Minimum Number of Neighbour Nodes and Transmission Range Based Overhearing Controlled Protocol for Mobile Ad-Hoc Networks

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Abstract: Ad-hoc networks are communications less wireless networks; the most critical problem in mobile ad-hoc networks is energy utilization. Energy could be a restricted resource. All nodes eavesdrops the data transference in its locality and uses energy without need. Nevertheless various existing routing procedures collect route information via eavesdropping. The important reason for more energy utilization is unnecessary eavesdropping and rebroadcasting of RREQ to nodes. We propose a new mechanism to decrease energy consumption called Minimum Number of Neighbor Nodes and Transmission Range Based Overhearing Controlled Protocol. In which node has a choice of whether to send a packet or not by transmit effective info in Announcement Traffic Indication Message (ATIM) window and node selection on the basis of Transmission range and RES. The Proposed protocol is high energy-efficient compared to Conventional 802.11 PSM-established projects.

Keywords: Energy Efficiency, Network Lifetime, Overhearing, Power Saving Mechanism (PSM)

I. INTRODUCTION

A group of wireless mobile hosts without any centralized administration and pre-fixed infrastructure is called as mobile ad-hoc network. Through multi hope paths and with the battery power, the nodes communication in MANET is done. Plenty of challenges are there in this part, all the Nodes runs in shared wireless medium, network topology varies very dynamically and unpredictably. All nodes in MANET perform as router, sending data packets to different nodes. [1] The crucial problem of MANET is energy efficiency as mobile nodes expect on batteries, which are restricted sources of power. The life of every node is directly on the battery in the instrument operating at the node. Reduce the use of energy and raise the life of network is significantproblem in Mobile ad-hoc network. [3] The MANET of smart devices operates as communications less network. [2]

A.Routing protocols

For routing in MANET to attain efficient routing, different routing procedures have been proposed. These algorithms differ in the approach used for find a new route and maintaining an identified route when node moves. These protocols may be categorized as reactive, proactive and hybrid routing protocols.

Proactive Protocols (Table Driven Routing Protocols)-These protocols are maintaining the routing information as in the routing table and is occasionally upgraded as the network topology varies. DSDV, WRP and OLSR are examples of the table-driven procedures. [1] Reactive Protocols (On-Demand Routing Protocols)-These protocols do not maintain routing

information. If any node needs to forward an envelope to different node then this protocol explores for route in an on-demand manner and creates the link to transfer and obtain the envelope. The route find generally acquires situation by flooding the route demand envelopes throughout the network. AODV, ABR and DSR are examples of reactive protocols. [1]

Hybrid Routing Protocols- In this routing a well mixture of reactive and proactive routing methods. The example of hybrid protocols is Zone Routing Protocol (ZRP). [3]

i. AODV Routing protocol

AODV is also known as on-demand routing protocol. It contains two phases: a) Route Maintenance b) Route finding.

Route finding- It finds routes on an "on demand" basis. It begins a route finding by flooding a route request packet (RREQ). The RREQ packet includes the subsequent fields.

Variety of packet	Hop count	Bcast _ID	Des t _IP	Dest _seq.No	Source _IP	Source_ seq.No

Fig 1: AODV RREQ Packet Format

The intermediate node checks the way to the end in its routing table, if it is available it unicast a RREP back to the source using reverse path utilizing preceding hop of the RREQ as the next hop in the routing table or else it re-broadcasts the RREQ packet of the network. When node receives duplicates copies of RREQ, it immediately discarded. Route Maintenance- It makes a RRER packet and forwards to all traffic sources if it is find any error such as power failure, link failure etc. Traffic source starts a fresh route finding if it still requires a route [5]. Loop Freedom and Sequence number- Every node retains two types of sequence numbers. First is series numeral for itself and second is the series numeral for end which is called destination sequence number. When a node obtains many RREQ packets such compares the series numbers of the RREQ packet. The RREQ containing maximum series number is maintained. RREQ with maximum series number is presumed to contain additional new information. In case of equivalent series number, packet with maximum hop count is received.

