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Modified Energy Efficient Transmission State MAC Protocol for improving link Stability in MANET- A Review

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Abstract: *Mobile adhoc network are flexi-mobile, they use wireless connections to connect to various networks. An ad-hoc network is a collection of wireless mobile hosts forming a network without central epicentre. The automated factor means that any mobile nodes can join or leave the network at any point of time when they want which causes many prob like Qos parameters is affected The EETS is the improved version of AODV protocol for path recovery in mobile adhoc networks. In the EETS protocol, when the mobile node change its location then link failure occurred in the network. The EETS protocols works on the node connectivity factor for the link recovery. When any node detects link failure in the network, then the node with which maximum number of nodes is connected is selected as the best node for link recovery. The EETS protocol performs well in terms of certain parameters but for the link recovery it donot include quality of service parameters. In this research work, improvement in the EETS protocol will be proposed by applying quality of service parameters for path recovery & Better Link Stability in mobile adhoc networks. The quality of service parameters are like Overhead, Energy consumption and delay.*

Keywords: AODV, EETC MAC, Modified EETC MAC.

I. INTRODUCTION & CHARACTERSTICS OF MANET NETWORK

To resolve the problems like power consumption of a device in MANETs and improve the overall network quality, a routing technique is applied [3]. Having an up-to-date route to all the nodes at all times is the major attempt of the various outing solutions proposed by different researchers. The routing control information is exchanged periodically and as per the topological changes in case of proactive routing protocols.

Following are the important characteristics of MANETs that distinguish them from other networks:

1) Infrastructure-less Nature: For performing communication among the nodes, collaboration among the independent peer-to-peer nodes generates MANET [2]. There is no definition of prior base station and all the devices have similar role to perform.

2) Dynamic Topology: The mobility of MANET nodes is free. Therefore, the links and topology of network will change constantly when the nodes move in and out of the network. Either unidirectional or bi-directional links could be generated among nodes. Higher user density and large level of user mobility are however, caused by this feature in MANETs.

3) Multi-Hop Communications: MANETs require multi-hop communication since they have the signal propagation properties of wireless transceivers. Thus, MANETs perform multi-hop routing for mobile nodes in case when a source node is out of the radio range of a destination node. Due to the limited transmission radius, a message is passed across multiple nodes from source to destination node.

II. DIFFERENT PRE-PROCESSING METHODOLOGY (COMPREHENSIVE LITERETURE SURVEYS)

Author	**Description**	**Simulation Environment**	**Our Contribution**
K. Anish Pon Yamini, K. Suthendran, T. Arivoli, "Enhancement of energy efficiency using a transition state mac protocol for MANET", 2019 Computer Networks, Volume 155, 22 May 2019, Pages 110-118, [1]	In this The first routing path towards destination was chosen on the basis of minimum distance by the recommended algorithm The proposed routing algorithm was called TSMP (Time Synchronized Mesh Protocol). This protocol conserved energy and used existing nodes efficiently.	The experimentation is done using NS2 software to evaluate the certain parameters like Throughput, Average Energy Consumption, Delay & Overhead.	From this Paper we Learned that the achieved simulation results depicted that recommended routing algorithm showed lower average delay with minimum overhead and less energy expenditure
Y. Neeraja, V., "A novel power efficient MAC protocol design for MANETs", 2017, IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI). [2]	In such networks, the optimized information sharing schemes were more crucial. These networks mainly considered routing, energy managing, and MAC layer management. A new energy efficient MAC protocol had been recommended in this work	Different factors played an important role for improving the efficacy of the network. These factors included delay, throughput and average power utilization & NS2 Simulation Environment is used for evaluation.	Under this we learned that Major research in the ad hoc networks is on routing and MAC channel allocation schemes. Power efficiency is also a major aspect to increase the network life time and throughput. So it recommended routing algorithm novel power efficient MAC scheme with ACO optimized path selection procedure
Chaker Abdelaziz Kerrache, Andrea Lupia,,"An energy-efficient technique for MANETs distributed monitoring", 2017, 13th International Wireless Communications and Mobile Computing Conference [3]	The proposed approach included both trust and link period amid truthful peers for moderately dividing the monitoring time. The periodically shared hello messages were used in this work for making this approach completely distributed	By using the ns2 platform this approach also ensured the high discovery ratio of malevolent nodes & evaluates the Energy Consumption parameter.	In this paper we Learned that the proposed approach made energy consumption constant. No increase in energy consumption was noticed with the increase in number of nodes.

