QOS Analysis of Wireless Network in MANET

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***Abstract*:- Mobile Ad hoc Networks (MANET) is a type of wireless ad-hoc network is a self arranging network of mobile nodes connected by wireless links which creates a flexible topology. The mobile nodes movable free randomly and to arrange themselves in a random method. The wireless ad hoc network topology may develop rapidly and unpredictably. In MANET the routing protocol plays an important role in improving Quality of Service (QoS). There are three different types of routing protocols used such as reactive routing protocol, proactive routing protocol and hybrid routing protocol. The AODV is a reactive routing protocol which establishes routes on-demand such as they are required. In this paper, we described a new protocol based on the AODV which gives better performance than the original AODV routing protocol with respect to set of performance metric such as a packet delivery ratio, throughput, energy consumption and overhead, under different conditions. The proposed routing protocol Modified Ad-hoc on-Demand Distance Vector (M-AODV) describes that the from the source. It also explains a new method for identifying multiple displaces routes. Performance analysis of routing protocol designed for wireless networks has been very difficult. Thus the simulation is for all time utilized to obtain the desired performance results. Simulation was performed by Network Simulator (NS2).**

***Keywords*:- MANET's, AODV, DSDV, DSR, QoS, NS2**

I. INTRODUCTION

Mobile Ad-Hoc wireless network is a special case of wireless network devoid of predetermined backbone infrastructure. This feature of the wireless ad-hoc networks makes it flexible and quickly deployable. As the nodes correspond over wireless link, all the nodes must combat against the extremely erratic character of wireless channels and intrusion from the additional transmitting nodes. These factors make it a challenging problem to exploit on data throughput even if the user-required QoS in wireless ad-hoc networks is achieved.

Wireless mesh networks (WMN's) contains several stationary wireless routers which are interlinked by the wireless links. Wireless routers acts as the access points (APs) for wireless mobile devices. Through the high speed wired links, some wireless routers act as a gateway for internet. Wireless mobile devices transfer data to the corresponding wireless router and further these data's are transferred in a multi-hop manner to the internet via intermediate wireless routers. The popularity of WMN's is due to their low cost and auto-organizing features [1, 2].

In this paper the focus is on the problem of providing QoS support for real-time flows, while allocating bandwidth to elastic flows fairly. A protocol QUOTA (quality-of-service aware fair rate allocation) is proposed, a framework that combines QoS support and fair rate allocation. Their proposed framework QUOTA provides higher priority to real-time flows than elastic flows by reserving the necessary bandwidth for the former and fairly allocating the left-over bandwidth to the latter [3].

A. *Components in QoS architecture:*

1) *Traffic specification:*

Specifies source traffic characteristics and desired QoS.

2) *QoS routing:*

Provides route(s) between source and destination(s) that have sufficient resources to support the requested QoS.

3) *Call admission control:*

Decides whether a connection request should be accepted or rejected, based on the requested QoS and the network status.

4) *Resource reservation:*

Allots resources such as wireless channels, bandwidth, and buffers at the network elements, which are required to satisfy the QoS guarantees.

5) *Packet scheduling:*

Is to schedule packets to be transmitted according to the QoS requirements of the connections.

B. *Wireless channel characterization:*

Specifies the statistical QoS measure of a wireless channel, *e.g.*, a data rate, delay bound, and delay-bound violation probability triplet [4].

The network architecture is illustrated in Figure 1. First, an end system uses traffic specification procedure to specify the source traffic characteristics and desired QoS. Then, the network employs QoS routing to find path(s) between source and destination(s) that have sufficient resources to support the requested QoS. At each network node, call admission control decides whether a connection request should be accepted or rejected, based on the Requested QoS, the wired link status, and/or the statistics of wireless channels. For base stations, wireless channel characterization is needed to specify the statistical QoS measure of a wireless channel, *e.g.*, a data rate, delay bound, and delay-bound violation probability triplet; this information is used by call admission control.

