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OPTIMIZED ROUTING STRATEGIES TO RESOLVE THE ENERGY DRAINAGE AND ROUTING OVERHEAD ISSUE IN MANET

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Abstract: - *Energy saving is important and necessary in dynamic network because of deplete the unnecessary energy consumption of mobile nodes in MANET. Therefore, it is vital that at any moment some specific number of nodes be a live (sufficient energy for communication) and the rest remain is in sleep mode. If maintain number of live nodes in desirable way, so network lifetime will be prolonging by far. If live nodes can cover desirable level of network then a smaller number of live nodes will be required for communication in between sender and receiver. Power failure of a mobile node not only affects the node itself but also its ability to forward packets on behalf of others and thus the overall network lifetime. Energy depletion of nodes in MANET is one of the prime concerns for their sustained operation. In this research we proposed a new energy efficient approach to improve routing performance. In this scheme the proposed efficient routing is done with proposed scheme mechanism. The performance of proposed scheme is compared with pure AODV, DSDV and existing scheme but performance of proposed scheme is better. The nodes in network are lost their energy in each transmission in that case after some time most of the nodes in network are lost their energy by that that the link in network ate break then in that case the proposed energy efficient mechanism are not inform to sender for established the path but it renovate the new route in network from the same end were the link is break, it means proposed energy efficient drain rate minimization scheme are providing the route establishment capability to each node in network. If the link is repaired from that same end where it breaks then the energy consumption is reducing. The proposed mechanism is having a capability to renovate the link if it breaks due to lack of energy. The performance of proposed routing is better than normal energy-based multicast routing.*

Keywords: - MANET, Energy, Routing, Mobile, AODV, DSDV.

I. INTRODUCTION

An ad-hoc network, as the name suggests, is a network formed by nodes connected arbitrarily for some temporary time. The proliferation of cheaper, small and more powerful devices make MANET a fastest growing network. A Mobile Ad-hoc network (MANET) is a kind of wireless ad-hoc network having arbitrary topology (no fixed infrastructure) with mobility. Its intrinsic Flexibility, lack of infrastructure, ease of deployment, auto-configuration, low cost and potential applications make it an essential part of future pervasive computing environments. Due to nodal mobility, the network topology may change rapidly and unpredictably over time Message routing is a problem in a decentralize environment where the topology fluctuates. Few examples which use the concept of ad hoc networking include students working with laptop for participation in an interactive lecture, soldiers communicating information for situational awareness on the battlefield and emergency disaster relief personnel coordinating efforts after an earthquake. MANETs can be a viable solution for communications and information access. Consequently, this continuous development in the field of wireless communication networks has made it one of the most important areas of research.

Infrastructure Based Networks: These are the networks which work with a fixed wired/wireless backbone infrastructure and help all communication over this backbone. Infrastructure based wireless networks are also known as hosted or managed network, which consist of one or more access point being connected to an existing network. The bridges play a vital role on base station for these networks. Mobile phones which can communicate with the help of base stations is the best example for Infrastructure based wireless network.

Infrastructure less Wireless Networks*:* These networks work without the presence of a base station. Here, wireless devices communicate to each other through point-to-point connections. Multi-hop data forwarding is the one important aspect in infrastructure fewer wireless networks. Thus, the nodes that reside in immediate radio range of each other can only communicate via direct point-to-point connections. Here, in such cases the remote nodes need to be supported by other nodes in the network for making the communication between different nodes of the network. Infrastructure fewer wireless networks are also referred to as Ad hoc networks, as these can be deployed without the need of prior planning and base station.

II. LITERATURE SURVEY

Sachidananda S. Joshi and Sangappa Ramachandra Biradar [1] "Communication Framework for Jointly Addressing Issues of Routing Overhead and Energy Drainage in MANET" the title presents a communication district with inclusion of auxiliary nodes for minimizing the overhead during the routing process. The outcome of the proposed study shows significant reduction in routing overhead along with energy efficiency as compared to existing AODV and DSDV protocols.