Aqeel Taha, Raed Alsaqour, Mueen Uddin, Maha Abdelhaq, Tanzila Saba, "Energy Efficient Multipath Routing Protocol for Mobile Ad-Hoc Network Using the Fitness Function", 2017, IEEE Access, Volume: 5 [4]	The recommended algorithm was called FF-AOMDV (AOMDV with the fitness function). Finding best route from source node to the destination node for reducing power consumption in multipath routing was the main aim of fitness function	Network Simulator Version 2 is used and performance Metrics parameters included energy consumption, throughput, packet delivery ratio, end-to-end delay, network life span and routing overhead ratio, packet size, and simulation time etc	From this paper we learned that Energy consumption is considered as one of the major limitations in MANET, as the mobile nodes do not possess permanent power supply & have to rely on batteries, thus reducing network lifetime as batteries get exhausted very quickly as nodes move and change their positions rapidly across MANET. The research proposed in this paper highlights this very specific problem of energy consumption in MANET by applying the Fitness Function technique to optimize the energy consumption in Ad Hoc On Demand Multipath Distance Vector routing protocol.

Andrea Lupia, Chaker Abdelaziz Kerrache, Floriano De Rango, Carlos T. Calafate, Juan-Carlos Cano, Pietro Manzoni, "TEEM: Trust-based Energy-Efficient Distributed Monitoring for Mobile Ad-hoc Networks", 2017, Wireless Days [5]	The proposed approach included both trust and link period amid truthful peers for moderately dividing the monitoring time. The periodically shared hello messages were used in this work for making this approach completely distributed	Under the Simulation environment of NS2 , The achieved simulation results proved the worthiness of recommended algorithm in terms of energy efficiency, particularly for high density conditions	In this Paper We learned that in such conditions, consumption became constant and did not increase with the number of nodes while making certain high identification ratio of malevolent nodes.
Prasanta Kumar Manohari , Ankit Dubey, Niranjan K. Ray, "A Technique to Enhance the Energy Efficiency of Multipath Routing Protocol for MANETs", 2016, 2nd International Conference on Computational Intelligence and Networks (CINE).[6]	This routing algorithm was termed as energy efficient multipath routing (E2MR) . In order to select route, the recommended algorithm used a cost metric. It was a function of remaining battery energy and the existing traffic load at a node	NS2 Simulation Environment is used for evaluation of parameters included end-to-end delay, PDR & Energy Consumption	From this Reseach we learned that simulation results revealed that the recommended algorithm performed better than other existing protocols in term of different performance parameters . These parameters included lower end-to-end delay, higher packet delivery ratio and more remaining energy.
Atif A. Alghamdi , Robert J. Pooley, Peter J. B. King, "Energy-efficient adaptive forwarding scheme for MANETs", 2016, Wireless Days (WD) [7]	For evaluating the performance of the recommended routing algorithm they used ns2.In contrast to the Pure-Flooding AODV and Dynamic-Power AODV, the recommended algorithm	This work used a simulation tool called NS2 (network simulator version 2) for evaluating the performance of the various parameters like Overhead and Power Consumption	In this we learn that he proposed algorithm combined various other algorithms that worked together for reducing overhead and power consumption. The recommended algorithm used the information of the single hop neighboring radios.
Siddhant Dodke, P. B. Mane, M.S. Vanjale, "A survey on energy efficient routing protocol for MANET", 2016, 2nd International Conferen	Selecting an energy efficient route on the basis of vague set measurement method was the main concept behind the recommended routing algorithm	NS2 Simulation Environment is used for evaluation of parameters like Energy Consumption	From this we learned that achieved simulation results depicted that recommended routing algorithm highly contributed in the performance extension

