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Sealed-bid Auction based Energy Efficient Route Selection in Mobile Ad-Hoc Network

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Abstract*: *In MANET (Mobile Ad-hoc Network) is an unstructured network. The nodes are moving any directions and frequently change its locations. So the nodes facing an energy issues. There are many energy efficient routing techniques in MANET. An energy efficient routing mainly classified transmission power control, load balancing, power save and energy efficient designed algorithms or techniques. In this paper focused on sealed-bid Auction based energy efficient route selection in MANET. This technique give a best Packet Deliver ratio and power consumption during the transmission time.

Keywords: Mobile Ad-Hoc Network, Energy Efficient Routing, Sealed-bid Auction techniques.

I. INTRODUCTION

A Mobile Ad-Hoc Network is an infrastructure less network frequently chance the network topology and configure itself. It also called a flat network and every devices called as node [3]. The nodes are sharing or exchanging the information one node to another node every node communicate with their neighbor nodes. Nodes are moving independently so it can change the location frequently. Why using for ad-hoc networks because it processing faster than other network and cost friendly. The routing protocols to find the route between the nodes. The MANET routing protocols are divided into two types (i) Reactive routing process when the signal reach the node then only it react otherwise it's not responding, (ii) proactive routing process it all ways in active mode. But some of the both can work it called hybrid routing. The ad-hoc networks suitable for the emergence situation, military conflicts and emergence medical situations etc,..

An Energy is the most important factor in MANET [9]. Energy only decided the nodes lifetime and also the networks lifetime. In the ad-hoc networks depends on the nodes energy actions based on their battery capacity. There are many protocols available to solve this problems how to reduce the energy consumption and increase the network life time. At transmission time if any problem with power it's affected the whole network communication. There are two basic approach to save the nodes energy level. (i) To minimize activity communication energy means transmission control and load distributed. (ii) Minimize inactivity energy to save the energy when the nodes are sleep or power down mode.

Auction is one of the branch in economical world every type of auction have set of rules. There are many issues but auction theorists fined the solution [2]. It gives an efficiency auction design pattern optimal and balanced bidding strategies. There are four type of auction play in the market (i) first sealed-bid auction (ii) second sealed-bid auction it also called vickrey auction. This two type of auction basically sealed-bidding type no one knows the bidding values it sealed the envelop cover to hand over the auctioneer then he will fine the highest bidder then announced the first and the second winner. (iii) Open ascending-bid auction called as an English Auction method. First fix the product average value the bidders bid in openly finally how gives the highest amount of this product the auctioneer announced he is the winner. The value increasing the small to large so it called ascending bid. (iv) Open descending-bid auction call as Dutch auction method. It process is opposite the English auction method.

II. RELATED WORK

Maitir Biphibhai Patel and Manish M. Patel [5] describe about the node residual energy and stability of the link in this mode gives better lifetime of the network. Here analysis various energy efficient routing protocols SBNRP (stable routing with power) factor, queue based energy efficient multipath load balancing in ad-hoc network, improved AODV using mean energy value, EM_AODV protocol(Energy Matrices _ AODV) , adaptive load balancing in AODV, Cost based power aware cross layer AODV, Energy efficient secured routing protocol. The source node start to broadcast the request packet. Each intermediated node adds its own residual energy and stability to forward its neighbor nodes. It checking every nodes information's finally destination node wait for predetermined amount of time for all routes calculate cost best on two factor (i) average energy value (ii) stability of node based selects the path with cost efficient.

S. Das and S. Pal [8] has analysis various energy efficient techniques and its pros and cons. The energy efficient techniques or algorithms are only focused on the results not concentrated on the actual problem. Here analysis some of the major problem to consider to write a new algorithm. This cause for excess energy consumption aspect are: - (i) unequal transmission energy due to different path length, (ii) overhearing by nodes, (iii) retransmission or data or control

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message due to collision or path congestion, (iv) common node / uneven load distribution, (v) route selection through nodes with less residual battery capacity.

