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Load Balancing Mobile Routing Technique for Ad Hoc Networks

*S.J.SANGEETHA[#1], Dr.T.RAJENDRAN[*2]*
[#1]Research Scholar, Department Of Computer Science,
*[*2]Assistant Professor,Department of Computer Science,*
PERIYAR UNIVERSITY, SELAM,
*[*2]Arignar Anna Government Arts College,*
Namakkal, India.

Abstract—themobile impromptu network (MANET) is nothing however the wireless association of mobile nodes that provides the communication and quality among wireless nodes while not the requirement of any physical infrastructure or centralized devices like access purpose or base station. The communication in MANET is finished by routing protocols. There are completely different completely different classes of routing protocols introduced with different goals and objectives for MANETs like proactive routing protocols (e.g. DSDV), reactive routing protocols (e.g. ADOV), geographic routing protocols (e.g. GRP), hybrid routing protocols etc. There are 2 necessary analysis issues with such routing protocols to deal with like economical load equalization and energy potency. during this paper, we have a tendency to are specializing in analysis and analysis of economical load equalization protocol style for MANET. Inefficient load equalization technique ends up in increasing routing overhead, poor packet delivery quantitative relation, and different Quality of Service (QoS) parameters. In literature, there are variety of various ways planned for up the performance of routing protocols by economical load equalization among mobile nodes communication. However, most of the ways suffer from varied limitations. during this paper, we have a tendency to propose a unique technique for improved the QoS performance of load equalization approach yet as increasing the network life. analysis of Network life is out of scope of this paper.

Keywords—AODV; MANET; Load balancing; throughput; packet delivery ratio; routing overhead.

I. INTRODUCTION

The term MANET (mobile impromptu network) is outlined because the wireless autonomous network within which nodes get connected by wireless links while not victimization any physical infrastructure. MANET may be a temporary network. every node in MANET acts as each information sender or receiver and information forwarder above all direction hand-picked by routing protocol. All mobile nodes in network move indiscriminately inside a selected network space. Field is one among the most space wherever MANET is wide used. For communication purpose, such reasonably networks don't want any additional support within the style of base stations or access points. Therefore, it's a complete dynamic and infrastructure-free network. MANET network is nothing however a gaggle of radio devices within which wireless communication is dead with none mounted physical foundation. The communication between the supply mobile node and destination mobile node isn't direct, however rather is carried by victimization intermediate nodes in step with multi-hop communication approach. Direct communication will solely be attainable among neighboring nodes.

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The mobile nodes in MANETarea unit placed willy-nilly and incessantly dynamic their positions in network. Thus, the interconnections among mobile nodes are dynamic overtimes. Such networks area unit so self-organizing and self-configuring and one doesn't need central management for configuration purpose. In MANET, all nodes will communication one another victimization the wireless links. because of the characteristics of MANETlike permitting access to services anyplace, anytime ubiquitously while not would like of any physical devices or platform, it's principally utilized in crisis management services, military areas, conference halls, classrooms, etc. Development of transmission applications like video conferencing and video on demand is feasible solely owing to accidental networking developments of MANETs.

The communication in MANETs is feasible because of use of routing protocols that facilitate to get the communication ways, choose the ways, forward information on current ways, maintain the routes, and handle frequent changes in routes because of frequent nodes movements. the standard and existing routing protocols failed to addressed the problems associated with QoS (Quality of Service). QoS is nothing however the extent of performance of specific routing protocol of service providing to network finish users. several real time applications particularly transmission programs having the QoS necessities that should be achieved. the essential aim of QoS solutions is to urge the improved settled behavior of network with the target of delivering the info carried by wireless network justly, and utilization of network resources ought to be economical. However, there's still the analysis challenge of maintaining the QoS solutions in line with finish users quality. several of the present routing protocols conferred up to now for MANET area unit targeted either at minimizing the info traffic in wireless network or at reducing the amount of hops taken to deliver packets.