ce on Applied and Theoretical Computing and Communication Technology (iCATccT). [8]			of MANET in terms of energy efficiency.
Kartik Chawda, Deepmala Gorana, "A survey of energy efficient routing protocol in MANET", 2015, 2nd International Conference on Electronics and Communication Systems (ICECS).	In this work, different existing routing algorithms were reviewed and the classification of these algorithms was done on the basis of techniques applied, advantages and limits	Network simulator version 2 is used to work on Energy Consumption parameter.	From this we learn that direct comparison of this algorithm was not easy as every method was different from other. It was possible to design an energy efficient protocol using analytic results.
Thamizhmaran Krishnamoorthy, Akshaya Devi Arivazhagan, "Energy efficient routing protocol with ad hoc on-demand distance vector for MANET"	The proposed protocol used residual energy and hop count as parameters. The route having minimal left over energy and least hop count was selected for the routing	They use NS2 environment to compute the Quality of service parameters life Efficieny , hop count , Energy Consumption .	Under this we learned that in contrast to AODV (Ad Hoc On-demand Distance Vector Routing) and MaxlMin energy routing protocol, the recommended algorithm improved quality of service and life span of the network.
, 2015, IEEE 9th International Conference on Intelligent Systems and Control (ISCO) [10]	purpose. As per the range of the neighboring node, adjustments in transmission energy of the node had been done.		
Prasanta Kumar Manohari , Niranjan K. Ray, "EAOMDV: An energy efficient multipath routing protocol for MANET" , 2015, IEEE Power, Communication and Information Technology Conference (PCITC) [11]	This was a multipath routing protocol. This protocol selected routes between source-destination pair on the basis of a route cost function. The remaining battery energy of a node and its existing traffic were considered in this work for measuring cost function	By using Simulation Environment of NS2, they evaluate the parameters like Energy consumption and PDR.	In thus we learned that the achieved simulation results depicted that the recommended protocol reduced energy consumption and improved packet delivery ratio.

Routing in MANET: For dynamic mobile environment, the proactive routing protocols are the improvised versions of traditional routing protocols that were used in wired networks. Having an up-to-date route to all other nodes is not necessary at all times. Thus, for setting up routes to nodes only at the time of communication and keeping them alive only until their requirement, reactive routing protocols are designed.

Energy Efficient Routing Protocols for MANET: For establishing communication paths among nodes without causing traffic overhead on the power constrained devices, efficient routing protocols are designed since

the MANETs are categorized by a multi-hop network topology that changes frequently due to the mobility. For the ad hoc networks, energy is a limiting factor.

Following are the important characteristics of MANETs that impact this factor:-

(i) It is very imp for the nodes to use energy to perform tasks for which batteries are placed which they have limited power in them.

(ii)Frequent route failures occur when nodes move in an uncontrolled way in the network.

The only solution to all such problems is providing an energy efficient routing protocol in these networks. Since the on-demand routing protocols like EETC, IEETC are more energy efficient in comparison to proactive protocols, most of the energy efficient protocols are based on it [4]. Sensible flooding at the route discovery process of reactive protocols also provides better energy efficiency. The efficient metric for route selection can be achieved by energy efficiency as well. The network lifetime and performance can be improved by applying energy efficient routing.

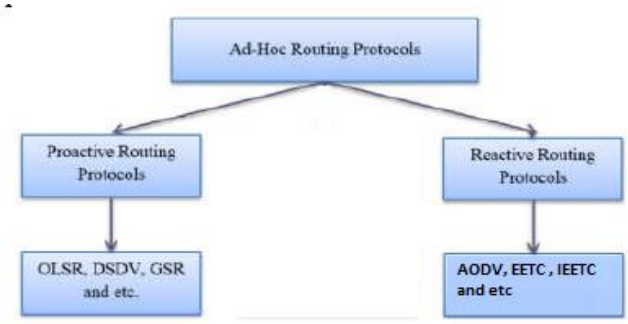

Figure 1: Type of AD-Hoc Routing Protocols

III. PROPOSED WORK

The nodes are deployed in the network and path is established according to AODV protocol from source to destination. The EETS (Energy Efficiency Transition State) protocol is the improved version of AODV protocol which plays role for the link recovery. There are many nodes in the path having so much movability than other nodes. Because of this nodes link failure problem arises. Due to this the performance is degraded and low reliability of the network occurs. In this technique, the parameter of node connectivity is considered to recover path from source to destination. The mobile node which has maximum energy is selected as the best node for the path recovery using Improved EETC. The EETC protocols works on the node connectivity factor for the link recovery. When any node detects link failure in the network, then the code with which maximum number of nodes is connected is selected as the best node for link recovery. The EETC protocol performs well in terms of certain parameters but for the link recovery it does not include quality of service parameters.

