Improving the QoS of AODV Routing Protocol by Location based DREAM Protocol in MANET

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Abstract*—In MANET, Mobile nodes can join and leave or change their position inside the network, so its topology can change anytime in unpredictable ways. A MANET is self organizing, adaptive and infrastructure less. AODV currently does not support Quality of Service (QoS) and also has no load balancing mechanism. The QoS routing feature is important in a stand-alone multi hop mobile network for real-time applications and also for a mobile network to interconnect wired networks with QoS support. 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 dynamic behavior of network of the network. In this research we improves the QoS routing of AODV routing protocol by using the location based features of Distance Effect Routing Algorithm for Mobility (DREAM). In this DREAM protocol the particular information of each node is maintained in network with respect to other nodes that are participating in routing mechanism. The mobile nature of network is predicted by DREAM protocol so that the flooding of route establishment packets are only delivered to that Zone by that the extra overhead for finding destination is minimizes. The DREAM protocol is improving the QoS of AODV routing protocol. In this research we are consider the different scenario of mobile nodes means in terms of number of nodes in network and observe that the performance of proposed QoS routing is better with minimized overhead of route establishment procedure.

***Index Terms*—QoS, DREAM, AODV, Routing, MANET**

INTRODUCTION

All A mobile ad hoc network (MANET) consists of mobile nodes that can communicate with each other through wireless links without an existence of fixed communications, thus allowing users to put awake the network fast and cost efficient. For this uniqueness, MANETs have been widely used in various application areas like military field, disaster relief, battlefields sports stadiums, individual Area Networks, the association of conferences and so on. The dependability of data broadcast in the network cannot be guaranteed since MANETs are characterized by self-configured, active changes of network topology, limited bandwidth, instability of link capacity and other resource constraints. The dynamic nature of an ad hoc network makes it extremely difficult to obtain accurate knowledge of the network state. Furthermore, constant updates of link state information are required to make optimal routing decisions, which consequences in general control overhead. Another characteristic of MANET's is mobility. All the nodes are permissible to move in diverse dimensions which consequence s in energetic topology, since nodes are affecting so they be able to go out of the range of network or come in the range of network at any time, a node which is part of one network at time can be part of one more network. [1] In Mobile Ad hoc Networks every node has limited wireless broadcast range, so the routing in MANETs depends on the cooperation of intermediate nodes.

The Ad Hoc On-demand Distance Vector Routing (AODV) [2] protocol is a reactive unicast routing protocol for mobile ad hoc networks. As a reactive routing protocol, AODV only needs to maintain the routing information about the active paths. In AODV, routing information is maintained in routing tables at nodes. Every mobile node keeps a next-hop routing table, which contains the destinations to which it currently has a route. A routing table entry expires if it has not been used or reactivated for a pre-specified expiration time. Moreover, AODV adopts the destination sequence number technique used by DSDV [3] in an on-demand way.

QUALITY OF SERVICE (QOS)

The QoS stands for Quality of Services and the certainty is that there is much discuss on what precisely QoS is supposes to mean. Most vendors realize QoS protocols having in intelligence specific scenarios and taking into thought diverse parameters, network topologies and variables. The United Nations review board for International Telephony and Telegraphy (CCITT) proposal E.800 has definite QoS as: "The cooperative effect of service performance which determines the degree of contentment of a user of the service". This is a widely accepted clarification since it doesn't makes any orientation to any minimum individuality, such as Bandwidth or Delay, or mechanisms, such as right of entry Control, SLA, Signaling Protocol.

"Quality of Service is the cooperative effect of service presentation which determines the degree of contentment of a user of the repair". The provisioning of QoS based system services is in terms an particularly complex problem, and a important part of this difficulty lying in the direction-finding layer. The goals of QoS routing are double: selecting paths that can satisfy given QoS requirements of incoming communication requests, and achieving global efficiency in store operation [4]. The DREAM [5] location based protocol is maintained the location of each node in network with their mobility speed. The proposed work is based on the location based improvement of QoS in MANET.