Rangaraj Jayavenketesan and anitha mariappan [6] propose ACO_FDRPSO algorithm (Ant colony optimization _ fitness distance ratio particle swarm optimization).
ACO algorithm to find the energy efficient routing path based on the higher residual energy value. FDRPSO minimizing the energy consumption to save the network lifetime. Also using one more algorithm called duty cycle. It collaborated with ACO_FDRPSO algorithm. It monitor the nodes activity and nodes has no longer communication between them. It means the nodes no need to active mode put on the sleep mode. This algorithm works on hybrid method it gives better results of the node lifetime.

Getsy S Sara, Neelavathy Pari. S and D. Sridharan [1] reviewed the various energy efficient routing protocols, how it works on th network? And what are the techniques used? Here minimizing the active communication of the nodes, energy required to transmitting or receiving or minimizing the inactive energy. There is a comparison table of the various emerging energy efficient routing protocols. Compared metrics are given a better delivery ratio, lifetime of the nodes, energy dissipation rate, overhead ratio, end-to-end delay, energy reserve and multipath routing possibilities.

L. Femila and M. Marsaline Beno [4] implementing an efficient power are routing (EPAR) with help of (CCSPR) cooperative cost shortest path routing algorithm and (COSPNR) cooperative over shortest path non-cooperative routing algorithm. The EPAR algorithm to minimizing the variance of energies in all the nodes and prolong the lifetime of the network. it comparatively give a better throughput ratio in Future concentrate on the security perspectives.

Razvan Craciunescu, Simona Halunya and Albena Mihovska [7] analysis the relay selection process in a cooperative communication scenario. The Nash equilibrium algorithm used based on the marriage equation. The marriage equation help to predict the satisfaction ratio between the nodes. It help to nodes direct communication then select the relay modes.

Xiaozheng Gao, Ping wang, Dusit Niyato, kai yang and Jianping [10] An focused on the secondary network performance. So they implemented two auction based time scheduling structure for fixing the network demand and the variable-demand cases. The nodes act the seller as well as auctioneer then the bid for time resources. It works very efficiently in the simulation time.

III. DESING AND IMPLEMENTATION

In this paper implement a sealed-bid Auction based energy efficient route selection in MANET. Source node generate a hello message and broad cast their neighbor nodes. When the neighbor node receives the hello message it generate their own information like node energy level and progressive values. Here there is a bidding values of the nodes. Now the nodes update their neighbor nodes information with the Drain Rate and fix the Threshold value. Then find the best forwarding nodes, which node have a maximum weight of residual energy and progressive value. Finally forwarding a packets.

Initialization:-

FDN = Forwarding Node Destination,
NL = Neighbor List,
NHL = Next Hop Node = 0,
CNL = Candidate Neighbor List = 0,
MW = Maximum Weight = 0,
RE = Residual Energy,
DR = Drain Rate,
DRT = Drain Rate Threshold Value,
P = Progressive Value.

Update the neighbor list:-

FOR (i = 0 to i < NL. count)
FND ← NL. Count
DR= $\frac{Node\ Previous\ Energy - Node\ Current\ Energy}{Current\ Time - Previouse\ Time}$
DRT ← DR/2
IF (DRT <= 2.0)
CNL ← CNL + FND
END IF
END FOR

Find the best Forwarding Node:-

FOR (j = 0 to j < CNL. Count)
MW ← RE + P
IF (MW < Best)
NHN ← Best
END IF
END FOR

Here update the neighbor list with the help of the nodes drain ratio. First count the nodes list NL into the forwarding node destination FND. Now fine the drain ratio of every node the fix the threshold value because avoiding to add the failure nodes. If nodes drain threshold value greater than the drain ratio the node listed on the CNL candidate neighbor list otherwise the node not eligible for the transmission. Second find out the bet forwarding nodes to select the routing path. Check the every node in the candidate neighbor list then the nodes bidding their own the information. Here the bidding values are residual energy and the progressive value of the node failure rate it's not greater than of the threshold value. Then calculate the maximum weight nodes to select the best path forwarding the packets source to destination.