A. Vijayan and M. Ramakrishnan [2] "Transmission Power Control Techniques on Energy Management in Mobile AD HOC Networks: Descriptive Review Study" This field of research still offers more scope as the world has seemingly become wireless. In MANET, mobile nodes are battery powered which needs to utilized fairly, especially, when no external infrastructure is available such as military battlefield applications. So, variety of algorithms has been

proposed to minimize the energy consumption while nodes are actively participating in network activities and also when they are idle. Transmission Power Control and Load Balancing Approach minimize energy consumption during active communication, whereas Power down Approach minimizes during inactive communication. This survey title was aimed to analyses active communication approach and also discussed about existing protocols and possible challenges in achieving energy efficiency.

Bhanumathi, R. Dhanasekaran,[3] "Energy Efficient Routing with Transmission Power Control based Bi-objective Path Selection Model for Mobile Ad-hoc Network" this title is to find an optimal path to prolong the network lifetime and to find energy efficient routes for MANET. Routing involves path discovery based on Received Signal Strength (RSS) and residual energy and selection based on an optimized bi-objective model. Bi-objective here represents energy and hop. In path discovery process, initially, transmit power required is varied to reduce energy consumption. Then the RSS of the Route Request (RREQ) and node's remaining energy are validated for deciding whether a node can forward the RREQ or not. Selecting the path that consumes less energy and a smaller number of hops extends the network lifetime. Theoretical computation is compared with the simulation results. As far as the simulation is concerned, the results of the proposed model called Energy Efficient Bi-objective Path Selection (EE-BPS) are encouraging. The selection process fetches us the energy saving, because of this model. On the other hand, if the optimal path is not considered, the nodes will drain off soon and the network lifetime will decrease.

Jyoti Upadhyaya, Nitin Manjhi[4] "A Survey on Energy Efficient Routing Protocols and problems in MANET" This title presents a survey on energy efficient routing protocols. These algorithms and methodologies modify routing protocol in order to reduce energy consumption and maximize life of network. These proposed methodologies also minimize energy consumption by selecting an energy efficient route.

P. S. Karadge, Dr. S. V. Sankpal, [5] "A Performance Comparison of Energy Efficient AODV Protocols in Mobile Ad hoc Networks"this title describes improvement of the conventional routing protocol by utilizing high energy paths in the network. We present a comparative analysis of existing AODV protocol and energy efficient AODV protocol which is modified to improve network lifetime as well as packet delivery ratio. Simulation results indicate that the routing scheme of proposed method is more efficient than existing well-known routing protocols.

Neha Yadav, Pooja Kundu [6] "A Survey on Energy Efficient Routing Protocols in Mobile Ad hoc Network" This title presents a literature survey of such energy aware routing protocols. These protocols are modified from existing routing protocols.

M. Kokilamani, Dr. E. Karthikeyan, [7] "Energy-Efficient Routing Protocols in Mobile Ad Hoc Networks: A Survey" In this title, different energy-based routing protocols have studied to design efficient energy-based routing scheme. The main contribution of this title is to provide an exhaustive survey on the energy-efficient routing protocols for MANETs as well as their classification based on its energy efficiency metrics.

Nazila Majdkhyavi, Raziyeh Hassanpour, [8] "A Survey of Existing Mechanisms in Energy-Aware Routing in MANETs" This title reviews some energy aware routing protocols. The main purpose energy aware protocols are efficiently use of energy, reducing energy consumption and increasing the network lifetime.

Natarajan Meghanathan and Leslie C. Milton [9] "A Performance Comparison of Stability, Load-Balancing and Power-Aware Routing Protocols for Mobile Ad Hoc Networks" this title is a simulation-based detailed performance comparison of three different classes of routing protocols for mobile ad hoc networks: stability-based routing, power-aware routing and load-balanced routing. We choose the Flow-Oriented Routing protocol (FORP), the traffic interference-based Load Balancing Routing (LBR) protocol and Min-Max Battery Cost Routing (MMBCR) as representatives of the stability-based routing, and load-balancing and power-aware routing protocols respectively. Among the three routing protocols, FORP incurs the least number of route transitions; while LBR incurs the smallest hop count and lowest end-to-end delay per data packet. Energy consumed per node is the least for MMBCR, closely followed by LBR. MMBCR is the fairest in terms of node usage and hence it incurs the largest time for first node failure. FORP tends to repeatedly use nodes lying on the stable path and hence is the most unfair of the three routing protocols and it incurs the smallest value for the time of first node failure. As we measure the failure times of up to the first five nodes in the network, we observe that LBR incurs the maximum improvement in the lifetime of the nodes and MMBCR incurs the least improvement beyond the time of first node failure.

