

ENERGY EFFICIENT ROUTING PROTOCOL FOR MANET : FF-AOMDV

Sapna kumari C

Assistant professor, Department of Electronics and communication engineering, Nitte
Meenakshi Institute of Technology, Yelahanka, Bangalore, Karnataka

Manjusha Behera

Assistant Professor, School of Electronics Engineering Campus 12, KIIT deemed to be
University, Bhubaneswar, Odisha

Devasis Pradhan

Assistant Professor, Department of Electronics & Communication Engineering, Acharya
Institute of Technology, Bangalore -560107, Karnataka

Tirtha Majumder

Associate Professor, Dept. of Electrical and Electronics Engineering, School of Engineering
and Technology, Adamas University, Kolkatta

Abstract

One of the greatest traits of technological know-how is networking. For a quantity of decades, networking has been an necessary aspect of communication. The hubs include the quintessential business enterprise associations. Power is one of the most quintessential factors that the nodes consider. MANET nodes solely have a restricted quantity of power. At the factor when the hub's energy is not depleted, it is utilized for positive undertakings. The frameworks are continuously impacted by way of energy deficiencies, which likewise affect the availability of the organization. Issues with power additionally have an impact on the mobility and congestion of the nodes, which in flip reasons packet loss and hyperlink disasters as nicely as a terrible impact on the protocol's fantastic of provider (QoS) performance. In MANET, this find out about combines balanced and energy-efficient multipath routing (BEMRT) with sturdy transmission. With the assist of this blend, the business enterprise will definitely favor to undergo the troubles illustrated above, which are reliant upon the FF-AOMDV path disclosure component.

Keywords: Ad-Hoc Network, Fitness function, QoS, Energy Efficient

1. Introduction

Data verbal exchange and networks is the essential subject the place the science has pushed and impacted many areas. All the embedded structures or different information conversation structures in basic terms depended on the internet or laptop networks. Many nodes mixed structure a network. The nodes can be any structures that can be ship or obtain any information. two All the nodes talk through the hyperlinks with every different [1]. The hyperlinks are related by using the channels additionally named as verbal exchange channels. These channels can be telecommunication, optical, wireless, etc.

The cell nodes have the privilege of no longer often altering their personal IP addresses. Mobile IP technological know-how is the identify of this one. With the help of Foreign and Home Agents, Mobile IP nodes are tasked with managing IP addresses. A cellular IP node's Ad Hoc Network is a definitely wi-fi machine that can use any cellular community infrastructure except a base station. The nodes can have any form of hyperlink arrangement, and each node is in cost of making the router work with the Mobile IP at exceptional mobility degrees [2].

2. Basic System of Communication

Basic verbal exchange mannequin communicates the data from one location to another. The source generates the records which is transmitted. Transmission machine is a community which includes the facts to a unique receiver [4]. The receiver receives the statistics and sends to the destination. The complete procedure is proven in determine 1. The transmission community can be wired or wireless. Communication can be nearby or far off [5-8]. Local is commutation internal a precise region or building.



Figure 1. Block Diagram for Basic Communication System

3. Concept of MANET

The field of mobile computing is expanding at an exponential rate as a result of the strategy of numerous free wi-fi devices. As a result, networks are conducting extensive lookups. MANET is a mobile ad hoc community in which communication takes place only among its nodes. It is necessary to switch devices outside of their transmission range [6-10]. With no get admission to the point, MANET is a self-configuring community of cellular routers and nodes related by way of wi-fi links. In a network, every cellular system operates independently. It is inevitable for cell gadgets to advance, cross arbitrarily, and prepare themselves subjectively. The MANET's topology modifications unevenly and dynamically as nodes share the wi-fi medium. Cellular hosts are utilized for the installation of independent base station structures. This installation makes use of a community mannequin with a single hop cell. two The two cellular nodes' communication relies entirely on constant base stations. In MANET, nodes can travel anywhere for free.[11,12]



4. Benefits of MANET Protocols

When the constant infrastructure community is both too pricey or no longer reliable, advert hoc networks can be very helpful. Ad hoc community set up is effortless due to the fact it would not want to design base stations or set up them, so it would not require as tons human interventions[13,14,15].The shape for making use of the 4G structure and the sources it offers is already constructed into Mobile Ad Hoc Networks. This offers customers geared-up machine environments that allow them to lift out a range of duties and speak with one every other regardless of the place they are or what machine they are using. The World Wide Web or the net as a total ought to encompass advert hoc networks. As a result, a quantity of customers and gadgets will definitely gain from the community provider.They are influenced to be used in conjunction with present mobile infrastructures due to their capacity, range, and strength arguments [16,17,18].