The main reason of not providing the QoS solutions with existing routing protocols is that they're not designed with load reconciliation approach to address diver's conditions of MANET, mobility, information traffic, etc. For Mobile accidental networks, one in every of the vital drawback is load reconciliation. As we tend to mentioned earlier during this paper, the present routing protocols don't have the process of coping with load reconciliation in MANET. Therefore, since the last twenty years, variety of strategies are designed for load reconciliation in routing protocols. because of rising application necessities and conjointly for reliable information transfer, load reconciliation is one in every of the key analysis areas within the field of MANETs. In MANETs, taskfinishing particularly is a lot of complicated if there's a lot of traffic on mobile nodes with decreased process capability. there's no special technique for load sharing. Non-uniform process or computing power of systems resulted in load imbalance in MANET. Sometimes, bound nodes within the network area unit over laden and a few nodes area unit utterly idle. The mobile node with higher process capabilities will complete its tasks in pace. Such nodes area unit treated that it doesn't load or less load all the time. Therefore, scenario of nodes with less load area unit keep idle, and demand of over loaded mobile nodes is objectionable.

Many routing approaches are developed for load reconciliation in MANETs. Major analysis work is administered by approaching the load reconciliation drawback through congestion estimation and control. Some approaches area unit utilized in energy and power metrics for creating routing call for load reconciliation. Clustering-based approaches conjointly exist. only a few literatures use queue size, hop count, and information measure metrics for load reconciliation in mobile accidental networks. However, for MANET, there area unit 2 analysis

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challenges like QoS improvement and energy potency. These 2 points weren't with efficiency addressed by existing strategies. Therefore, it becomes a motivation for this analysis paper to gift novel hybrid approach for load reconciliation in MANET with goal of rising QoS performance and energy potency performance.

The main goal of this research is therefore to gift novel formula for economical load reconciliation technique. This planned methodology ought to address each load reconciliation and energy potency parallel. The planned methodology has 2 necessary options like methodology of link estimation planned for energy potency improvement and another is learning of network load reconciliation so as to realize the improved QoS solutions. These 2 contribution points area unit combined along so as to realize each energy potency and improved QoS performance. However, during this paper, we have a tendency to keep the scope significantly with analysis of QoS performance of economical load reconciliation technique. Energy potency is out of scope of this paper. the remainder of this paper is organized as follows: section II presents the connected work studies over completely different load reconciliation techniques with analysis. Section III presents an outline of planned framework, formula steps and style. Section IV presents the simulation studies and results achieved with completely different network conditions. Finally Section V presents the conclusion and discusses future work.

II. RELATED WORK

In [1], the authors Yin and Lin presented the MALB technique which is based on multipath communication load balancing approach. For every discovered path, this protocol iteratively tracking the current traffic rate. The tracking of traffic rate is done for reducing the end-to-end delay performance in network.

In [2], authors present another technique which is based on similar approach presented in [1] for multipath communication based protocol.

In [3], authors Wu and Harms introduce the communication among the 2 node disjoint routes as the number paths among

the nodes on different routes. From the practical analysis and results of this method, it can be seen that increasing the correlation results in increasing end to end delay for two numbers of paths. Therefore, to decrease this end to end delay performance, another approach is introduced in which traffic balancing is done around the least correlated routes.

In [4], [5], [6], different unify path based load balancing techniques are proposed by authors. In [4], various routing metrics are considered. In [5], packet caching approach is adopted. In [6], directional antennas approach is used.

In [7], the authors Zhu and Hassanein propose the new load balancing routing method known as LBAR. This protocol considers the nodal activity for routing metric from the total number of valid routes.

In [8], authors Lee and Riley presented approach for overloaded mobile nodes in which it is presented that such nodes would have freedom to forbidding the extra communications in order to make them load free by solving their overloaded condition. Therefore, every mobile device of MANET having the specific threshold value for making the decision on receipt of RREQ messages. There are number of other articles presented in which comparative study among multi path and single path load balancing techniques is discussed. Practically, the multipath-based load balancing methods providing the various benefits for improving the fault tolerance as well as reliability. However, it is showing that in [9], single path based techniques claim to be more efficient for load balancing.

