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Improvement in Routing Behavior of AODV Protocol in MANET

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***Abstract*—This A Mobile ad-hoc network (MANET) is a network, self-configuring, proficient of self-directed functioning, quickly deployable and operates without infrastructure. MANET operates without any centralized administration. The nodes are self configuring, independent, quickly deployable. Nodes are movable since topology is dynamic and they have restricted computing resources. We know that routing protocols make an important role for improving routing mechanism in Mobile Ad hoc Network. The reactive AODV routing faces problems like long route, time delay, mobility and many other while routing. In this work the AODV routing protocol has been improved to enhance the routing capability. In this paper the performance of normal AODV routing protocol are improves on the basis of enhancement in routing mechanism. Here we consider the particular TTL Value and dynamic threshold value for established the connection in long route and also measure the varying queue length technique by that if the node buffer size is full then no packet is drop form queue, it means the size of queue is varying according to data. The dynamic TTL value established the connection with long route receiver and the varying queue minimizes the packet loss. The performance of improves AODV protocol is measures on the basis of performance metrics and the enhanced AODV showing the improved performance.**

***Key words*—MANET, TTL, AODV, Routing, Queue length.**

I. Introduction

In mobile ad hoc network (MANET) [1] all nodes are mobile and can be connected dynamically in an arbitrary manner. As the range of each host's wireless transmission is limited, so to communicate with hosts outside its transmission range, a host needs to enlist the aid of its nearby hosts in forwarding packets to the destination. So all nodes of these networks behave as routers and take part in discovery and maintenance of routes to other nodes in the network. If a node needs to communicate with another that is outside its transmission range, an intermediate node acts as a router to relay or forward packets from the source to the destination. For this purpose, a routing protocol is needed. Routing protocol design is an important and essential issue for Ad Hoc networks due to dynamism of the network. One interesting research area in MANET is routing. Routing [2, 3] in the MANETs is a challenging task and has received a tremendous amount of attention from researches. Data delivery and the capability to handle dynamic connectivity are the most important issues for routing protocols in wireless mobile ad hoc networks. Once there is a path from the source to the destination for a certain period of time, the routing protocol should be able to deliver data via that path. If the connectivity of any two nodes changes and routes are affected by this change, the routing protocol should be able to recover if an alternate path exists.

Ad hoc Networks are very useful in emergency search-and rescue operations, meetings or conventions in which persons wish to quickly share information, and data acquisition operations in inhospitable terrain. This MANET routing protocols can be divided into three categories [3, 4]:

***Table-Driven Routing Protocols*:** In table driven routing protocols, consistent and up-t o-date routing information to all nodes is maintained at each node like DSDV, OLSR

***On-Demand Routing Protocols*:** In On-Demand routing protocols, the routes are created as and when required. When a source wants to send to a destination, it invokes the route discovery mechanisms to find the path to the destination like AODV, DSR.

Hybrid Routing Protocols: The hybrid routing protocols are the combination of routing mechanism of both proactive and reactive routing protocols like ZRP.

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

AODV [4, 5] discovers routes on an as needed basis via a similar route discovery process. However, AODV adopts a very different mechanism to maintain routing information. It uses traditional routing tables, one entry per destination. This is in contrast to DSR, which can maintain multiple route cache entries for each destination. Without source routing, AODV relies on routing table entries to propagate an RREP back to the source and, subsequently, to route data packets to the destination. AODV uses sequence numbers maintained at each destination to determine freshness of routing information and to prevent routing loops. All routing packets carry these sequence numbers. An important feature of AODV is the maintenance of timer-based states in each node, regarding utilization of individual routing table entries. A routing table entry is expired if not used recently. A set of predecessor nodes is maintained for each routing table entry, indicating the set of neighboring nodes which use that entry to route data packets. These nodes are notified with RERR packets when the next-

hop link breaks. Each predecessor node, in turn, forwards the RERR to its own set of predecessors, thus effectively erasing all routes using the broken link. In contrast to DSR, RERR packets in AODV are intended to inform all sources using a link when a failure occurs. Route error propagation in AODV can be visualized conceptually as a tree whose root is the node at the point of failure and all sources using the failed link as the leaves.

III. Related Work

This paper [6] considers the problem from a different perspective, using a simulation model the combined effect of node density and packet length; node density and mobility on the performance of a typical 802.11 MANET is investigated. This is a common and realistic scenario in MANETs where nodes move around, join and leave the network at any time. Based on the performance (end-to-end delay, throughput), routing load and packet retransmissions, this paper systematically analyzes the performance of four diverse MANET routing protocols with the different simulation model and configurations. None of the protocols investigated can offer an optimum routing solution under various network scenarios.