Jaspreet Singh, Kartik Sharma [10] "Energy Efficient AODV routing protocol For Mobile Ad-hoc Network" In this title we proposed energy efficient AODV routing protocol in which Dijkstra algorithm is enhanced to improve the overall performance of the network. Existing systems are not capable of finding the shortest and energy-based path among the nodes in the network if multiple nodes fail simultaneously. Performance parameters are Packet delivery ratio, Throughput, Energy consumption and routing overhead. The simulation is done using NS2 network simulator.

Dharani D, Dr. Devaki P [11] "A Survey on Improving the Lifetime of the Network in Mobile Adhoc Network" This title presents some latest approaches that provide the energy efficient route in delivering the packets from source to destination and also enhance the lifetime of the network.

Ankit Verma, A. K. Vatsa [12] "Optimized Stable and Reliable Routing (OSRR) Mechanism in MANET" this title we future an optimized stable and reliable routing mechanism in MANET that's includes route discovery through node selection and edge selection based on various parameters. Thereafter optimal path is selected based on Global weight.

Nitin Manjhi, and Nilesh Patel [13] "Signal Strength Based Route Selection in MANETs" In this title we proposed a method which measures signal strength between nodes and compare with RSSI threshold values if it is greater than threshold value then it is accepted for further processing otherwise it is discarded. The benefit of this scheme is by selecting a strong route to the destination we can increase the lifetime of the network. Simulation results show that SSAODV has performance better than AODV routing protocol in terms of the metrics: End-to-end delay, Packets delivery ratio, throughput, Routing overhead.

Surabhi Purwar, Shiva Prakash [14] "Reliable pair protocol for Link Stability in MANET" This title presents a new protocol used for measuring link stability on basis of metric reliability pair factor. This title also used to provide stable links on the basis of different factor like power of node, signal strength of node and distance between the nodes. Using these factors this protocol discovers the route between source and destination and follows that route for data transfer.

Gaurav Sharma, Jigyasu Dubey, [15] "An Approach to Rigid Minimum Residual Power Level of Nodes in Multi-Hop Wireless Network" In this title an approach is presented that specify minimum residual energy level of nodes to prevent data transmission from irregular manner. The proposed approach also offered to sending prioritized data packets and discard Route-Request packets comes from other nodes during regular transmission. The work minimized battery dissipation via discarding route discovery request packets and maximize the period of data transmissions.

III. PROPOSED WORK

Mobile ad hoc network is a form of momentary node-based communication, where the device acquired light weighted resources. Each device capable to generate routing table in temporary bases, in recent time this network gains the popularity due to broad range of application in future communication. But the mobile device in dynamic nature such dynamics is mobility, signal strength, energy, bandwidth etc. Now a day those device natures generate the hurdle to adaptation in real world problem handling, so that many researchers focuses to tune the mobile ad-hoc network to implement for solving real world problems. In past research some of techniques to solve the problem of routing strategies under dynamic environment and tested under various conditions such as sparse and denser network medium with respect to mobile nodes. Other areas are energy consumption issue, security, load balancing, application of mobile ad hoc network etc. Through of those works motivate toward to optimization the existing technique to improve the solution accuracy with respect to network parameters. In the proposed approach develop the solution to finding the optimized route with respect to energy efficiency, reliability and low overhead. In the very first test the existing system and set the statement of research problem. And then apply the rule in step by step process, in firstly configure the nodes through initial energy, transmission power, receiving power and some other parameters, then broadcast the routing packets using Ad-hoc on-demand distance vector (AODV) routing. During the route request time each receiving node evaluate self-configuration and its utilization such as energy utilization per packets, processing utilization, queue utilization, current speed of node, location with respect to predecessor, receiving signal strength etc. In the second step those evaluated behaviour incorporated from routing packets and sends to upward direction of receiver nodes. Receiver node evaluate the incoming packets and sort the separated path tables based on priority (average energy consumption is low, receiving signal strength is higher, mobility lower) and compare to all the incoming tables with each other out of which select one best priority match table. In the third step receiver generate the reverse route and sends the acknowledgment to source node for further communication. Through the proposed routing methodology efficient path are selected but dynamic movement of mobile nodes require the maintenance process that's why monitor the all connected mobile nodes (in between path) with respect to speed, receiving signal strength variations, location, energy consumption rate and predict possibility of connection time of each node under connected path. While we get any node break the threshold (minimum 10% energy remains and rss 10% remain) than disjoint route repair module executes in respective zone and find the optimal node to re-establish the disjoint path in minimum route spreading manner. The proposed approach provides the reliable route with minimum energy consumption and routing overhead, high throughput and packet delivery ratio.