B. Impact of Overhearing

A node selects the packets which is purposes for various nodes is known as overhearing. Overhearing develops the routing capability in AODV by eaves reducing further interactions to collect way details but it uses a vital quantity of energy. The main causes of energy utilization are Unnecessary Rebroadcasting and Unconditional Overhearing of RREQ to the nodes.

i. Unconditional Overhearing and Unconditional Rebroadcast

Some objectionable significance is taken by overhearing. It may possibly intensify the state way problem, with node mobility, all node in AODV energetic gathers way details through eavesdropping but it initiates a semantic inconsistency, eavesdropping may create the bad condition. Because AODV creates other than single RREP packets for a way finding to presents another ways [4]. Whereas the major way is observed for its legality through the interaction between the destination and source, different ways could persist in way cache unverified even following they become old. In AODV, the extreme energy consumption is the unrestricted rebroadcast. RREQ envelope is forward toward each neighbor node in the system, and here every node is understood to rebroadcast the request whenever it obtains individual. Due to this, node consumes more energy, and then network lifetime becomes reduced. With high node mobility, there will be other connection shatter sources more RREQs (broadcast packets) as well as their overflow in the system. To raise the network performance, reduce the RREQ packets, so node selects to rebroadcast an envelope established on scantling possibility.

(a)

(b)
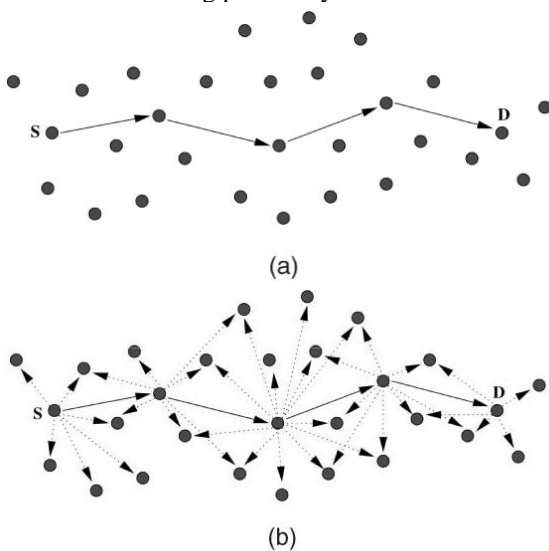
Fig. 2 Distribution of a unicast messages with several eavesdropping method. (a) No eavesdropping, (b) unrestricted eavesdropping

ii. MAC Layer Specification and IEEE 802.11 PSM:

Several techniques to develop the presentation of multi-hop ad hoc networks under 802.11 power managements have been submitted [6]. Broadcasting is very necessary in MANETs. Most of the Reactive Routing protocols depend on MAC layer's broadcast maintain. Nevertheless, the broadcast method of the normal IEEE 802.11 can't give dependable broadcasting service. The average access mechanism in multi-hop wireless networks should be concerned of the hidden and exposed node troubles and reduce collisions. The IEEE 802.11 MAC with Distributed Coordination Function (DCF) doesn't balance fit in some networks. In medium access control layer design, IEEE 802.11 assists the Power Saving Mechanism (PSM) [6]. There are 2 modes of management: power save (PS) mode or active mode (AM). Mechanisms continue to aware every time in AM. In PS mode, mechanisms sometimes awaken to see is there any data to obtain through the envelope announcement time, called Ad hoc Traffic Indication Message (ATIM) window and it will wait for low-power sleep condition if it is not addressed during the data transmission period, or else waits awake to obtain an announced packet. Actually 802.11 PSM is developed for single-hop wireless LANs and more explore is needed to powerfully utilize it in a multi hop MANET. All the nodes in the network are coordinated awaken occasionally and listen to signal messages in PS mode. In Power saving mode Broadcast/multicast messages or unicast messages are primary barrier at the transmitter and declared during the time (Beginning of ATIM window) when every node is awake.

In MANETs, energy conservation is the sufficient issue. To rise the device life time, a careful power saving mechanism (PSM) is needed because node lifetime is depending on batteries.

In AODV routing protocol overhearing develops the routing competence by intrude different communications and collecting route information. To create the IEEE 802.11 PSM relevant in multi hop MANETs regard as the AODV (Ad-hoc On-demand Distance Vector) as the network level protocol. With IEEE 802.11 PSM, AODV protocol is unified to concern overhearing. In short, overhearing take part in an important function in AODV but it should be cautiously re-structured, if energy is a chief discuss. This article intended a communication eavesdropping method called signal power based conditional overhearing. Here a dispatcher can identify the preferred level of eavesdropping when it broadcasts a packet. Upon obtaining a packet announcement through an ATIM window, a node creates its choice whether to eavesdrop it established on the particular overhearing level. If no overhearing is identified, each node chooses not to eavesdrop apart from the future receiver and if unrestricted eavesdropping is identified, each node should choose to eavesdrop.