5. Performance Issue

MANET and different traditional wired, constant networks have a vast vary of qualities. The sub-qualitative and quantitative elements of the graph and implementation should be taken into account when growing a routing protocol that is appropriate for the MANET working environment[19,20,21]. Table 1 discusses the critical issue.

Table 1. Critical Issues

Sl.No.	Features	Remark
1	Active Topology	<ul style="list-style-type: none"> • The hyperlinks are supported with the aid of the distance between every node. • In a MANET system, updating statistics inside nodes can be challenging.
2	Loop Freedom	<ul style="list-style-type: none"> • This ensures that the routing protocol will be dependable due to its uniqueness.
3	Distribution Operation	<ul style="list-style-type: none"> • MANET in places devoid of the conditions for the institution of the vital network • Routing may additionally no longer be structured on a single node in these locations.
4	Usage of Bandwith	<ul style="list-style-type: none"> • The routing protocols in a wi-fi community gadget are sure to make the most of bandwidth resources. • The topological statistics can not be maintained by means of routing protocols due to the fact of the restrained transmission range.
5	Independence	<ul style="list-style-type: none"> • There is no provision for a server-side or centralized

		administrator due to the impartial mobilization of the routing nodes.
--	--	---

6. Modified Methodology

In MANET, this locate out about combined BEMRT with sturdy transmission. This aggregate will continue to be the troubles which happen in mainly appointed networks. Errors are minimized at all ranges thanks to this combination [22,23]. The multi-path from the furnish to the holiday spot is hooked up with the useful resource of the energy-efficient neighbor node mechanism. The implementation of a new QoS with balanced strength effectivity is established on the FF-AOMDV route discovery mechanism. The health feature "Fitness Function Ad Hoc On Demand Multipath Distance Vector" is used effectively[24]. Stable transmission is finished by means of taking into account a range of elements like sign strength, queue length, and delay. One definition of multipath is that each the supply and the vacation spot have more than one routes. Multipath makes it feasible for the system to pick the choice course even if one route fails or has a problem[25,26]. Data transmission mistakes are decreased when there are a couple of paths. The protocols are routed the usage of vector distances or hyperlink country routing algorithms. Routing commercials are required often by using these algorithms. Taking into account the network's general topology, every router is broadcast to the different routers. It takes into account a range of networking-related elements to decide which is the shorter distance [27,28,29,30].

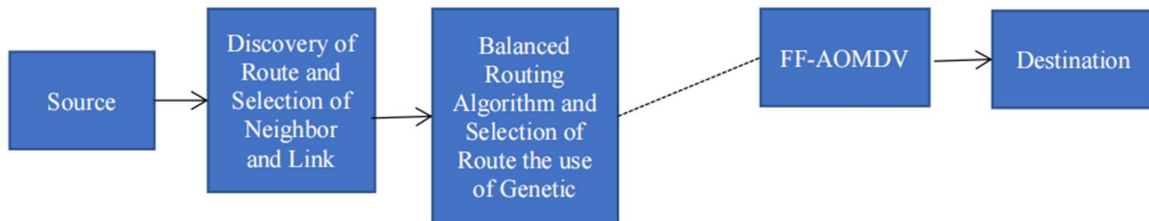


Figure 2. Modified Version with FF-AOMDV Mechanism

7. Parametric Analysis

The parametric analysis has been done according to the flow chart.

