Improvements in Aodv Routing Protocol using IPV6 and 802.11e in Manets

Yasoda Devi Gondi, Venkateswara Rao Gurrala

ABSTRACT--- Development of IEEE 802.11e standard is a cost-efficient wireless technique for services and improves the QoS potentiality to wireless networks. It provides outstanding enhancement to multimedia communication which lead to gain vogue and overcome the significant challenges in reaching the up-marks of the applications related to multimedia.

Mobile Adhoc Networks (MANETs) face challenges with reference to QoS, limited bandwidth, mobility, limited battery power, routing and so on. These issues are raising due insufficient resources in MANETs, this leads to a difficulty in achieving marked QoS. AODV, QAODV, ZRP, DSDV, OLSR, etc., can be regarded as well known routing protocols of MANETs[1]

The instigation of IPv6 has bought un-eliminating certainty with vital consequences, it's very much essential to verify and examine the changes. In MANET and other Ad-hoc systems, the implementation of IPV6 brought good results in the all the moving nodes in different ways in distinct environments. In the present paper we examine Adhoc On Demand Distance Vector routing protocol (AODV) of MANET by including (Internet Protocol version) IPv6 and 802.11e implementation on OMINI network and ns2 for simulation. The performance level of routing protocol AODV is measured with relation to throughput, delay and packets loss.

MANETs are very much benefited by new technology, it is most widely installed and utilized by wireless medias that belongs to IEEE-802.11 constructs. The work in proposed paper aims at the results related to the reciprocity of MANETs-Reactive routing protocols by considering the IPV6, IEEE 802.11e technique. This results in considerable improvements in terms of routing protocol properties and overheads are reduced due to enriched routing protocol.

Key words: MANETS, QoS, IPV6, 802.lle, reactive

I. INTRODUCTION

Ad-hoc wireless network is creating wonders and also in today world it is the most dynamic means of network and communication system as of now due to the frequent use of increase of devices that are mobile and wireless have increased significantly in present era. Ad-hoc mobile network is established by gathering portable devices as phones, laptops, sensors, etc., that interact with each other.

Adhoc Wireless networks that has the feature of mobility comprises of many devices or nodes they communicate with one another simultaneously, are self-configured and no firm infrastructure nor predetermined topology. Some parameters are finite like physical security, bandwidth, energy including other resources; MANETS follow multiple hops in wireless networks and connection link to the internet can change. In today's era ad-hoc networks are robust and perform efficiently by including routing processings in the mobile devices, which in turn reduces the routing overheads.

MANETS are applied in many applications like communication in military, emergency situations, security systems, marketing from remote areas, fixed infrastructure replacement, disaster mitigation what not in all spears of the world where communication is needed. To say fact there is a demand in MANETS to search an efficient path to deliver data through the data packets all the way from source point to destination point.

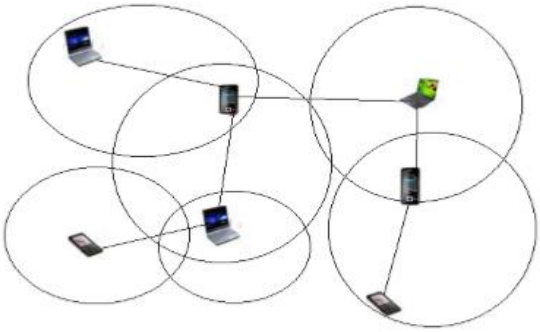

Figure 1 – MANETS representation[1]

Congestion can arise from limited bandwidth of MANETs and to overcome the specified problem efficient routing techniques are required in mobile nodes, the requirement of considerable Internet addressing protocol- Internet Protocol (IP) to accommodate the mobile node's demand, flexibility to communicate without infrastructure, are specifically considerable.

The first and foremost challenge in construction of MANET for IPv6 is to provide data pass through device without any interruption and maintain the proper route formed. Hence here the nodes relay on neighbouring nodes to route the packets to the destination efficiently and without any data loss in short duration across the specified network. The changes in the connectivity are characterised by its outstanding feature of adhoc networks executed by mobility of nodes and control practices of power.