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In [9], author Pearlman,*et al.* introduced an approach for multipath-based routing method which is efficient if the alternate routes are disjoint. However, this is not simple to achieve in MANETs [10]. In [11], author Ganjali and Keshavarzian proposed that under any MANET with large number of mobile nodes the approach of multipath communication can address the load balancing more efficiently as compared to single path routing approach if there are huge number of routes utilized among all source and destination pairs.

In [12], the authors presented the performance evaluation multipath routing approach and reactive routing approach with load balancing technique.

In [13], author of this paper proposed method of load balancing in which number of realistic parameters like battery powers of every node, processing capabilities of every node, communication cost required for transferring the loads from overloaded nodes to under loaded mobile nodes.

In [14], author Saigal,*et al.* introduced another load balancing technique for MANET called as LARA (load aware routing in ad hoc). In this protocol, traffic density metric is utilized for presenting the contention degree at MAC layer. During the process of route setup, traffic density parameter is utilized for selecting the communication path with less traffic load.

In [15], the authors presented the details on selecting the right trade off among improved performance and increased routing overheads.

In [16], authors present the new technique for achieving the both improved reliability in case of path failures as well as multipath based load balancing routing in MANETs. This paper achieves the objectives through full use of multiple paths in MANETs to solve frequent paths failures problems as well as load balancing problem.

In [17], authors Chakrabarti and Kulkarni present an approach for designing the alternate paths that are maintained as well as used in the DSR protocol. This method also provides the QoS solutions by ensuring the proper bandwidth for data transfer even if mobile nodes are under the mobility.

In [18], Souinli, *et al.* introduced another technique of load-balancing which push data traffic from the network center. This approach delivered the new routing parameters which consider the mobile nodes centrality degree for reactive as well as proactive routing methods.

In [19], author Pham, *et al.* presented the multihop wireless communication networks in which IGW (internet gateway) method is used for providing the internet connectivity, wireless network linking with global Internet. However, for taking the benefits of capacity generated through the multiple gateways, routing protocol presented in [19] is required to balance the load efficiently between all the available IGWs in order to achieve the optimized network performance.

In [20], the authors Yoo, *et al.* introduced the load balancing technique called SLBA means simple load balancing approach. This method can easily added to any existing routing protocols (reactive only). This SLBA method reduces the traffic concentration by enabling every node for dropping the RREQ packets or for giving up the packet forwarding.

In [21], author Khamayseh,*et al.* presented a novel MLR (Mobility and Load aware Routing) method for reducing the impacts of broadcasting problem. Flooding process is controlled by MLR method by restricting messages of rebroadcast based on less speed as well as less loaded mobile nodes. In this method every mobile node takes decision on received RREQ message depending on number of parameters such as routing load, speed etc.

In [22], authors Cheng, *et al.* presented approach for formulating problem of dynamic load balanced clustering into the problem of dynamic optimization. To solve this problem,

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author presented the different types of dynamic genetic algorithms in MANETs.

III. PROPOSED METHODOLOGY

The flowchart in Figure 1 is showing the simulation work flow and comparative study parameters. To address the problem of achieving both efficient load balancing and energy efficiency we design and proposed novel algorithm called EELAR (energy efficient load aware routing) in which both factors traffic on mobile nodes and energy level of mobile nodes considered while communication. Algorithm 1 is our proposed algorithm.