In this paper [7] proposed a routing protocol called Power

Control AODV (PC-AODV) to improve network throughput and power consumption. The idea is to establish a route with an appropriate data-rate link within the transmission range and to adjust the transmit power level.

In this paper [8] proposed another class of AODV called Centre base Distance Multi-path AODV (CDM-AODV). The idea is to choose two paths from the centre of the network. The reason being is that there is a reverse relationship between the distances of the node to the centre of network. When request packets are sent, replay packets have the information about the centre of network and distance between nodes.

This paper [9] are analyzing the performance of reactive routing protocol via increasing number of nodes and observing its effect on Quality of Service of Mobile Ad hoc Network. As we know routing protocols make an important role for improving QoS in Mobile Ad hoc Network. The reactive routing protocol which we are considering is AODV for this scenario with MCHG [10]. Here we are observing performance of Routing Protocol via enhancing the network size on the basis of following parameters: delay, throughput, traffic sent, traffic received, data dropped and network load.

In this work [11], AODV, a purely on demand MANET routing protocol, is enhanced to provide QoS. The route discovery process is modified to reduce the connection set up latency. In addition, QoS provision based on delay and bandwidth requirements is incorporated to ensure guaranteed performance level to the QoS sensitive applications. The enhanced protocol is called EQoS AODV. The drawback of this approach each node will maintain two tables, own routing table and neighbour table.

Active techniques based on the end-to-end probe packets, needed to estimate the available bandwidth along a path. We mention DietTOPP [12] for example. It has been developed for wireless network based on the TOPP method for wired environment. His major idea is to compute the medium utilization from the delays and to derive the available bandwidth from this utilisation. The main defaulting point of such approach is the higher consumption of bandwidth.

Enhanced AODV [13] routing protocol for reset a new shortest routing path during sending packet. Enhanced AODV routing protocol maintain expire time that created first. So expire time in routing table is not updating until expire time. Therefore, routing table updated in a cycle. Enhanced routing protocol ensures shortest routing path through fixed expire time. So the source packet sends to destination quickly than original AODV routing protocol.

In this approach [14] include a pre-emptive routing method that make use of proactive mechanisms to detect the link weakening so that a reliable route can be chosen before the link breaks. In the pre-emptive approach, a node that detects a weakening link from one of its neighbours will broadcast a Handoff packet with TTL=1 to its neighbours. On receiving Handoff packet, each node will determine if any of its neighbours has links with more signal power than the current links. The information about link signal strength is kept by Neighbour Power List (NPL) and Power Difference Table (PDT). NPL records all neighbours' energy and PDT records the power difference between every two nodes in neighbours. As we can see, this approach costs a lot in storage for link power information.

In this paper [15] Query localization techniques are based on the concept of time locality. The time locality is kept track in a history path node list, Pold. Two kind of repair mechanisms are discussed that is, Exploiting Path Locality (EPL) and Exploiting Node Locality (ENL). In EPL, a node will broadcast a query with a counter and the accumulated path (P) to at most k nodes not in Pold. A node in ENL sends a query with Pold and a counter to neighbours when link error occurs. When a node receives a query, the nodes in ENL will drop the query it received if the counter in the query exceeds a threshold value k. The counter (initialized to zero) in the query packet will be incremented by a node that is not in Pold, otherwise the value of the counter will be kept.

IV. Problem Statement

MANET is form of distributed network with infrastructure less environment that endorse unreliable and low quality of data service. The AODV routing procedure definitely gives the best result in dynamic network but if it is possible to enhance their performance is then the utilization of resources, network performance and the data delivery are also improved.

V. Proposed Scheme:

Here we proposed AODV updated scheme for routing over head minimization as well as queue variation scheme for data drop minimization and retrieve enhancement result of updated routing scheme, in this algorithm initially we set time to live as 7 millisecond and threshold time to live as dynamic and one constant value and through that value we broadcast route request packet and find out genuine receiver and dynamic

threshold scheme useful for longer route request response time case, after that scheme we apply queue variation base technique for data drop minimization in that scheme we check queue limit if limit value is full so we cannot drop data rather than increases queue limit by one and save data into queue. That algorithm gives better quality of service as well as maximum performance as compare to existing AODV routing system.

```
Set TTL_START     7   //time to live 7 ms
Set TTL_THRESHOLD ;  //Threshold Dynamic Setting
Define TTL_INCREMENT 2     // increment by 2 ms
Flood-route (AODV, S, R)        //  (protocol,  source,
receiver)
{//here TTL limit not constant so vary according to
dynamically
If (node in range && next-hop!=R)
        {Search next-hop;
                If (next-hop!=R && loop free)
                {
Continue tile all radio range nodes route packet receives
                }
        }
Else {Receiver found;
        Data_send();
        }
Data_send (S, R, data)  // sending case drop minimization
        {
         Generate application data;
         Sender send's data through computed path;
        Check (Q-limit of I node's) //dynamic variation Q
scheme at intermediate node
        If (Q-limit == Full)
        {Increment-Q;
        Store incoming data;
        }
        Receiver receives data from I node;
        Send ACK to sender S;
         }
```