The reactive routing protocol construct route from source to destination to transmit data. Reactive routing protocol uses the technique of flooding for route finding. After the routes being found the path is stored and noted in the cache of router. The considerable benefit of this routing protocol to consume less bandwidth in wireless adhoc networks, and the considered algorithm – AODV, a type of routing

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protocol that is reactive in nature where the path is formed when demanded.

A. AODV

This enhanced AODV algorithm improve overall performance and proves that data is delivery with no packet loss. It supports both the multicast and unicast communication.

- In AODV Routing protocol the nodes are maintained in a tree structure consisting of information of local connectivity
- The route is formed only when the route is demanded form specified source to destination and caches the information.
- The route path is maintained by source until it is necessary.
- The source node that has initiated uses the recorded least count of hops among the other nodes.
- The route is formed as follows:
  - The active route-nodes that are considered as the part of connection sends a 'Hello' message to connected neighbouring nodes.
  - The RPEQ's of source node's IP address is tracked and ID is broadcasted.
- If any error occurs it receives an error message RERR (receives route error) then source node reinitiates the route finding.
- The routing table are recycled periodically if not used. Under link failure circumstances a routing error will be traced back to the node form where the transmission started. The mentioned process is repeated when ever any disturbances occurs.
- The routing tables are utilized by AODV to maintain the routing information, which consists fields like [dest-addr, next-hop-add, dest-seq-num, life-time]
- The life time of the selected/used route is updated and unused routes expire.
- The packets consist of information like: Source IP-address, its current sequence-number, Destination IP-address, its sequence-number and broadcastID which is incremented each time source node passes RREQ.
- BroadcastID and IP-address of source node are RPEQ unique values.

B. IPV6

Is passed down for packet switch in networking provides an End-To-End datagram transmission among multiple network protocols, is one of the contemporary IP version. Path is laid down by recognising and positioning of devices in the network is the process that is carried on in this communication protocol. IETF-Internet Engineering Task Force has developed IPv6 to overcome inconveniences of IPv4. IPv6 has maximum replaced IPv4.

IPv6 uses approximately 3.4×10^{38}addresses i.e., 128-bit address(2^{128}). But genuinely, number is a little bit smaller, because many ranges are preserved for special use. IPv6 uses addresses of size 32-bit, which provides app. 4.3 billion addresses and it is 7.9×10^{28} times more than IPv4. IPv6 architecture includes the network security as design requirement.

The IPV6 addressing architecture as in RFC 4291 has 3 types of transmissions: unicast, anycast and multicast.

IPV6 addresses consists of 128 bits which are represented into 8 fields each of 16 bits as specified before these fields are written in four hexadecimal digits

c. IEEE802.11E

IEEE802.11e mainly designed taking into regard wireless LAN certain prioritization properties as QoS-Quality of Service by implementing some enhancements in MAC-Media Access Control layer. This standard has given more importance to applications that are delay-sensitive.

IEEE 802.11e MAC protocol working, it implements HCF-Hybrid Coordination Function[10] comprises of 2 methods EDCA-Enhanced Distributed Channel Access and HCCA-Hybrid Controlled Channel Access to define the Traffic Categories.

In EDCA categorizes the traffic as higher and lower priority traffic and more probability chances for higher priority traffic to be processed first prior to lower priority traffic. The AC-Access Categories represent the ranking of priority in EDCA, in the channel which promotes contention free access for TXOP -Transmit Opportunity period by setting contention window based on the expected traffic in each AC.

At the point of MAC Layer, EDCA is implemented by considering four different access categories. The data packed that are transmitted out-form the higher-layers with a distinct priority-id is mapped to the correlating AC. According to the identified table of divergent types of application are mapped to different ACs. The WLAN that is enhanced to EDCA the QoS is also enhanced by supporting priority based services. By the introduction of different access categories the prioritized QoS came to be implemented.

One of the two fields from access categories namely conwin_min and conwin_max values are obtained from A_conwin_min, A_conwin_max values[10] respectively, which are existing in each physical layer that is supported by standard 802.11e.