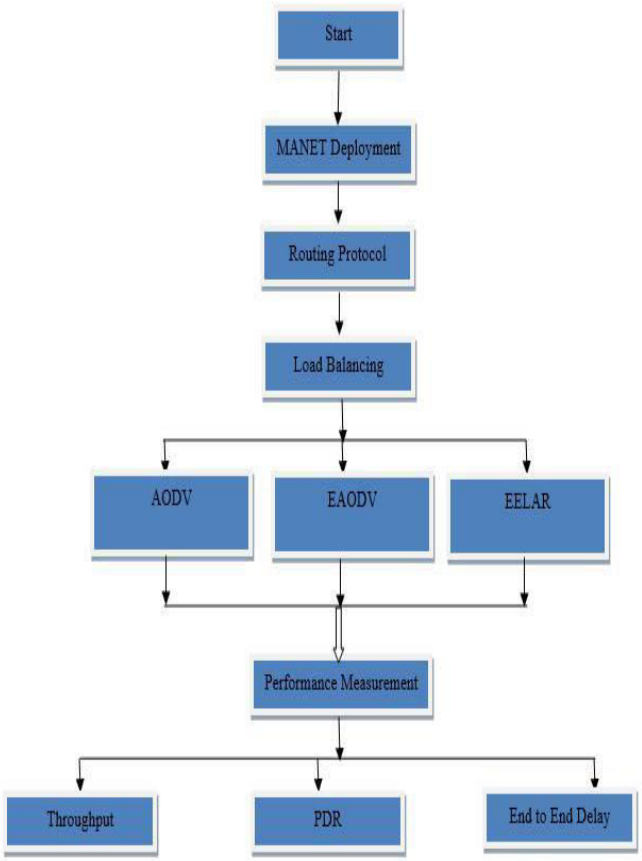

Fig. 1. Flowchart of simulation work

Algorithm 1: EELAR Method

Inputs:

Routing Table Entry,

packet p,

node ID,

Set energy threshold,

Set load threshold values.

Step 1: Extract the current packet details

Step 2: Define the routing table pointer

Step 3: Extracting the Destination space (DA) by computing the depth from sink node

Step 4: Extracting the Forwarding space (FA) by computing the sink node neighbors

Step 5: Finding the shortest path from supply to destination

Step 6: Update routing table entries

Step 7: Apply Energy potency perform

7.1.: Before beginning information transfer, convert all nodes except supply node into the sleep state

7.2. If supply node is prepared to send information on elite active ways, then convert all nodes into active state from sleep state.

Step 8: Apply Load reconciliation perform for information forwarding

Step 9: If energy state of any node goes below threshold or load on node goes explicit threshold, then finds another alternate path so as to balance load or improved the network time period performance.

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Step 10: If any node detects all its lower depth nodes below current threshold price, then it calculates new threshold and, begin causation information on those ways once more.
Step 11: Repeat this method still to the simulation ends.

Step 12: Stop.

IV. EXPERIMENTAL RESULTS

A. *Network Configurations*

For sensible work analysis, we tend to used Network machine (NS2). In NS2, we tend to enforced and evaluated the projected EELAR protocol for comparative study purpose against existing AODV and EAODV routing protocols. This simulation is completed on Ubuntu package and exploitation NS-2.34 version. The performance of routing protocols analysis is completed supported numerous network situations and electronic communication approaches underneath the varied network conditions. For this simulation study we've got used 2 main parameters like variable quality speed and ranging range of mobile nodes in network. we've got designed 2 totally different network situations for evaluating the performance of projected protocol that is known as as EELAR. Tables one and a pair of show the opposite configuration parameters used.

B. *Simulation Results*

We have compared the performance of 3 routing protocols exploitation 3 performance metrics like AODV, EAODV and projected EELAR technique for load leveling QoS performance.

TABLE I. SIMULATION CONFIGURATION FOR SCENARIO 1-VARYING MOBILITY SPEED

Number of Nodes	50
Traffic Patterns	CBR (Constant Bit Rate)
Network Size (X * Y)	1000 x 1000
Simulation Time	100s
Transmission Packet Rate	10 m/s
Pause Time	1.0s
Routing Protocol	AODV/EAODV/EELAR
MAC Protocol	802.11
Channel Data Rate	11 Mbps
Mobility Speed	10 m/s to 50 m/s