III. RELATED WORK

Zheng and Kravets proposed a technique, known as On-Demand Power Management (ODPM) [10], here node switches in between PS and AM mode established on time-out values. If a node obtains an RREP envelope, it will keep on in AM for a complete era of time, it maybe require sending data envelopes in the next opportunities. Every node requires identifying and sustaining the power management mode of its neighbors. Its presentation significantly relies on time-out rates, which require well tuning with fundamental routing procedures and traffic situations. For example, examine that a node waits in AM for 5 successive signal periods upon obtaining a data packet (Data time-out) as recommended in [10].
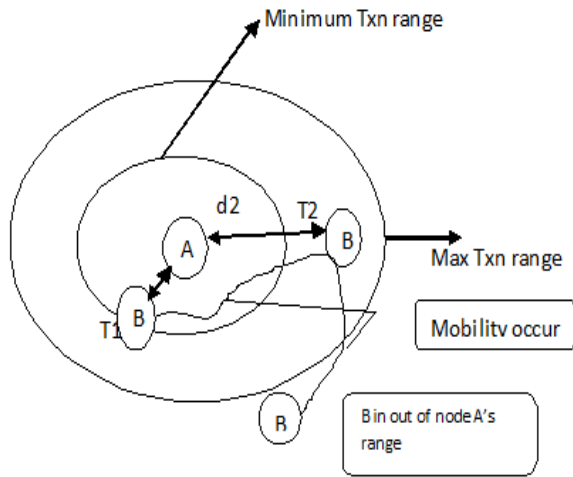
If data traffic is uncommon, say once all 6 signal periods, the node waits in AM for 5 intervals without obtaining some additional data envelopes and controls to a less-power sleep condition. It obtains the upcoming data envelope while working in PS mode, and hence, chooses another time to wait wake up for a further 5 intervals. Compare to Random cast in this energy cost and packet delay are more.

V.Bhanumathi ,R.Dhanasekaran[11] proposed that minimizing the quantity of rebroadcasting and overhearing on the Received Signal Strength (RSS) rate. The high rate of RSS is specifies the node is distant away from source .they mainly focus on minimize the path breakages, energy utilization and wait by reducing the Overhearing and

PV 2	Type 2	Subtype 2	ToDS 1	FromDS 1	More flags 1	Retry 1	PwrMgt 1	More Data 1	WRP 1	Order 1

Fig 3: Frame format of ATIM

Rebroadcasting, the proposed technique R-ROR is determine the Probability of Overhearing Reduction(POR) to limit the hearing of unicast packets.

Sunho Lim, Chansu and Chita.R. Das, Proposed Random Cast communication system [4], they determined the overhearing probability established on number of neighbors to bang a balance between throughput and energy. Every node sustains an eavesdropping possibility, P_F if an arbitrarily created numeral is superior than P_F, then a node choose to eavesdrop. This paper classifies four factors which measured for eavesdropping/rebroadcast conclusion; those are number of neighbors, sender id, remaining battery energy and mobility. The important attainment of this paper is to make 802.11 PSM related in Manet among DSR. This is extremely energy-efficient while contrasted with 802.11 and 802.11 PSM schemes. In every node the persisting power is depends on routing protocol. The result has been addressed established on Power-aware and other different power rate functions.

IV. PROPOSED WORK

Neighbor	RSS-PCV	Node-position	Distance	Residual Power

In this paper, we propose Minimum Number of Neighbor Nodes and Transmission Range Based Efficient scheme for Reduction of Overhearing scheme which is used to reduce the overhearing of nodes to increase the lifetime of Network. Some nodes are Overhear but other nodes are going to sleep state. Each node maintains an overhearing probability, here it is determined using the number of neighbors and specified Transmission range. The proposed protocol developed to enhance energy utilization by monitoring the level of overhearing and forwarding without any effect on network performance. Proposed scheme adopts that mobile nodes employ 802.11 PSM and consistently operate in the PS mode.