PRIVIOUS WORK

Several researchers have done the quantitative and qualitative analysis of Ad hoc Routing Protocols by means of different performance parameters. Also they have used different simulators for this purpose.

Ashish Bagwari, Raman Jee, Pankaj Joshi, Sourabh Bisht, [1] has proposed the "Performance Of AODV Routing Protocol With Increasing The MANET Nodes And Its Effects On Qos Of Mobile Ad Hoc Networks" the performance of reactive routing protocol in this research analyzing by increasing number of nodes and observing its effect on Quality of Service (QoS) of Mobile Ad-hoc Network. A very well assumption is that the routing protocols make an important role for improving QoS in Mobile Ad-hoc Network. The QoS depends upon various different matrices like end-end delay, throughput, date drop and network load that has consider for communication.

Akhilesh Kumar, Ritesh Kumar Mishra [6] proposed a "Performance Evaluation of MANET Routing Protocol for Varying Number of Nodes" here the researchers are analyzing the performance of AODV, DSR and DSDV routing protocol based on throughput of receiving packets and Average End-to-End Delay via increasing number of nodes and observing its effect on Quality of Service (QoS) of Mobile Ad hoc Network. The simulation of routing protocols had been done in discrete event simulator known as NS2.

Mohamed amnai, youssef fakhri, jaafar abouchabaka,[7] proposed a "QoS routing and performance evaluation for mobile ad hoc networks using OLSR protocol" in this title they have studied the impact, respectively, of mobility models and the density of nodes on the performances (end-to-end delay, throughput and packet delivery ratio) of routing protocol (optimized link state routing) OLSR by using in the first a real-time VBR (mpeg-4) and secondly the constant bit rate (CBR) traffic. Finally they compare the performance on both cases. Experimentally, they considered the three mobility models as follows random waypoint, random direction and Mobgen steady state. The results is evaluated in all these cases.

S. R. Biradar, Hiren H D Sarma, Kalpana Sharma,[8] proposed a "Analysis QoS Parameters for Mobile Ad-Hoc Network Routing Protocols" in this title they discuss a Routing protocols for mobile ad hoc networks has limitations such as frequent changes in topology, limited battery power, bandwidth constraint, hidden and exposed node problem, high Bit Error Rate (BER) are major problems. Proactive routing protocol and Reactive routing protocols both prove to be inefficient in MANET. Protocol performance is compared with proactive and reactive protocols.

Sridhar Subramanian and Baskaran Ramachandran [9] has proposed a "Trust Based Scheme for QoS Assurance in Mobile Ad-Hoc Networks" In this title they describe a Trust Based Reliable AODV [TBRAODV] protocol is presented which implements a trust value for each node. The misbehavior is identified by trust value of nodes. Every node trust value is calculated and based trust value nodes are allowed to participate in routing or else identified to become a misbehaving node. The misbehavior node is identified through trust based scheme. This represents the enhanced reliability in AODV routing and results in increase of PDR, decrease in delay and throughput is maintained.

Sachin Kumar Gupta & R. K. Saket [10] proposed a "Performance Metric Comparison Of AODV and DSDV Routing Protocols In MANET Using NS-2 simulator" In This title the researchers are focus on the most popular ones are Dynamic Source Routing (DSR) protocol in network, Ad-hoc On-demand Distance Vector (AODV), Temporally Ordered Routing Algorithm (TORA) and Destination-Sequenced Distance Vector (DSDV) routing protocol. The performance of AODV and DSDV routing protocol have been evaluated for Mobile Ad-hoc Networks (MANET) in terms of throughput, the average end to end delay, jitter and drop. The performance of the AODV is better than the performance of the DSDV routing protocol.