VI. Simulation Environment

The network simulator (ns-2) [16] is a discrete network simulator targeted at network researching. The simulations were performed by using Network Simulator 2 version NS-2.31 [16]. The traffic sources are Constant Bit Rate (CBR) and FTP (File Transfer Protocol). The source destination pairs are spread randomly over the network. The mobility model uses 'random waypoint model' in a rectangular field of 800m x600m with 50 nodes. Network scenario for 50 nodes has created 10 connections in network. The routing protocol AODV is used for data packets delivery.

A. Performance Metrics

In this paper, we consider following four performance metrics to compare the three routing protocol.

1) *Average End-to-End Delay:* It is defined as the average time taken by the data packets to propagate from source to destination across a MANET. This includes all possible delays caused by buffering during routing discovery latency, queuing at the interface queue, and retransmission delays.

2) *Normalized Routing Load (NRL):* The number of routing packets transmitted per data packet delivered at the destination.

3) *Packet Delivery Fraction (PDF):* This is the ratio of the number of data packets successfully delivered to the destinations to those generated by sources. Packet Delivery Fraction = (received packets/sent packets) * 100

4) *Throughput:* It is the rate of successfully transmitted data packets in a unit time in the network during the simulation.

VII. Simulation Results

This section represents the results that has generated after applying the proposed scheme and compare the performance with normal AODV protocol.

A. PDR analysis of normal and updated AODV

The Packet Delivery Ratio (PDR) analysis is the ratio of successful percentage of packets that are received in network. This graph are represents the PDF analysis in case of normal and updated AODV routing. Here the performances of both the protocol are almost equal it means that only negligible difference in proposed performance of improved AODV routing. But in case of proposed work the amount of packets in network are deliver more by that the through put in case updated AODV is improved and also the reliability of receiving of packets at destination are get better than normal AODV.

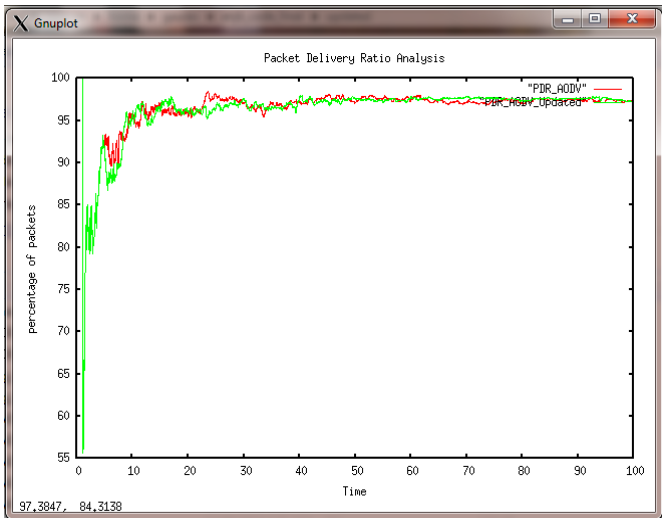

Fig. 1 PDF analysis

B. Routing Packet Analysis of Normal and Updated AODV

Routing packets are required in network to established connection in between sender and receiver. The routing packets are first discover the route on the basis of routing procedure of routing protocol and if the receiver are send back to so sender connection confirmation packets then the data delivery is started in between sender and receiver. This graph has show the routing packets analysis in case of normal AODV and

updated AODV routing in MANET. The difference in performance of number of routing packets in both the cases are almost equal but the data delivery in network in case of proposed AODV routing are more in equal number of routing packets. The performance of dynamic TTL value is definitely reduces the routing load.