ACs map for class of services priority levels:

Table 1:Priority Levels

802.11e		
Priority	**Access Category (acc)**	**Acronym**
Low	acc_bg	BackGround
	acc_be	BestEffort
	acc_vi	Video
High	acc_vo	Voice

Table 2: Contention Window Calculations

Boundaries of Contention Window(cowin) Calculations		
acc	**cowin_min**	**conwinmax**
acc_bg	A_conwin_min	A_conwin_max
acc_be	A_conwin_min	A_conwin_max
acc_vi	(A_conwin_min +1)/2-1	A_conwin_max
acc_vo	(A_conwin_min+1)/4-1	(A_conwin_max+1)/2-1

Table 3: Access Category Default Parameters

For each ACC the EDCA Default Parameters				
ACC	**conwin_min**	**conwin_max**	**AIFSN**	**Max-TXOP**
acc_bg	15	1023	7	0
acc_be	15	1023	3	0
acc_vi	7	15	2	3.008ms
acc_vo	3	7	2	1.504ms

The highest priority and lowest priority data are properly analyzed by defined QoS. Not only this, there are some possibilities where data need to safeguarded from any other means of data that belongs to the same class. This type of situations are handled in EDCA address by Admission Control.

The AP reveals available bandwidth in form of beacons. Before adding to the existing traffic the clients need to check the available bandwidth. For the purpose of proper functioning of EDCA and TXOP the certified APs has to be enabled. These discussed are considered as main enhancements where other enhancements of IEEE802.11e are considered optional depending on the requirements

The Power Save Polling technique which is already existing in the previous IEEE 802.11 standards is enhanced to new power save deliver and notification (APSD) technique[10]. This mechanism leads to low power consumption, because it minimizes the signalling traffic and collision rate between power-save polls.

Along with these other mechanisms provided are,

- Block acknowledgements which reduces the protocol overhead with longer TXOPs
- QosNoAck frames aren't acknowledged the critical data which requires large time, retransmission is avoided
- Direct frame transfer from station-to-station through Direct Link Setup

II. ALGORITHM

A. Algorithm for overview of the System

Step1: A network is established with different nodes (Mobile nodes, static nodes which acts as base stations). In formed network one of the desired starting node as source-node and the other destination point as destination-node.
Step2: Forms route by sending the route request to it's neighbouring node for laying a path to the destination.
Step3: Transmit the data packets through the shortest root that has been established.
Step4: Performance metric defined are taken into consideration

B. Algorithm for Implementation of the System

Step 1: Fist initialize the variables that are required
Step 2: Object for simulator is to be created.
Step 3: Tracing, Animation file are to be created
Step 4: Topology to be used has to be defined
Step 5:GOD has to be included
Step 6: Nodes has to created for communication
Step 7: Define the channel for propagation
Step 8: Define the position of the nodes in the network
Step 9:TCP and UDP traffic is to represented
Step 10: Run the Simulator

III. SIMULATION SETUP OF THE SYSTEM

The simulation setup involves network basic settings the simulation is performed in ns2.35 simulator.

The below table gives the considered parameter values for the enhanced protocol AODV including IPV6, 802.11e, TCP, UDP , CBR

Table 4 : AODV Parameters

Parameters	Value
Number of nodes	30
Mac Type	802.11e
Protocol	AODV
Communication Protocol	UDP
Application	CBR
Delay	1ms
Simulation Time	100

IV. PERFORMANCE METRICS

This design focuses on the specified metrics performance and are measured quantitatively. The accuracy anlyzed over the designed algorithm, performance metrics plays a main role. The metrics that are considered are as follows,

A. Ratio of Packet Delivery: Nothing but, the Number_of_Packets_Ratio that are Received_by_Destination by the

Number_of_Packets_from_source. For considered ith application let us consider $pktd_i$ as the no_of_packet_destination_received, and $pkts_i$ as the no_of_packets_from_source. The average is represented by PDR-Packet Delivery Ratio

$$\text{PDR} = \frac{1}{n}\sum_{i=1}^{n}\frac{pktd_i}{pkts_i}$$

B. Average Delay of End-to-End Point: **T**he average time spend for the transmission of a packet from source to destination point. The Total_Delay_of_Packets at Destination_Node is d_i, and the Total_Number_of_Packets_Received at the destination is $pktd_i$. n's Traffic is the Average_Delay of end-to-end communication, represented by *E*.