If a connection request is accepted, resource reservation at each network node allots resources such as wireless channels, bandwidth, and buffers that are required to satisfy the QoS guarantees. During the connection life time, packet scheduling at each network node schedules packets to be transmitted according to the QoS requirements of the connections. As shown in Figure 1, in a network node, QoS routing, call admission control, resource allocation, and wireless channel characterization, are functions on the control plane, *i.e.*, performed to set up connections; packet scheduling is a function on the data plane, *i.e.*, performed to transmit packets.

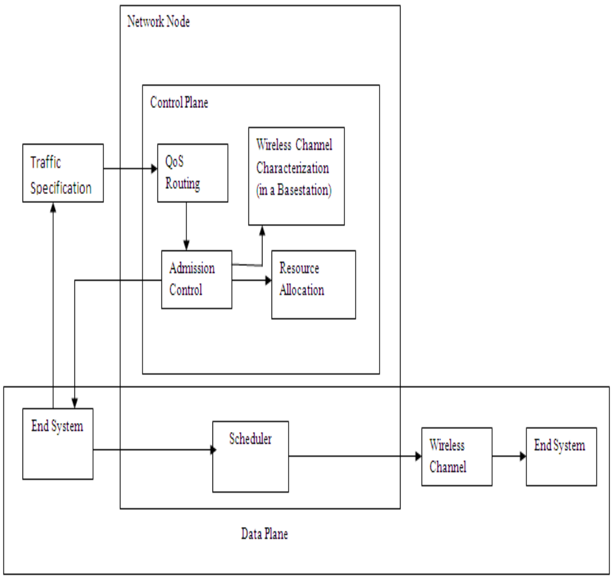

Fig.1. Network architecture for QoS provisioning

C. QoS Concept:

As defined in [5, 6] Quality-of-Service is a set of service requirements to be met by the network while transporting a flow. "Here a flow is" a packet stream from source to a destination (unicast or multicast) with an associated Quality of Service (QoS). In other words, QoS is a measurable level of service delivered to network users, which can be characterized by packet loss probability, available bandwidth, end-to-end delay, etc. Such QoS can be provided by network service providers in terms of some agreement (Service Level Agreement, or SLA) between network users and service providers. For example, users can require that for some traffic flows, the network should choose a path with minimum 2M bandwidth.

D. QoS in WSNs:

WSNs are used for a wide range of applications and each application has its own QoS requirements such as delay sensitivity, energy and Network lifetime. QoS is an umbrella term for a group of technologies that permit network Sensitive applications to demand and receive expected services levels in terms of QoS requirements [7, 8]. In WSNs, QoS requirements can be speed from two perspectives [9]. One is called Network Speed QoS and other as Application Speed QoS. In application speech application has different QoS parameters such as data truthfulness, aggregation delay, fault tolerance and exposure [10, 11]. However, in WSNs every lass of application also has some common requirements. So the network must fulll the QoS needs when transmitting the sensed data from sensor field to the sink. Various data delivery models are used such as continuous, query and event driven [12]. Each model has its own QoS Requirements. The basic QoS issues in WSNs are Described below in details [13] [14].

E. QOS MECHANISMS:

If we want the data stream to obtain desired QoS, every node on the network must be informed about that demands. We can do that in two ways [15]:

- *Packet labeling* – a packet carries information about the demands.
- *Signalization* – there's a special signaling protocol Implemented

That is why two QoS models can be used, informing the Network in different ways:

- Reservation resource basing model
- Class differentiation basing model

II. ROUTING PROTOCOLS FOR MANETs

A. Destination Sequenced Distance Vector (DSDV):

The DSDV Routing Algorithm is based on classical Bellman-Ford Routing Algorithm. This is proactive [16, 17] routing protocol and routes are always available. In DSDV periodically each node advertises its own routing table to its immediate neighbors. Every node maintains a routing table that stores all available destinations, the number of hops to reach destination and the sequence number assigned by the destination. The routing table updates can be sent in two ways: a full dump or an incremental update. A full dump sends the full routing table to its neighbors, but in case of incremental update only the changed information since the last full dump is sent. Whenever the network is relatively stable, incremental updates are sent to avoid extra traffic and full dump are relatively infrequent .Routes with more recent sequence numbers are always preferred as the basis for making forwarding decisions, but not necessarily advertised. If two or more routes have the same sequence number, then it selects route with the smallest metric. All routes are loop free and hello messages are periodically exchanged to know new members.

B. Ad-Hoc On-Demand Distance Vector Routing (AODV):

The AODV is a reactive [18, 19] protocol derived from Dynamic Source Routing and DSDV [20], and DSR. It combines the advantages of both protocols. Its route discovery procedure is similar to DSR. When a node has a packet to send to a particular destination and if it does not know a valid route, it broadcasts a route request packet by specifying the destination address. The neighbors without a valid route to the destination establish a reverse route and rebroadcast route request packet. Destination on reception of route request sends the route reply to the source. The route maintenance is done by exchanging beacon packets at regular intervals. This protocol adapts to highly dynamic topology and provides single route for communication. The major disadvantage is large delay for large networks.

C. Problem formulation:

The objective of the work is to compare the performance of two routing protocols namely DSDV and AODV against the two quality of Service (QoS) parameters i. e packet delivery ratio and average end-to-end delay. We also analyze these routing protocols with respect to routing overhead. This study has been carried out under group mobility model which is a very common phenomenon in the battle field operation or disaster recovery operations.

III. PERFORMANCE PARAMETERS

In order to calculate the performance of routing protocol such as modified M-AODV and Existing AODV, we compare them with set of execution measurements for example, throughput, Packet Delivery Ratio (PDR), Delay.

A. Packet Delivery Ratio (PDR):

It is a proportion of packets received to packets sent during certain simulation period, it is given by

$$PDR=PR*100/PS$$

Where, PR is Sum of packet received by destination node, PS is Sum of Packet sent by source code.

B. Throughput:

It is defined as average transform rate or bandwidth of route, it is given by

$$TP = PR * SZ / SE$$

Where, SZ is Packet Size, SE is Simulation End Time [21].

C. End-to –End Delay:

$$D_{end\text{-}end} = N[d_{trans}+ d_{prop} +d_{proc}]$$

Where
$D_{end\text{-}end}$ =end-to-end delay
D_{trans} =transmission delay
D_{prop} = propagation delay
$D_{pro\,c}$=processing delay
D_{queue} =Queuing delay

N=Number of links(Number of router+1)

Note = We have neglected queing delays

Each routes will have its own d_{trans}, d_{prop}, d_{proc} hence this formula gives a rough estimate. $D_{end\text{-}end}$ = 264.451[22].

IV. SIMULATION RESULT AND ANALYSIS

The performance analysis of existing AODV,DSDV and DSR routing protocol in MANETs is performed in a network simulator environment .The tool used here is NS 2.35 Which work with linux platform for simulation. The simulation parameters that are used performance analysis for both routing protocols is mentioned below. Table 1. Shows the main solution parameters used for scenarios.

TABLE I. SIMULATION PARAMETER USED IN THIS EVALUATION

Simulator	**NS-2.35**
Protocol	AODV, DSDV,DSR
Simulation duration	0-30 Seconds
Simulation area	500m*500m
Number of nodes	15 nodes
Movement model	Random Waypoint
MAC Layer Protocol	IEEE 802.11
Link Type	Duplex-link
Queue size	50
Transmission Range	250
Interference Range	550
Packet Size	1500 bytes/packet
Application Type	CBR
Agent Type	UDP