A. Proposed Algorithm:

In this section describe about how the proposed work are implemented. The algorithm of optimization routing and energy-based adaptation is providing efficient mechanism to overcome the problem of frequent route modification and energy drainage problem of mobile ad-hoc network. Algorithm provide the step by step process of execution the work in the below section.

Algorithm: Optimized Routing Strategies to resolve the energy drainage and routing overhead.

Input:

W: wireless mobile nodes
t: transmitter nodes
r: receiver nodes
e: {e_i, e_j ----- e_{n-1} , e_n } energy of node
q: {q_i, qj ----- q_{n-1}, q_n} queue for storing route packet
l: location of node
s: speed

rss: receiving signal strength
t_h: threshold 10%
ec: energy consumption
Z: { z_i , z_j --- z_{n-1} , z_n } sub zones
ψ: maximum radio zone 550m^2
RP: AODV routing protocol
rt: route table

Output: *Throughput, PDR, Energy consumption (ec), residual energy, routing overhead*

Procedure:

t want to search the route for communication with r node
t calls the routing class
execute the route method AODV with energy module
bind the AODV, energy, location, rss module
broadcast route request packet by t and generate rt table
If z_i in ψ and w found and w != r then
w evaluate (e_i, q_i, rss_i, s_i, l_i)
rt ← rt_t + rt_w (e_i, q_i, rss_i, s_i, l_i)
forward rt to next hop in next z_j
Else if z_i in ψ and w found and w == r then
rt_i, rt_{j----} rt_n receives by r
Evaluate all rt by r
Compare (rt_i, rt_j)
If e_i< e_j& rss_i> rss_j& s_i< s_j then
Select rt_i
Else
Select rt_j
r generates reverse path
Send acknowledge packet to r
End if
Else
r out of range
End if
If connected path w_k< t_h then
W_k initiate re-join query
Identified z_j
Multicast route message sends to w_n
Select w_u node using route initiation procedure
Re-established route through previous predecessor to successor node via w_u
Else
Selected path complete reliable till end
End if

IV. SIMULATION PARAMETERS

Table are representing the following simulation parameters to make the scenario of routing protocols [16]. The detailed simulation model is based on network simulator-2 (ver-2.31), is used in the evaluation. The NS-2 instructions can be used to define the topology structure of the network and the motion mode of the nodes, to configure the service source and the receiver etc. The numbers of nodes are considering 100 and the simulation of nodes are done with four protocols with same network scenario in MANET.

Table 1: Simulation Parameter

Parameters	**Value**
Network Type	MANET
Nodes/Devices	100
Physical Medium	Wireless
Simulation Iteration	500
MAC Layer	802.11
Routing Protocol	AODV
Traffic Type	CBR, FTP
Number of Connection	Random
Propagation radio model	Two ray ground
Rate	10 packet/s