TABLE II.SIMULATION CONFIGURATION FOR SCENARIO 2-VARYING MOBILE NODES

Number of Nodes	20-100
Traffic Patterns	CBR (Constant Bit Rate)
Network Size (X * Y)	1000 x 1000
Simulation Time	25s
Transmission Packet Rate	10 m/s
Pause Time	1.0s
Routing Protocol	AODV/EAODV/EELAR
MAC Protocol	802.11
Channel Data Rate	11 Mbps
Mobility Speed	30 m/s

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Scenario 1 Results:

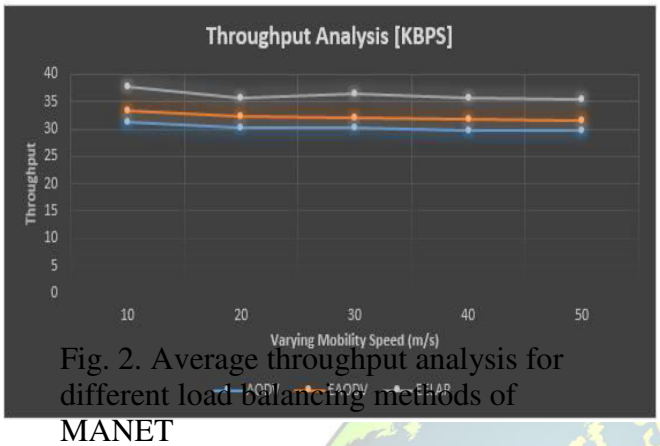

Fig. 2. Average throughput analysis for different load balancing methods of MANET

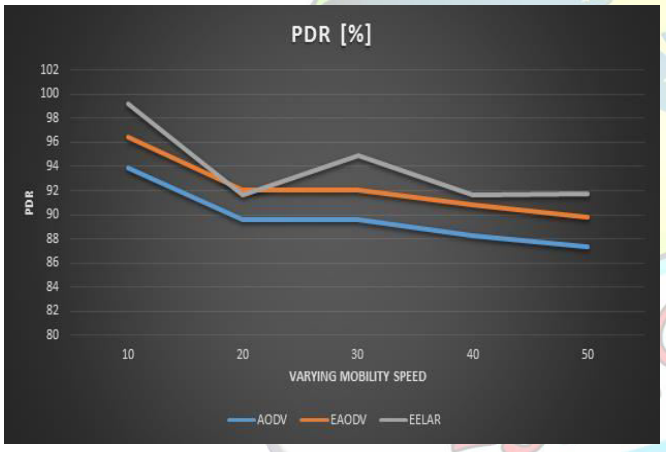

Fig. 3. Average delay analysis for different load balancing methods of MANET

Fig. 4. Packet Delivery Ratio analysis for different load balancing methods of MANET

Figures 2, 3, and four show the performance analysis for average output, average finish to finish delay, and packet delivery quantitative relation, severally for 3 studied routing protocols like AODV, EAODV, and EELAR. we tend to vary the quality speed of mobile nodes by keeping total variety of mobile nodes fifty to every quality speed. The results show that we've got achieved higher QoS performance for projected EELAR protocol. For this initial situation.it's showing that performance of output and PDR is improved by thirty five considered compared to EAODV protocol. the tip to finish delay is reduced by 15 August 1945 to eighteen as compared to EAODV protocol. Similarly, Figures 5, 6, and seven show the results for output, delay and PDR severally for network situation a pair of. within the second situation, the output shows associate degree improvement of thirty eighth and delay is reduced by twenty second as compared to EAODV approach.