IV. EXPERIMENTAL RESULT

The implementation of our proposed algorithm sealed-bid auction based route selection technique by using the Network Simulation 2 (ns2) tool. Here proposed system called SBA_EERS "Sealed-Bid Auction based Route Selection". Analyzing the results which one is give a better results. The result analyzing parameters are Energy Consumption, Packet delivery Ratio, End-to-End Delay and Network Throughput. The simulation parameters are given Table I:

Table I: Ns2 Simulation Parameters

PARAMETERS	VALUES
Dimension	800 X 800 m
Channel Frequency	2.4GHZ
Data Rate	2 MBPS
Routing Protocol	AODV
Nodes	50
Simulation time	1200 m/s
MAC Protocol	IEEE 802_11
Packet Size	512 bytes
Propagation	Two Ray Model
Antenna Model	Omni-Directional
Interface Queue Type	Pri-Queue
Node Energy	500 Joule

Energy Consumption

The energy consumption is total amount of energy used in the time of packet transmission. Table II and Fig 1 shown as energy consumption is comparatively our technique save more energy starting both are the same level but the ending SBA_EERS is using less energy to transmitting the packets.

POWER CONSUMPTION		
Number of Nodes	AODV	SBA_EERS
10 Nodes	9.19362	9.18601
30 Nodes	6.00709	5.97681
50 Nodes	7.60854	6.53709

Table II: Node Vs Power Consumption

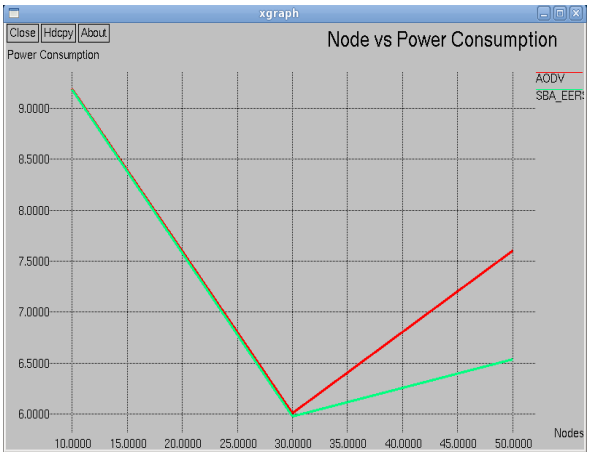

Fig: 1 Node Vs Power Consumption

Packet Delivery Ratio (PDR)

The packet delivery ratio calculated based on the received packets and generated packets as recorded in the trace file.

$$PDR = \frac{\text{Total no.of successful packets received}}{\text{Total no.of packets send}} \times 100$$

In the Table III and Fig 2 shown as packet delivery Ratio comparatively our SBA_EERS techniques give a better result 98.80%. Our proposed technique fine the best route so there is no packet loss it give a best result then existing.

PACKET DELIVERY RATIO		
Number of Nodes	AODV	SBA_EERS
10 Nodes	76.34%	86.91%
30 Nodes	80.39%	93.77%
50 Nodes	87.44%	98.80%

Table III: Node Vs Packet Delivery Ratio

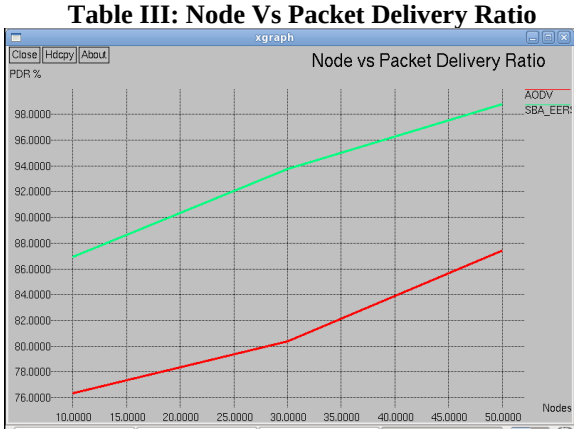

Fig: 2 Node Vs Packet Delivery Ratio

End – to – End Delay

There are four types of delay Queuing delay, Processing delay, transmission delay and propagation delay it works on various timing. The packets transmitting across the source to destination total time taken is call delay.