Rajneesh Kumar Gujral, Manpreet Singh [11] proposed a "Analyzing the Impact of Scalability on QoS-aware Routing for MANETs" In this title , they are analyze the impact of scalability on various QoS Parameters for MANET routing protocols, one proactive protocol (DSDV) and two prominent on demand source initiated routing protocols. The performance metrics comprises of QoS parameters such as packet delivery ratio, end to end delay, routing overhead, throughput and jitter. The effect of scalability on these QoS

parameters is analyzed by varying number of nodes, packet size, time interval between packets and mobility rates.

PROPOSED QOS SCHEME

Quality of Service provision is very essential part for communication, because communication requires reliable as well as accurate data and time manner data delivery from sender to receiver node, but mobile ad-hoc network quality are depends some parameter like antenna type, media access control mechanism, buffer management and routing behavior, so here initially we identifies the quality of service dependent parameter and then improve the quality of service, in our proposed mechanism we apply ad-hoc on-demand routing and buffer management and location aware protocol and solve the quality issue problem. DREAM (Distance routing effect Algorithm for mobility) routing protocol is very useful for minimization of routing overhead, because it uses location and speed information. In DREAM, destination gives the information about their location and speed to the sender node, so sender can find the location by calculating the distance and speed of movement of destination node.

Actually DREAM (Distance routing effect Algorithm for mobility) routing protocol for ad hoc networks built around two novel observations. One, called the distance effect and another is Mobility rate. The location information in routing tables can be updated as a function of the distance separating nodes without compromising the routing accuracy. It is clear that, in a DREAM, routing information about the slower moving nodes needs to be updated less frequently than that about highly mobile nodes. In this way each node can optimize the frequency at which it sends updates to the sender node in network and correspondingly reduce the bandwidth and energy used, leading to a fully distributed and self-optimizing system.

Here we design proposed algorithm that helps to implementation issue, initially we define initial parameter and then broadcast routing packet and search the receiver node and last module for connection recovery module, in this module we provide node grading and DREAM module.

```
Step1:  Initialize parameter PHY: Wireless link
                Channel: Wireless Channel
                Queue: Drop tail queue
                MAC: 8021.11
                Mobile Node: Mn
Step2: Routine: Modified-AODV
        Location-Identification: DREAM
        Sender Node: Ti subset of Mn
        Receiver Node: Rj subset of Mn
        Intermediate Node: I subset of Mn
Step3: S B-Cast(r-pkt, seq-no, Ti, Rj)
        If (Rj not direct range && Next-hop == I)
        {
        I receives r-pkt,
        While (Next-hop != Rj)
{
B-Cast(r-pkt, seq-no, Ti, Rj)
}
Do
{
Rj receives r-pkt from I node
Reverse shortest path established
Set all I node grade = 10;
        }
        }
Else-if (Rj in direct Range)
        {
        Rj receives r-pkt from I node
        Reverse shortest path established
        Set all I node grade = 10;
        }
Else {node out of range}
```

Connection Recovery Module

```
Step4: Ti node sends data to Rj node
        If (I node recv data && not forward)
                {
                grade = grade -1;
                }
        Else-if (grade ==1 || route Break)
                {
                Old route fail
                Apply DREAM protocol
                Re-route packet sends using DREAM
module
                }
Step 4    Stop
```

SIMULATION TOOL

NS2 is Associate in Nursing ASCII text file event-driven machine designed specifically for analysis in laptop communication networks. The machine we've accustomed simulate the ad-hoc routing protocols in is that the Network machine a pair of (ns) from Berkeley. NS2 is a Network Simulator which is used to simulate all type of networks and can be easily understandable by anyone. It is a discrete event driven simulator means that it start packet sending at the specified time by us and stop also at a specified time.

In our Simulation we use network simulator-2 (NS-2) [12] and create TCL script base simulation scenario, here we apply following parameter for analysis the behavior of existing protocol and modified or proposed protocol and get result on the bases of packet delivery performance, throughput and routing load analysis.