TABLE II. PACKET DELIVERY RATIO FOR SIMULATION WORK

Parameter	**Aodv**	**Dsdv**	**Dsr**
Pdr	98	92	62

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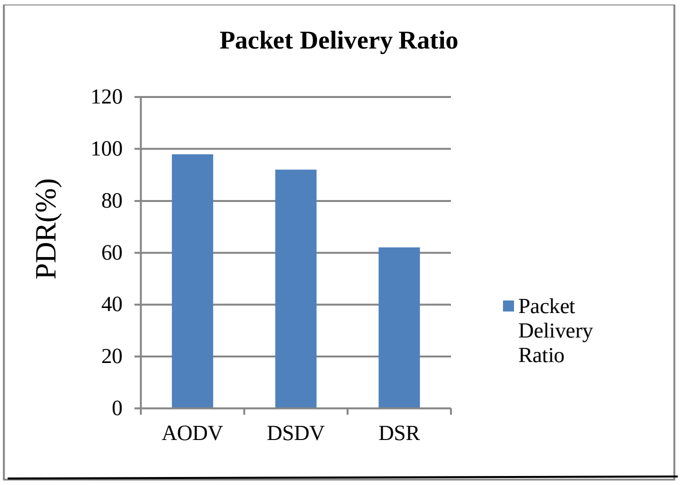