End – to – End Delay = $Start\_time_{np} - End\_time_{np}$

In the Table IV and Fig 3 shown as End-to End Delay its comparatively little bet high delay in our proposed technique SBA_EERS because first need to find out the best routing path then only transmitting the packets towards source to destination. So initially got high delay then it goes normal delay like existing delay.

END-TO-END DELAY		
Number of Nodes	AODV	SBA_EERS
10 Nodes	0.6117	2.0122
30 Nodes	4.4471	4.9462
50 Nodes	11.1233	11.4993

Table IV: Node Vs End-to-End Delay

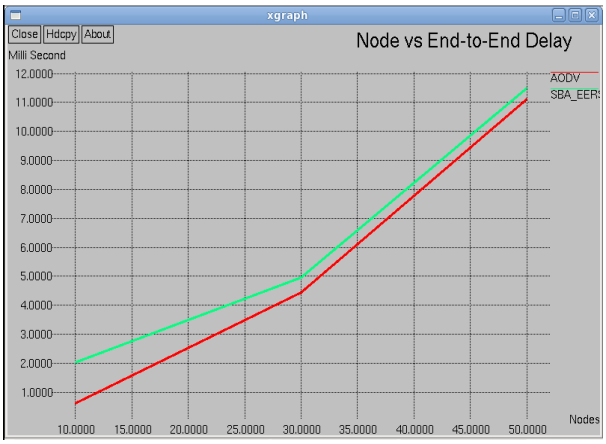

Fig: 3 Node Vs End-to-End Delay

Network Throughput

The total number of packets delivered over the total simulation time.

$$\text{Network Throughput} = \frac{\text{Total no.of successful packets delivered}}{\text{Total time taken}}$$

THROUGHPUT		
Number of Nodes	AODV	SBA_EERS
10 Nodes	45360	46980
30 Nodes	46116	49764
50 Nodes	49080	55672

Table V: Node Vs Throughput

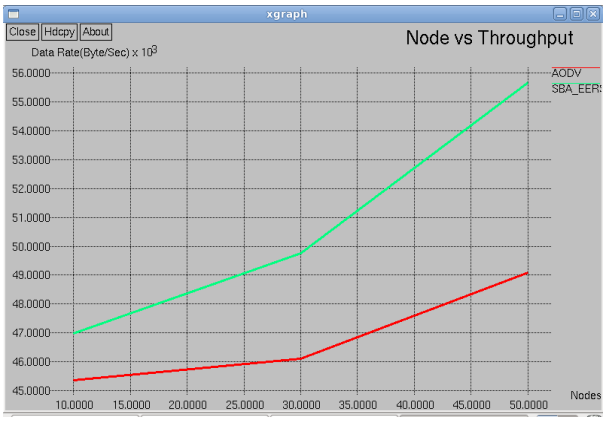

Fig: 4 Node Vs Throughput

In the Table V and Fig 4 Network Throughput it's give a better performance. If the number of nodes increases then there is an enormous variation but our proposed techniques gives better result.

V. CONCLUSION

An energy consumption is main problem in our network. Now a day's many algorithms and techniques are available foe MANET. The same time networks types are different so need to focus on suitable algorithms or techniques of network. It give a better result and easily solve the problems. In this work a sealed bid auction based energy efficient route selection techniques give a better result of packet delivery ratio and energy consumption. The same time delay is increase because our auction techniques first take time to select a routing path then it will take a normal timing.

In the future focus on reducing the end-to-end delay and consider some security aspects.

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