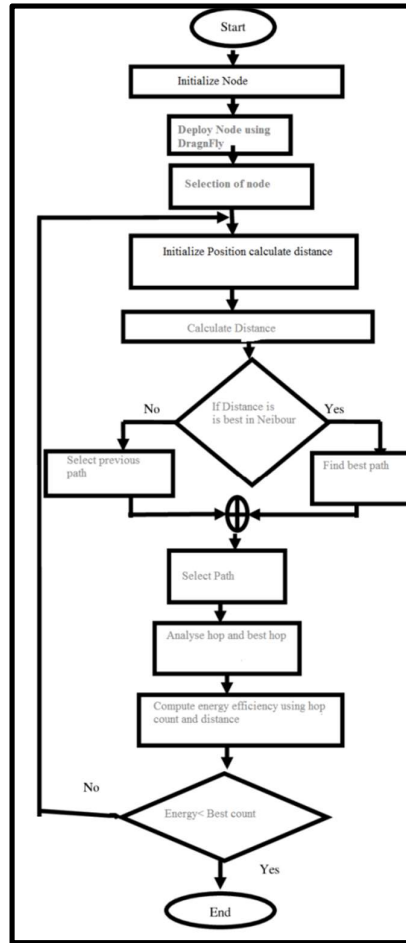


Figure 3. Flow chart for the parametric analysis

- a) End-to-End Delay: The common quantity of time it takes for records packets to efficaciously transmit messages throughout a community from a supply to a vacation spot is referred to as the end-to-end delay. This consists of all types of delays, which include interface queue packet queuing; switch time and propagation time; and buffering all through the latency of the route discovery .

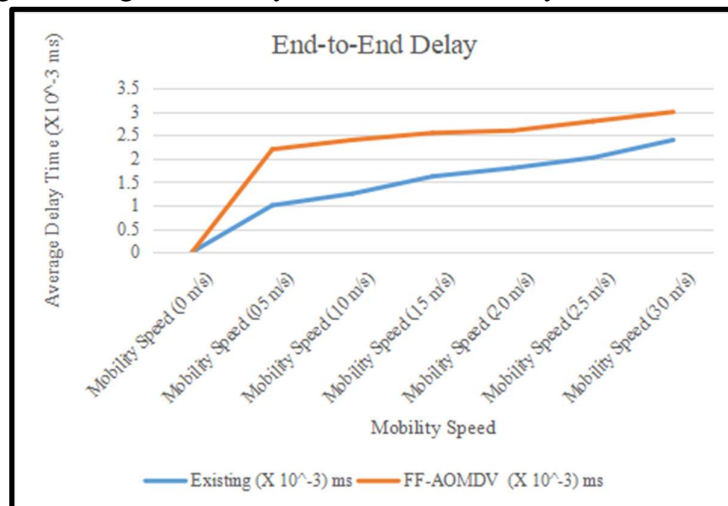


Figure 4. End-to-End Delay Prediction

- b) Packet Loss : The share of packet loss primarily based on the variety of black gap nodes. According to the simulation results, Hesiri's modern-day protocol has a packet loss fee of 50%, whereas our proposed scheme solely has a packet loss fee of 20%. As a result, the share of packet loss decreases by way of 60% beneath our proposed plan.