V. RESULT DESCRIPTION

A. Energy Residual Analysis

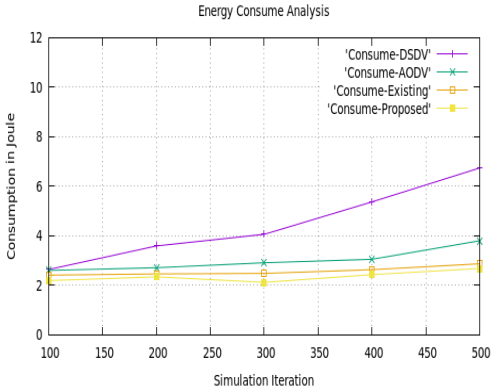

Figure 1: Residual Enegry Analysis

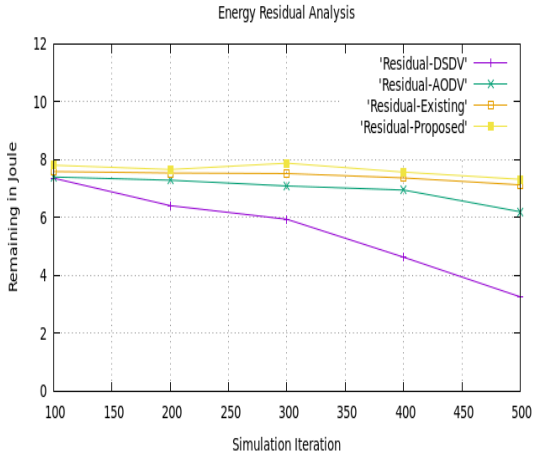

Figure 2: Energy Consumption Analysis

B. Energy Consume Analysis

In communication between sender and receiver, most of the nodes are playing the role of intermediate nodes in MANET.The sender is consuming the highest energy for trans-

mitting the data as well as control packets in network. Receiving energy is the second highest energy consumption in factor in network If the possibility of retransmission is reducing than the transmission energy consumption are also reduces. In case of previous scheme, the intermediate nodes are not able to select the alternative option in network if the link is break due to energy depletion. On the other hand, the proposed scheme has an ability to repair the route and again the transmission is started from the same state where it breaks. In this graph the proposed scheme performance of the energy is little bit less consumed as compare to previous scheme that shows the effectiveness of proposed scheme.

C. Routing Load Analysis

The routing packets in network are also consumes energy for sending and receiving. These are the packets that finding the destination generated by the source. The number of routing packets in normal energy AODV, DSDV and previous scheme routing is more flooding and because of that routing load due to link breakage that occurs the condition of retransmission in MANET. The proposed scheme is minimizing the routing is much better than normal DSDV and AODV. In proposed energy efficient drain rate minimization scheme routing packets delivery is less that shows strong link connectivity. The nodes that are selected for communication is reliable in term of energy capacity and due to that the possibility of data loss and retransmission is reduced and provides better data delivery in a given simulation time.

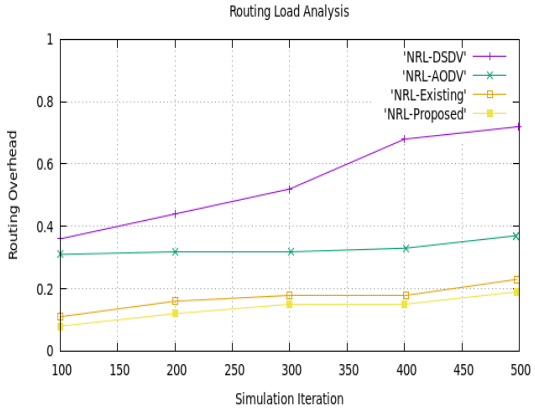

Figure 3: Routing Load Analysis

D. Packet Delivery Ratio Analysis

The Packet Delivery Fraction (PDF) performance metrics is represents the percentage of successful percentage of data received at destination. The number of nodes in MANET are died early due to energy exhaustion. In this graph the PDR performance of normal energy routing with DSDV, AODV, previous scheme and proposed is evaluated and identified that the PDR of proposed scheme is slightly more but in normal energy-based routing that is slightly low.The PDR performance is depending on the ration of input and output. If the data packets are less transmitted as equal to the receiving, it means PDR is good but in case of large packets transmission data is also received in good quantity but the percentage value is not possible more than 80%. In the previous routing scheme receiving is normal but improved then DSDV and DSDV.

