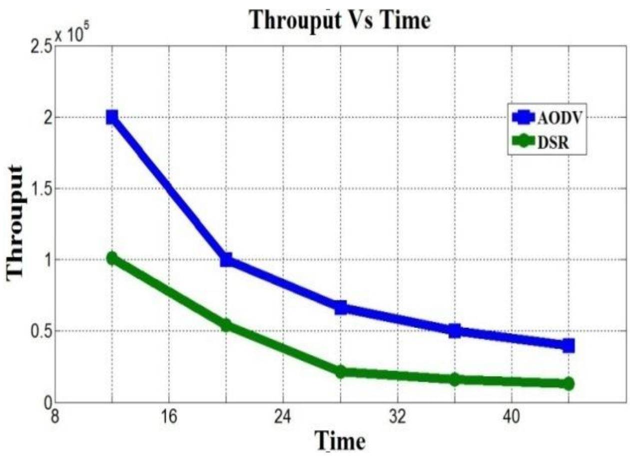

Fig.6: Throughput Vs Time

From fig. 7 simulation times is plotted against packet dropping rate. As the simulation time (8,16, 24 and 32) increases the packet dropping rate of AODV routing protocol is increases. In AODV, packet dropping rate minimum at 8 sec (235 packets) and maximum at 32 sec (644 packets). DSR touches minimum level at 8 and 16 sec (219 packets) and maximum at 24 and 32 sec (241 packets). There by the DSR performing better than AODV.

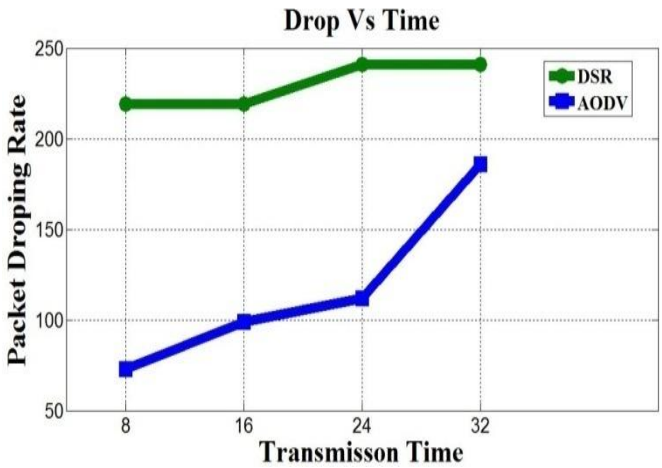

Fig.7: Drop Vs Time

Table 2: Performance matrices

	PDR	E2E Delay	THROUGHPUT	Node	Simulation time	CBR time
AODV1	14	52.531	195.31	50	10	8
AODV2	14	52.531	97.65	50	20	16
AODV3	14	52.531	65.1	50	30	24
AODV4	14	52.531	48.82	50	40	32
AODV5	14	52.531	39.06	50	50	40
DSR1	23.76	14.36	98.63	50	10	8
DSR2	25.92	36.55	53.73	50	20	16
DSR3	36.92	36.55	21.15	50	30	24
DSR4	42.76	36.55	15.86	50	40	32
DSR5	47.56	36.55	12.69	50	50	40

VI. CONCLUSION AND FUTURE WORK

The proposed work is regarding providing enhance video transmission over the mobile network. The performance metrics such as Packet delivery ratio, Throughput, End-to-End Delay and Packets Drop are evaluated against simulation time for both On-demand routing protocols AODV and DSR with The number of mobile nodes of up to 50 is using NS-2.35. In this paper we evaluate the three performance events i.e. PDR, end-to-end delay and throughput with different simulation time of nodes and 1000mX1000m size of network. From all the graphs and tables, we analyze that performance of DSR protocol is not good as throughput is very low as compared to AODV protocols. AODV performed good in some situations than DSR protocol but overall DSR is performing better than AODV protocol like if we compare average end to end delay, packet delivery ratio and packet drop dropping rate. In this simulation DSR has the all-round performance better than

AODV Protocol and it is the ideal choice for communication to happen under UDP and TCP protocol.

The work can be improved under different aspects:

•The proposed work is about optimizing the network communication for video transmission by performing the dynamic examination over the network nodes. The work can be enhanced by using some session based approach to save the path so that the path detection work will be reduced.

•The work is based on the statistical examination. The work can be enhanced by using some optimization approach.

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