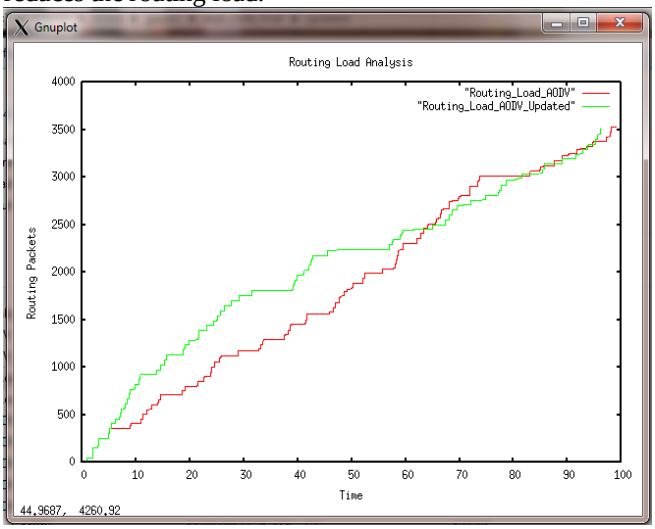

Fig. 2 Routing Load Analysis

C. Throughput Analysis of Normal and Updated AODV

Throughput is one of the important performance parameter to measure the performance of routing protocol in network. Here the throughput in case of proposed dynamic TTL value based enhancement of AODV routing is better as compare to normal AODV routing. The numbers of packets per unit of time (throughput) in case of proposed scheme are less up to 50 seconds because at that time the TTL value are varying rapidly according to requirement but after the setting of best possible TTL value the throughput are improves in network and reaches up to 1200 packets/sec by that the more amount of packets are sending in network and in previous AODV routing the throughput is slightly less than 1000 packets/sec.

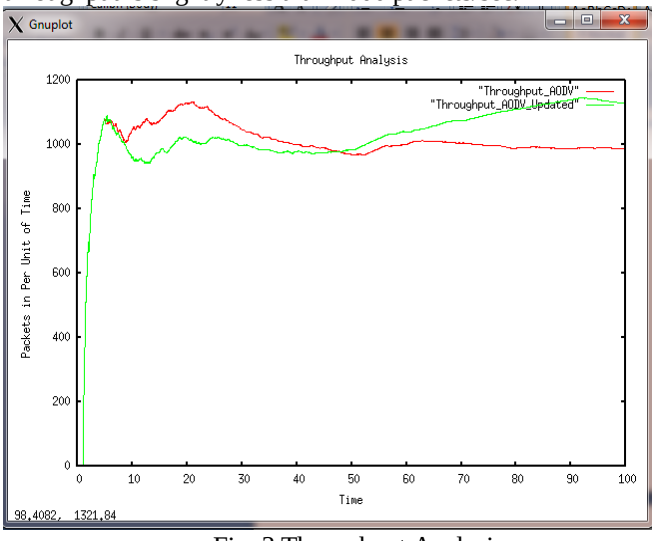

Fig. 3 Throughput Analysis

D. Overall Analysis

The overall analysis are provides the actual and clear performance of both the routing protocol are mentioned in table 1. The AODV are not bad for routing but this research are improves the performance of AODV and achieve their goal in the performance improvement. The major changes in results are evaluated on the basis of packets sending and receiving, packet loss and throughput in network.

Table 1 Overall Summery of AODV and Updated AODV

Parameters	AODV	Updated AODV
SEND =	5767.00	5977.00
RECV =	5609.00	5822.00
ROUTINGPKTS=	3535.00	3508.00
PDF =	97.26	97.41
NRL =	0.63	0.60
DROPRTS =	398.00	10.00
No. of dropped data =	158	155
Actual Performance =	93.84% (14911)	95.92% (15307)

E. Different Reasons of Packet Dropping

This table 2 is represents the different dropping reasons of the number of packets are drop in network. Here the main drop reasons of packet dropping are congestion and it has reduced in proposed AODV dynamic TTL value based routing. These results are also including the ACK packets in packet dropping.

Table 2 All Type Packet Drop Analysis of AODV and Updated AODV

Drop Reasons	AODV		Updated AODV	
Drop from ARP =	22	0.14%	23	0.14%
Drop from IFQ=	84	0.53%	68	0.43%
Drop from CBK =	248	1.56%	341	2.14%
Drop from NRT =	7	0.04%	9	0.06%
Drop from END =	62	0.39%	45	0.28%
Total Drop Via Congestion =	556	3.50%	165	1.03%
Total Drop =	979	6.16%	651	4.08%

VIII. Conclusion and Future Work

To provide efficient routing in mobile ad-hoc networks, there is a solid need to establish new technique for routine network controls. Maintain routing performance has be an important and desirable factor of MANETs. Although difficult, it is quite interesting and challenging to design and develop this kind of technique for routing in MANETs. This research provides a quality improvement in AODV routing technique to enhance their performance on the basis of dynamic TTL value with varying queue length. Simulation results show that the

proposed scheme has highly effective than as compared with the basic AODV.Conclusion of this approach is depends on the results analysis of normal AODV and proposed improved AODV. Proposed work is effective and better than normal AODV it proves on the base of performance metric. If you used improved routing protocol for regular movement state, you experience improvement of performance. Especially, MANET happen regular movement. So, it is a superior routing protocol for MANET.

Proposed work is effective and it improves the normal AODV routing mechanism then in future also applies that in energy conservation schemes in MANET

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