During the ATIM window proposed protocol specifies the unconditional or conditioned overhearing in ATIM frame

which is available to the neighbor nodes. It is simulated in IEEE 802.11 context with marginally modified ATIM frame format. ATIM frame can be called as management frame (type 00_2) and subtype is 1001_2 conferring to the 802.11 standard. The proposed protocol employs two unused subtypes, 1101_2 and 1110_2, to specify conditional and no overhearing, respectively. An ATIM frame with the original subtype 1001_2 is recognized as unconditional overhearing and hence conforms to the standard [6].

When node receives an ATIM frame for a Unicast packet, it goes to wakeup state at beginning of beacon interval. Frame contains Destination address (DA) and subtype value, based on subtype value node decides to whether overhear or not. The node can be sleep or wake up state based on conditional destination address and subtype.

FC 2	DI 2	DA 6	SA 6	BSSID 6	SC 2	Frame Body 0	FCS 4

Format of an ATIM frame (length in octets)ATIM frame Format

DI: Duration ID
SC: Sequence control
FCS: Frame Check Sequence
Type: 00 management frame
Subtype: 1001 for ATIM frame (Unconditional)
1101 for ATIM frame (conditional)
1110 for ATIM structure (with no overhearing).

Each node in network maintains its neighbor index routing table which is utilized as an indication while representing routing pursuits such as packet transmission and forwarding. Transmission power control (TPC) minimizing the overall transmission cost need to total communication between destination and source.TPC select the path that consume minimum energy to reach destination [7].

Selecting the mobility prediction and mobility models methods are more significant in MANETS, because it describe the nodes movement from time to time. In this, node movement can be evaluated with constant time interval't' or with constant Distance travelled'd' [8], we can predict the link states of node to offer Stable path with better energy efficiency. Each node maintains the updated nodes neighbor stability table with the help of neighbors RSS value. Each mobile node equipped with GPS to set node arrangements, here we have considered nodes Number of neighbors, Residual energy, node mobility distance and RSS to increase the energy efficiency.

Neighbor Index Routing Table Info:

Fig 4: Scenario for Mobility Movement in MANET

D : distance, $T1, T2$ is the time intervals, T_{Xn} - Transmission Range

Node A determines the variation to neighboring node B at 2 consecutive intervals $T1, T2$.

$$D = d1 - d2 \qquad (1)$$

We have to describe threshold value for distance by using D which is more than Minimum Transmission range and less than maximum range. The transmission equation is normally used to compute the RSS of mobile node.

$$P_R = \frac{P_T * G_T * G_R * \lambda^2}{4 * \pi * d^2} \qquad (2)$$

Where, λ is the Wavelength, P_t is the Transmit Signal Strength, Transmitting antennas is denoted by G_t and Receiving antennas is denoted by G_r , d is the distance between transmitter and receiver. To evaluates the mobility by the use of difference between successive Helo messages of a set of nodes in network.

$$D_t = K / \sqrt{P_R} \qquad (3)$$

Where, K is the constant, D_t is the distance and P_r is the RSS value. The total neighbors of neighbor nodes considered to select the minimum neighbor's.

P_n : Threshold value of amount of neighbor.

$$P_n = (\sum_{i=0}^{n} N(i)) / n \qquad (4)$$

Where, $N(i)$ is the amount of neighbors of node i , which is the neighbor of node N , n is amount of neighbors of node N .

A. Signal Strength based Conditional Overhearing and Rebroadcasting

When node receive ATIM structure (address DA, subtype ID, receiver MAC)
If (DA==BROADCAST)
    Keep on wake up and obtain
 Else {   *unicast*
    If (DA==ID)   *intended destination*
   {Keep on wake up and listen
    Else if (SID==1001) then   /*unconditional
     Keep on wake up and eavesdrop
      Else if (SID==1101)   /*conditional
        Optimal Transmission range and RES based overhearing
           Else
     Go to sleep;
   }
Else
Go to sleep;

B. Optimal Transmission range and RES based overhearing

When node receive a RREQ then it will check for its RES, Txn range
FOR each NEIGHBOUR
If (N(i)<P_n)
  {
    If (N(i)d <=Min Txn) || N(I)res>RES_T)
    {Continue wake up and Rebroadcast
     Update neighbor index Routing table
    }
   Else   go to sleep
  }
Else
   Select nearest neighbor node with having greater RSS value.
}