Table 1 Simulation Parameters

Parameter	Values
PHY	Wireless Phy
Channel	Wireless Channel
Queue	Drop Tail
Mobile Node	10,20,50
Routing	Modified-AODV, DREAM
Pause time	10,20,30……100
Transport Layer	TCP, UDP
Application Layer	CBR, FTP
Data Rate	4pkts/sec
Data Size	512 UDP, 1060 TCP

SIMULATION RESULTS

Routing Overhead Analysis in Existence Routing Scheme and Proposed Scheme

Routing overhead is one of the imperative aspects to measure the performance of routing protocol in ad hoc network. The routing packets or link establishment packets are required to maintain the connection in between sender and receiver after that the data delivery is starting. Due to the dynamic nature the routing overhead minimization is the challenging task in ad hoc network. In this graph the routing overhead in case of proposed enhanced LAR with memory management QoS based AODV protocol is very efficient as compare to Existing AODV routing protocol. The lower value of routing overhead is shows the better performance. In proposed approach only about 3800 routing packets are deliver in network but in case of existing AODV routing the above 6000 routing packets are deliver in network. It means that the performance of proposed protocol is much better than normal AODV and the more number of data packets are deliver in network in case of enhanced QoS AODV that is mentioned in previous results.

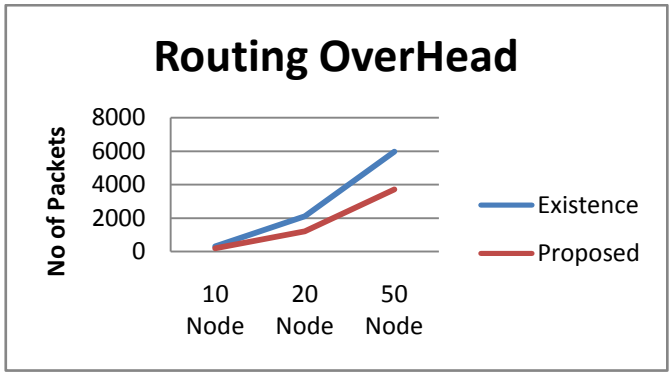

Fig. 1 Routing Packets Analysis

Packet Delivery Ratio (PDR) Analysis in Existence routing scheme and Proposed scheme

Packet delivery ratio is the percentage calculation of total packets that are successfully delivered and receive in network. This graph represents Packet Delivery Ratio (PDR) Analysis in case of normal AODV protocol and proposed enhanced QoS based routing protocol with the existence of LAR and Memory management scheme. Here the performance of proposed QoS based AODV protocol is better as compare to previous AODV. The number of scenarios is proving the better results in case of proposed scheme. The PDR in case of proposed scheme is about 90 % minimum in case of 20 nodes but in existing routing scheme it is minimum about 84% also in case of 20 nodes. It means the memory management with location information of mobile nodes are improves the routing capability and provides better PDR performance.

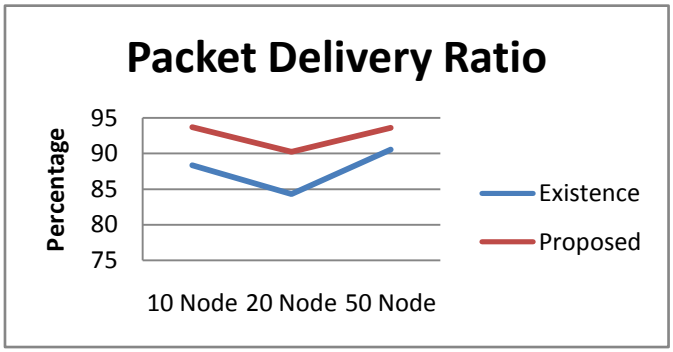

Fig. 2 Packets Delivery Ratio Analysis

Actual Performance in Existence routing scheme and Proposed scheme.

In this graph we conclude that our actual performance of the network on the bases of percentage of data received by the receiver and we get proposed mechanism performance very good as compare to existing protocol.