$$\text{E} = \frac{1}{n}\sum_{i=1}^{n}\frac{d_i}{pktd_i}$$

C. Throughput: T is the symbolic representation of throughput, to calculate the 'T' of considered application of designed 'n' traffic is obtained when the total_amount_of_data (bi) is received from source_to_destination is divided by the time_taken_to_deliver_the_last_packet (ti) to the destination. So, throughput is nothing but the number_of_bits_transmitted_per_second.

$$\text{T} = \frac{1}{n}\sum_{i=1}^{n}\frac{b_i}{t_i}$$

V. SIMULATION RESULT:

The simulation results shown below in the form of graphs of the designed Enhanced Aodv Protocol with IPV6 and 802.11e

The figure-2 shows the considered MANETs animation file

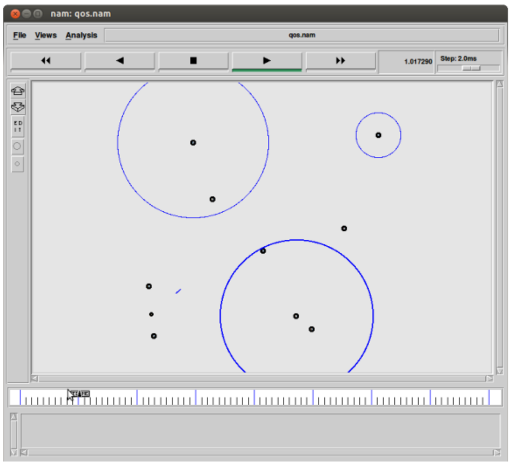

Figure-2 Animation

A. End-To-End Delay

The delay of end-to-end is only 698.77 milliseconds for transmitting 520 packets of data which in-turn increased the performance with no packet loss which is considered as the main criteria in today's critical data transmission

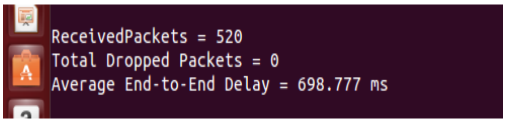

Figure-3 End-To-End Delay

B. Packet Loss Rate

The below figure4 is a graph which proves that there no packet loss with the enhanced AODV with IPV6 and 802.11e EDCA mechanism performance

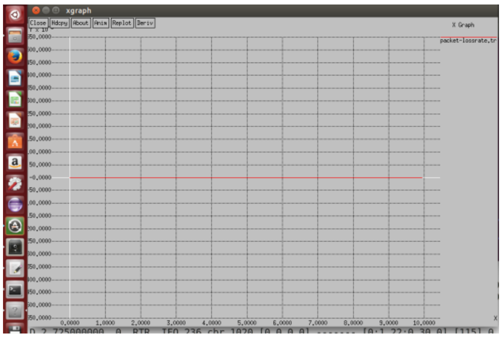

Figure 4 Packet Loss Graph

C. Throughput :

From the figure 5 graphs the throughput is high with no packet loss and high bitrate which show that AODV with 802.11e EDCA mechanism worths a lot

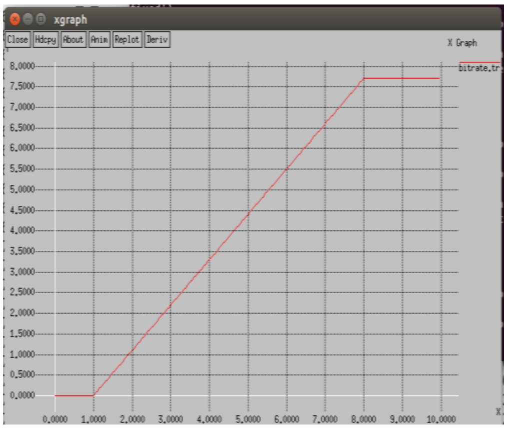

Figure 5 Through Graph

VI. CONCLUSION

MANETs is a network with no predefined infrastructure. There exits no central controlling system that controls the performance of the network. There is need to upgrade the protocol by including security to safeguard from attackers. The work done is implemented and observed that, there is no loss of packet. Further work of adding security algorithm to the existing protocol improves the performance levels to the highest mark.

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