Fig.2. Performance Analysis of PDR

TABLE III. DELAY FOR SIMULATION WORK

Parameter	**Aodv**	**Dsdv**	**Dsr**
Delay	296	286	107

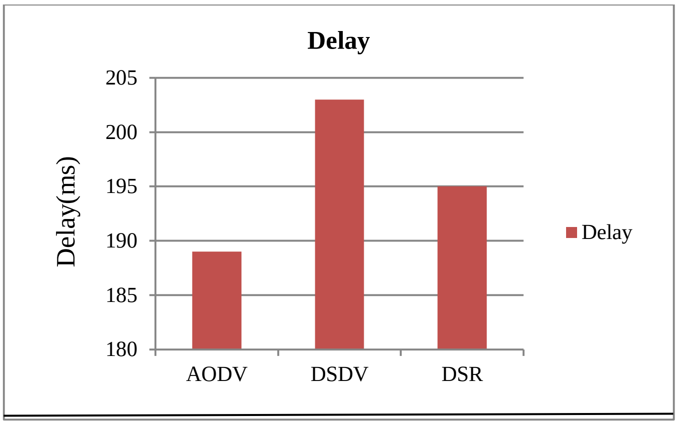

Fig.3. Performance Analysis of Delay

TABLE IV. THROUGHPUT FOR SIMULATION WORK

Parameter	Aodv	Dsdv	Dsr
Throughput	70	101	105

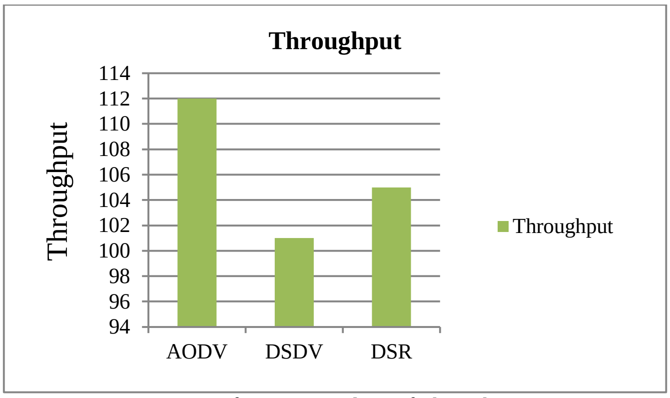

Fig.4. Performance Analysis of Throughput

TABLE V. PERFORMANCE VALUE OF AODV, DSDV AND DSR

Protocols	Pdr	Delay	Throughput
Aodv	98	189	112
Dsdv	92	203	101
Dsr	62	195	105

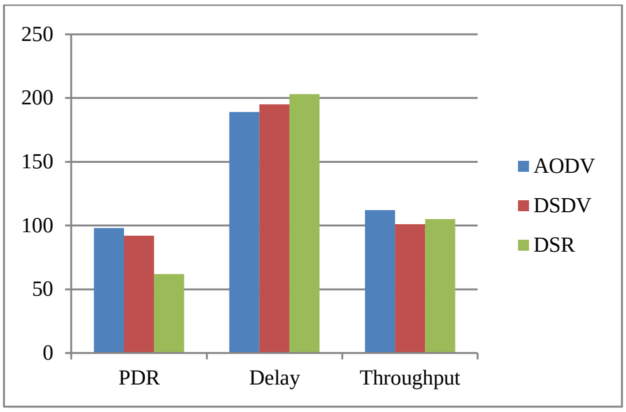

Fig.5. Performance Analysis of AODV, DSDV, DSR Protocols

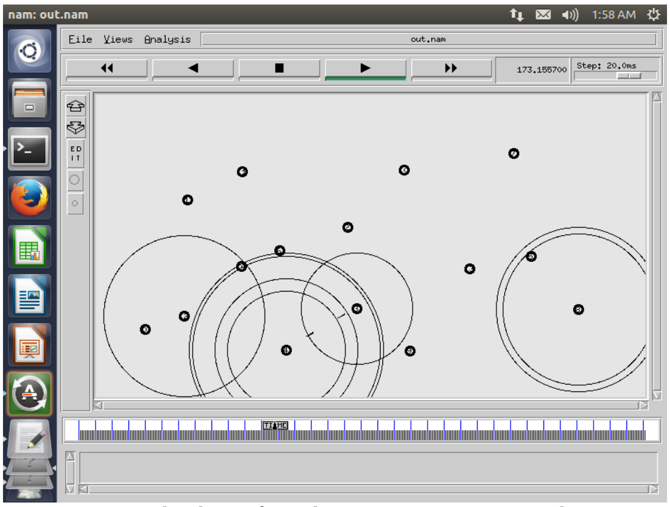

Fig.6. Graphical view for node movement using nam window1

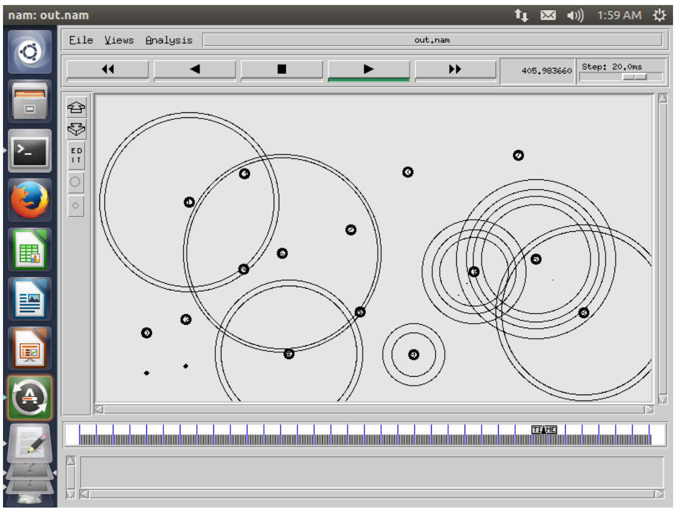

Fig.7. Graphical view for node movement using nam window2

V. CONCLUSION

From the criteria such as Throughput, Packet delivery Ratio (PDR),Delay, based on Quality of service Using AODV, DSDV, DSR Protocol it has analyzed AODV Protocol out performance Higher than the other. Using this Quality of Service Compare many parameters like Packet Delivery Ratio (PDR), End to End Delay, and Throughput than PDR gives better performance to other Parameter. In future, it will add performance criteria like Jitter, Data Rate, Bandwidth, Packet Loss, and Velocity and so on. It also Compare some other protocols with GSR, OLSR and TORA and Different Methods.

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