Scenario 2 Results

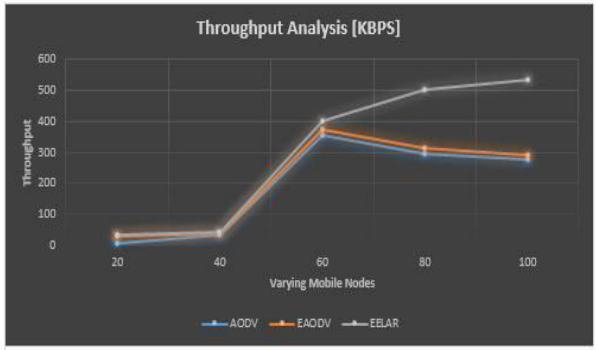

Fig. 5. Throughput analysis for different load balancing methods of MANET varying number of mobile nodes

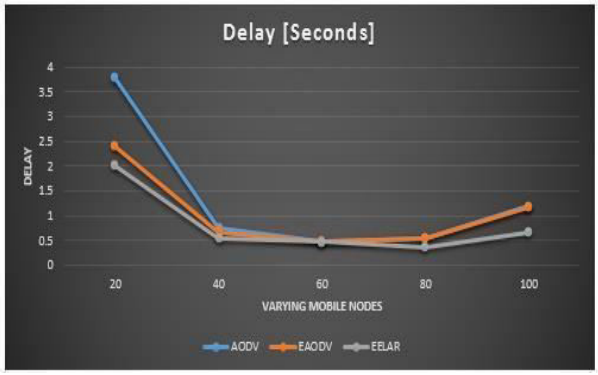

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Fig. 6. Delay analysis for different load balancing methods of MANET varying number of mobile nodes

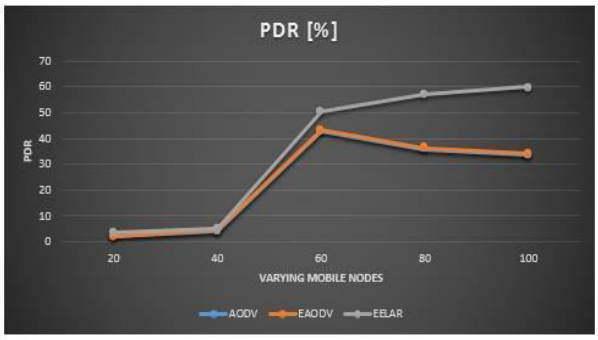

Fig. 7. Packet delivery ratio analysis for different load balancing methods of MANET varying number of mobile nodes

V. CONCLUSION

The MANET, load equalization technique plays a really important role so as to realize the QoS solutions. the normal Eduard MANET routing protocols laid low with additional routing overhead and weakened packet delivery magnitude relation thanks to not addressing the load equalization in Eduard MANET communications. during this paper, we tend to initial conferred the issues in Eduard MANET, then conferred totally different solutions for load equalization techniques conferred thus far. we tend to designed new load equalization technique for achieving the improved QoS performance as compared to existing EAODV and AODV routing protocols. The results section showing that we've simulated 3 protocols AODV, EAODV and projected EELAR with 2 totally different network conditions. The results are compared by considering 3 necessary performance metrics of any routing protocol like output, finish to finish delay and packet delivery magnitude relation. Altogether cases, projected load equalization approach shows improved performance in comparison to existing ways.

REFERENCES

[1] S. Yin, X. Lin, MALB: MANET adaptive load balancing, in: IEEE Vehicular Technology Conference (VTC2004-Fall), vol. 4, September 2004, pp. 2843–2847.

[2] L. Zhang, Z. Zhao, Y. Shu, L. Wang, O.W., W. Yang, Load balancing of multipath source routing in ad hoc networks, in: Proceeding of the IEEE International Conference on Communications (ICC 2002), May 2002.

[3] K. Wu, J. Harms, Performance study of a multipath routing method for wireless mobile ad hoc networks, in: Proceeding of the Ninth International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunications Systems (MASCOTS'01), August 2001.

[4] L. Wang, L.F. Zhang, Y.T. Shu, M. Dong, O.W.W. Yang, Multipath source routing in wireless ad hoc networks, in: Proceeding of IEEE CCECE, 2000, p. 479.

[5] A. Valera, W. Seah, S.V. Rao, Cooperative packet caching and shortest multipath routing in mobile ad hoc networks, in: Proceeding of IEEE INFOCOM, 2003.