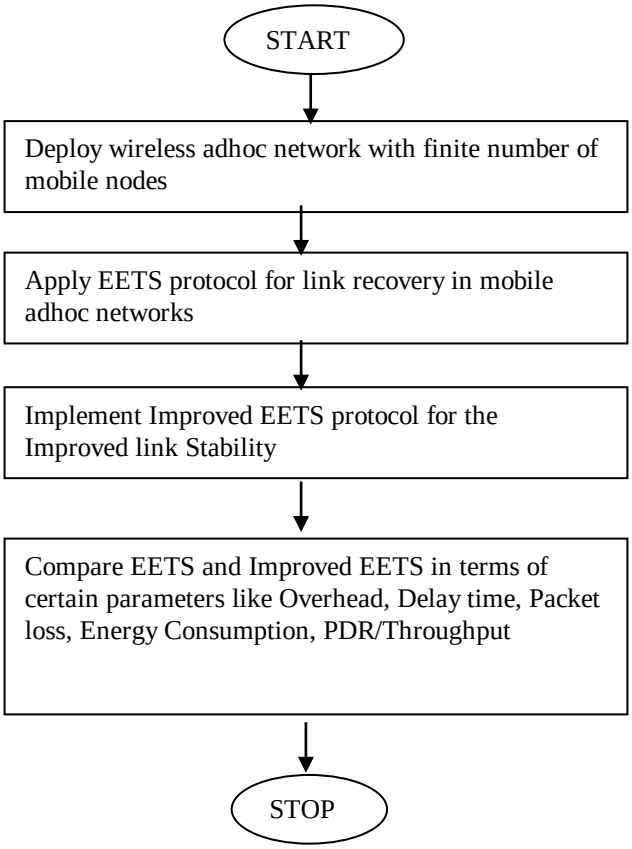

Figure 2: Proposed Flow Chart

In this research work, improvement in the IEETC protocol will be proposed by applying quality of service parameters for path recovery in mobile ad-hoc networks The Improved Energy Efficiency Transmission Control routing Protocol (IEETC) includes the several components in it which are discussed further. The major objective of this proposed protocol is to replace the variables used within the network parameters by utilizing a novel connectivity and buffer size estimation metric. Further, a novel dynamic connectivity factor is utilized in order to drop the extra RREQ packets. Due to this, the routing overhead of the net- work is minimized. In order to work within the three major stages which are route discovery, route reply as well as route maintenance, the AODV, the EETC, and the proposed improved EETC protocol are introduced.

IV. CHALLENGES

1. The mobile ad hoc network is the decentralized type of network in which chances of link failure is very high. The techniques like AODV which are proposed in the previous years for the link recovery require much time.

2. The technique which are proposed for the link recovery does not include the proper quality of service parameters.
3. The EETS is the energy efficient protocol for the link recovery which works on the basis of node connectivity and it does not include the quality of service parameters.
4. To Overcome the Flaws and lags in AODV and EETC protocols we proposed for IEETC (Improved Energy Efficiency Transmission) MAC Protocol. By using Improved EETC this Qos parameters Improved in form of Control Overhead, E2E DELAY, Packet Loss, and Energy Consumption is reduced and improves Link Stability in MANET.

V. METHODOLOGY ADOPTED

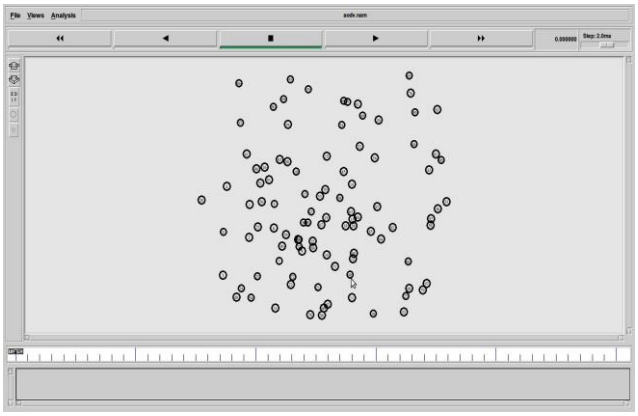

Figure 3: Network Deployment

The deployment of the network with infinite mobile nodes is demonstrated in figure 3. Mobile nodes are allowed to enter or exit the network at any time without any restriction. The self-configurable nature of this network makes routing one of the major issues of this network.

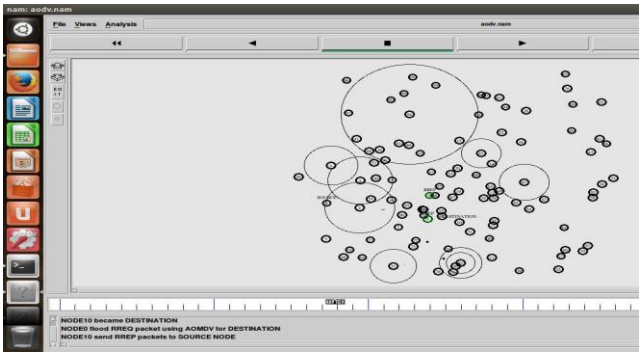

Figure 4: Flooding of RREQ messages & Path Formation

As evinced in Figure 4, the source node propagates route request message and nodes that are closest to the destination make reply by sending RREP message. formation between source and destination depends
Also the nodes closest to the destination make reply by sending RREP message. There are two parameters namely hop count and sequence number based on which the formation of most ideal route between source and destination depends. In the established route, link failure occurs due to the change of some nodes' position.