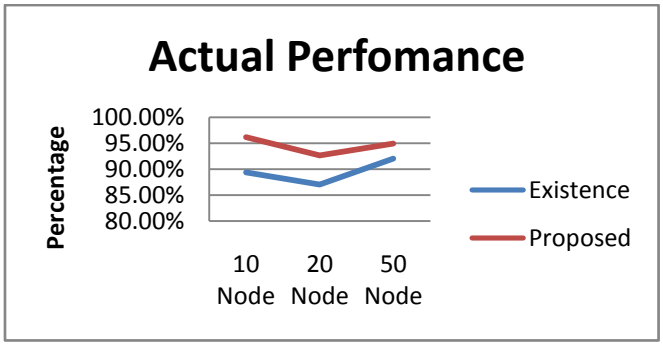

Fig.3 Actual Performance between existence and proposed

Queue Base Drop Analysis

In our proposed approach we apply buffer management mechanism on the bases of requirement that reduce the congestion from the network and increase the performance of the network that result clearly shows proposed approach out perform in every simulation environment.

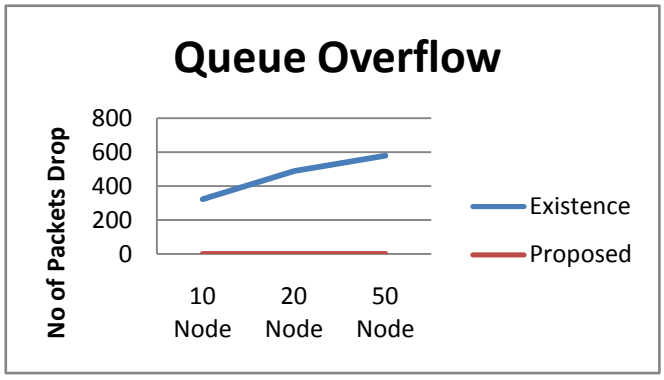

Fig.4 Queue Base Drop between existence and proposed

Congestion Base Drop Analysis

In this graph we analyze data drop by the congestion and identified total number of data dropped by the actual congestion occurrence during data transfer, congestion problem occur if more than one sender share single bottleneck link and other possibility is channel bandwidth is lower than the requirement. In this result proposed mechanism gives good result as compare to old mechanism.

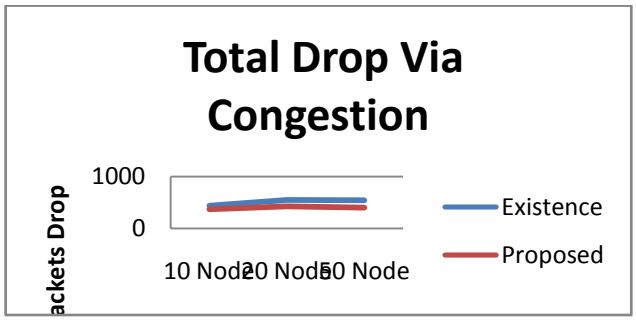

Fig.5 Congestion Base Drop between existence and proposed

CONCLUSION

Mobile ad-hoc network is dynamic nature means each node independent to other but one big challenge network topology control so here we apply ad-hoc base AODV routing and control the network topology, but measure issue to serve better quality to the receiver node. Here we proposed the modified AODV routing that uses node grading method and gives better reliability as compare to existing AODV, but only node grading not gives better performance in all parameter so we apply buffer management and DREAM (destination routing effect agent protocol) to increases the performance in all parameter like routing overhead minimization, Congestion control as well as route management. After all the internal modification we analyze our result through all network parameter in three different simulation scenario ten node, twenty node and fifty node case and we get better quality if we apply proposed protocol.

Research not bounded by any parameter, so here we cannot say our work is grunted every time gives good quality, its depends behavior of the node movement, speed, radio range and number of sender as well as receiver, so in future also analyzed that type of behavior through emulation base, and here we also that is checked through single protocol AODV base mechanism, in future that quality parameter checked by various other existing protocol modification base mechanism.

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