[6] S. Roy, S. Bandyopadhyay, T. Ueda, K. Hasuike, Multipath routing in ad hoc wireless networks with omni directional and directional antenna: a comparative study, in: Proceeding of the Fourth International Workshop on Distributed Computing, Mobile and Wireless Computing (IWDC), 2002, pp. 184–191.

[7] A. Zhou, H. Hassanein, Load-balanced wireless ad hoc routing, in: IEEE Canadian Conference on Electrical and Computer Engineering, vol. 2, 2001, pp. 1157–1161.

[8] Y.J. Lee, G.F. Riley, A workload-based adaptive load-balancing technique for mobile ad hoc networks, in: IEEE Wireless

Communications and Networking Conference (WCNC'2005), vol. 1, 2005, pp. 2002–2007.

[9] M. Perlman, Z. Haas, P. Scholander, S. Tabrizi, Alternate path routing for load balancing in mobile ad hoc networks, in: IEEE Military Communications Conference (MILCOM 2000), October 2000.

[10] P.Pham, S. Perreau, Multi-path routing protocol with load balancing policy in mobile ad hoc networks, in: IFIP Int'l Conference on Mobile and Wireless Communications Networks (MWCN 2002), September 2002.

[11] Y. Ganjali, A.Keshavarzian, Load balancing in ad hoc networks: single-path routing vs. multi-path routing, in: Twenty-third Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM 2004), March 2004.

[12] P. Pham and S. Perreau, "Performance analysis of reactive shortest path and multi-path routing mechanism with load balance," IEEE Conference on Computer Communications (INFOCOM 2003), March 2003.

[13] Turgut, D.; Turgut, B.; Das, S.K.; Elmasri, R.; , "Balancing loads in mobile ad hoc networks," Telecommunications, 2003. ICT 2003, 10th International Conference on , vol.1, no., pp. 490- 495 vol.1, 23 Feb.-1 March 2003.

[14] V. Saigal, A. Nayak, S. Pradhan, and R. Mall, "Load balanced routing in mobile ad hoc networks", Computer Communications, Vol.27, 2004, pp.295-305.

[15] Peter P.Pham, Sylvie Perreau , "Increasing the network performance using multi-path routing mechanism with load balance, Ad Hoc Networks, Volume 2, Issue 4, October 2004, Pages 433-459.

[16] AntoniosArgyriou, Vijay Madisetti, "Using a new protocol to enhance path reliability and realize load balancing in mobile ad hoc networks", Ad Hoc Networks, Volume 4, Issue 1, January 2006, Pages 60-74.

[17] GautamChakrabarti, SandeepKulkarni, "Load balancing and resource reservation in mobile ad hoc networks", Ad Hoc Networks, Volume 4, Issue 2, March 2006, Pages 186-203.

[19] [OussamaSouihli, MounirFrikha, Mahmoud Ben Hamouda, "Load-balancing in MANET shortest-path routing protocols",. Pham ,Erlend Larsen ,Paal E. Engelstad, Øivind Kure, "Performance analysis of gateway load balancing in ad hoc networks with random topologies ", Proceedings of the 7th ACM international symposium on Mobility management and wireless access, 2009, pp.66-74.

[20] YounghwanYoo, SanghyunAhn, Dharma P. Agrawal, "Impact of a simple load balancing approach and an incentive-based scheme on MANET performance", Journal of Parallel and Distributed Computing, Volume 70, Issue 2, February 2010, Pages 71-83.

[21] YaserKhamayseh, GhadeerObiedat, MunnerBaniYassin, "Mobility and Load aware Routing protocol for ad hoc networks", Journal of King Saud University - Computer and Information Sciences, Volume 23, Issue 2, July 2011, Pages 105-113.

[22] Hui Cheng, Shengxiang Yang, Jiannong Cao, "Dynamic Genetic Algorithms for the Dynamic Load Balanced Clustering Problem in Mobile Ad Hoc Networks", Expert Systems with Applications, , 5 September 2012.