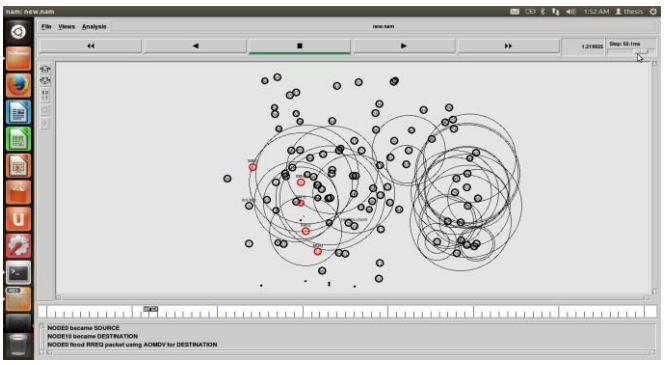

Figure 5: Path failure

Figure 5 shows the selection of route between source and destination. Link failure in the network causes path breakage and the packets may loss.

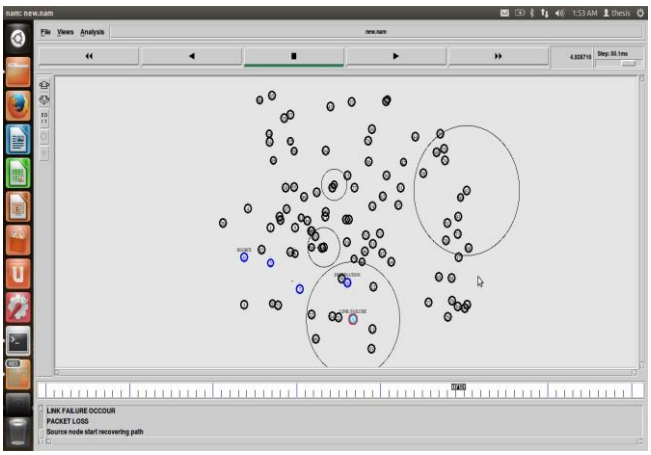

Figure 6: Route Recovery

As depicted in figure 6, the source floods the recovery message across the network and nodes make reply through their connectivity. The node with maximal connectivity is picked up as the recovery node.

VI. SIMULATION & PERFORMANCE PARAMETERS

By using the latest version of NS2 Simulator , which is version 2.35 & By Considering Number of nodes, Topology Size, Node Transmission Range, Connection Type(CBR), Packet size, Route bandwidth Performance Metrics Parameters like in form e2e delay time, Control Overhead, PDR, Throughput in order to evaluate the Efficiency and Link Stability.

Packet Delivery Ratio (PDR). It is calculated as follow:

$$PDR(\%) = \frac{\sum \text{Number of packets received}}{}$$

$$\sum \text{Number of packets sent}$$

Equation(1)

Average Throughput (TP): it is calculated as follow:

Throughput Formula= Number of Bytes Received * 8 * Simulaton Time * 1000 kbps

Equation(2)

Average End-to-End Delay (e2e delay) Avg e2e delay is the average time of the data packet to be greatly process across the network from the src to the destination. It is computed as follow:

$$\text{E2e Delay} = \frac{\sum \text{arrive time} - \text{send time}}{\sum \text{no. of connections}}$$

Equation(3)

Packet Loss (PL): It is computed as given below:

Packet Loss = No. of packets sents – no. of packets recieved

Equation(4)

VII. CONCLUSION

This comparative study carried out Routing Protocols on mobile adhoc network to improve link Stability. Different pre-processing and proposed techniques were discussed that helps to extract enhancements. . The EETS is the improved version of AODV protocol for path recovery in mobile adhoc networks. The EETS protocol performs well in terms of certain parameters but for the link recovery it lags in some quality of service parameters. From this survey, we consider that Modification in the EETS protocol will be proposed to improve quality of service parameters for path recovery in mobile adhoc networks & we consider that Modified EETC MAC becomes the better option for link Stability.

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