V. PERFORMANCE EVALUATION

To simulate the architecture proposed, the simulator NS2 [18] is utilized. 100 mobile nodes shift in a 1500 300 M ^{2} state for 100 seconds simulation time in the simulation. The broadcast range of 250 meters is same for every node. Constant Bit Rate (CBR) is also called as simulated traffic. The parameters and simulation settings are demonstrated in table.

| No. of Nodes	100
Area Size	1500 300 m^2
MAC	CBOMAC
Range of Transmission	250m
Time of Simulation	100 sec
Source of Traffic	CBR
Primary Energy	100 J
Power of Transmission	0.660
Power of Receiving	0.395
Value	500Kb
Protocol Routing	AODV

Simulation Results

a. Energy Utilization of nodes in AODV

In conventional AODV, due to the problem of overhearing the energy utilization is more. We have drawn the energy graph for AODV after simulation. We considered 100 joules of initial energy for each node and energy of each node is as follows.

Node ID	Energy(in Joules)
0	69.92
1	58.52
2	69.82
3	67.28
4	58.32
5	65.73

Average Energy = Total energy of all nodes/Number of nodes = 64.93 Joules.
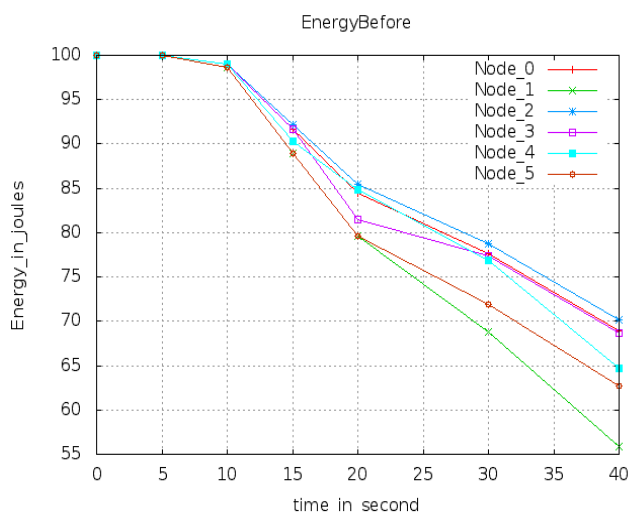
Fig 5: Energy Graph before applying algorithm in AODV

b. Energy Consumption of nodes in AODV after applying the proposed algorithm

After applying the proposed algorithm in AODV we reduce the energy utilization of every node as follows.

Node ID	Energy(in Joules)
0	68.82
1	71.43
2	70.67
3	69.16
4	65.78
5	67.24

Average Energy = Total energy of all nodes/Number of nodes = 68.85 Joules.
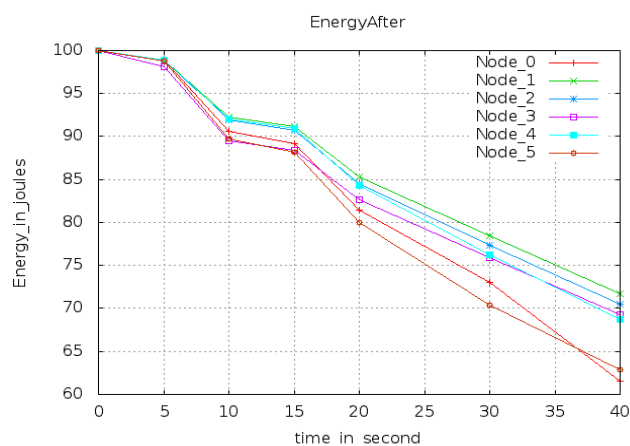
Fig 5: Energy Graph after applying algorithm in AODV

VI. CONCLUSION

In this paper the Minimum Number of Neighbor Nodes and Transmission Range Based Controlled overhearing protocol was proposed for mobile ad hoc networks that implement condition based eavesdropping MAC layer solution to boundary the getting envelopes of the nodes. Compare the anticipated technique with traditional AODV. Average energy of all the participating nodes in AODV is 64.93 joules and after applying the proposed algorithm of all the nodes is 68.85 joules. The simulation outcome represents that the proposed algorithm minimizes the total energy utilization and it leads to network.

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