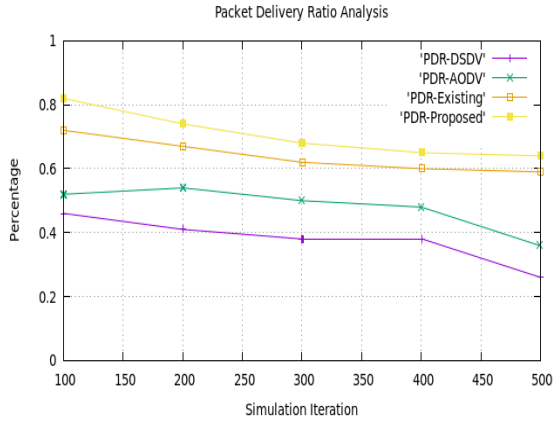

Figure 4: Packet Delivery Ratio

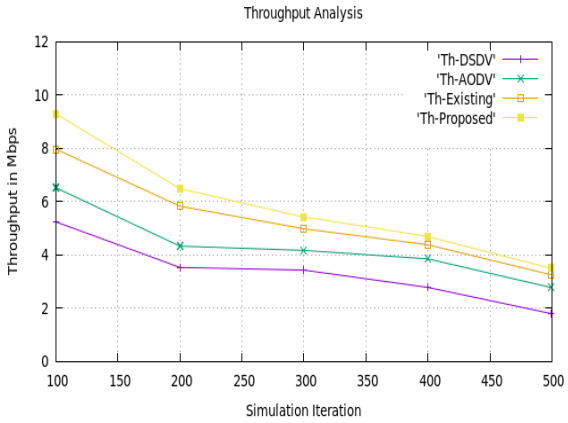

Figure 5: Throughput Analysis

E. Throughput Analysis

In throughput performance metrics, number of packets measure in network in per unit of time. The time in simulation we consider in seconds. Every communication in MANET is done by limited source energy of mobile nodes. The energy consumption of mobile nodes is also reducing the working capability of nodes. The throughput of proposed routing is about 9.2 Mbps in end of simulation time and also it is reaches to 2.8 Mbps. As compare to propose the performance of normal energy DSDV, AODV and previous scheme about 4.6 Mbps, 6.2 Mbps and 8Mbps. The throughput performance of proposed scheme shows the energy utilization is more in data packets receiving. It minimizes the energy consumption, possibility of retransmission that enhance network life time of network.

VI. CONCLUSION AND FUTURE WORK

The communication in dynamic network is not the easy task because of changing the location of mobile stations in network. The number of nodes in network are communicate with each other in dynamic changing environment and the strong connection possibility in between sender and receiver is also dependent on the nodes having sufficient energy for communication. The proposed research is completely based

on, to minimize the energy drain rate and provides optimization in proposed routing strategy. The performance of DSDV, AODV, previous work and proposed route optimization technique is improving throughput, PDR and minimizes the energy consumption and delay in dynamic network. Energy depletion of nodes in ad hoc networks is one of the prime concerns for their sustained operation. Conformist routing protocols typically focus on minimizing the number of hops or minimizing direction errors from the source node to the destination node but they don't generally focus on the optimize routing strategies by reduce energy depletion of the nodes. If the same node may be selected repeatedly, thereby causing its early depletion in energy then also measures it according to functional capacity. The routes selected are such that all the links of the routes are highly stable. This will increase the lifetime of the route. Current focus in energy-aware routing is to know the energy level of nodes and to include the value into route optimization process. The simulation result is shows that the proposed energy DSDV, AODV, previous scheme and proposed scheme are improving the network performance and reduces the energy consumption in network. The individual energy consumption states like transmission, receiving and idle are also saves the energy in network. The performance of proposed scheme is capable to maintain the strong link establishment in between sender and receiver i.e. also enhance the network life time.The location of mobile nodes are changes unpredictable in network because of that each and every time search the route from source if the link is break due to energy depletion and nodes are goes out of range in network. In future we also apply the Location Aware Mechanism to other compare their performance with any existing proposed protocol. The location is identified through GPS (Global Positioning System) and the route selection is also based on the higher Received Signal Strength (RSS) of nodes in a link.

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