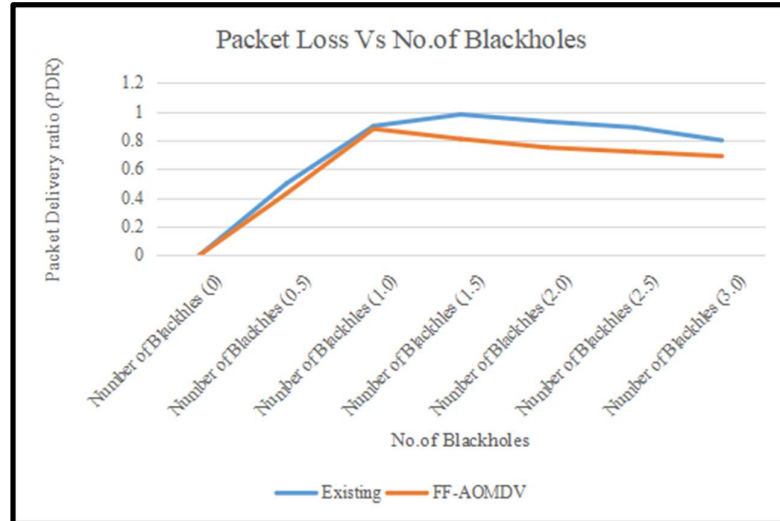


Figure 5: Packet Loss Vs No. of Blackholes

- c) Energy Efficient: The cell node's battery electricity will be low in MANET, so power consumption have to be taken severely [15]. In this examination we are increasing the transportable hub energy. The electricity degree of the cell node is decided by means of making use of the two routing protocols two FF-AOMDV. If the cellular node's electricity degree is low, the health characteristic will reflect on consideration on it to be a failure node and scan the complete network. The node can take an gold standard route. If the node is unable to transmit the packet, it will be regarded a failure node.

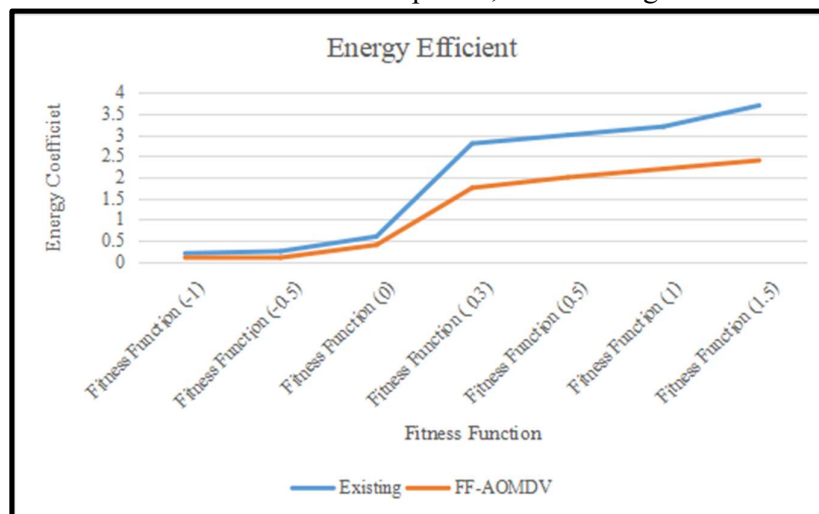


Figure 6: Energy Efficient Vs Fitness Function

8. Conclusion

Balanced and Energy Efficient Multipath Routing with Robust Transmission for MANET used to be the fantastic method that this learn about proposed. In MANET, it is confirmed that the restrictions are exceeded. Additionally, this learn about reduces mistakes and maximizes connections throughout all levels. Multipath is produced from supply to objective. Adjusting hub is finished flawlessly and furthermore the consistent way is set up except any problem. Also, there is much less delay. Additionally, it demonstrates low electricity consumption.

Reference

- [1] R. Praba, S. Subasree, and N. K. Sakthivel, Performance Analysis of Energy Efficient Multipath Routing Protocols in MANET, *International Journal of Pure and Applied Mathematics*, Vol. 117, No. 9, Pp. 163-167, (2017).
- [2] Hesham A. Ali, MarwaF. Areed, DaliaI. Elewely, "An on-demand power and load-aware multi-path node-disjoint source routing scheme implementation using NS-2 for mobile ad-hoc networks, *Simulation Modelling Practice and Theory*, Vol. 80, Pp. 50-65, (2018). <https://doi.org/10.1016/j.simpat.2017.09.005>.
- [3] Mueen Uddin, Aqeel Taha, Raed Al saqour, and Tanzila Saba, Energy Efficient Multipath Routing Protocol for Mobile ad-hoc Network Using the Fitness Function, "IEEE Translations and Content Mining, Vol. 5, Pp. 2169-3536, (2017). <https://doi.org/10.1109/ACCESS.2017.2707537>.
- [4] Sathiamoorthy J, Ramakrishnan B., Usha M, Design of a proficient hybrid protocol for efficient route discovery and secure data transmission in CEAACK MANETs, *Journal of Information Security and Applications*. Vol.36, Pp. 43-58, (2017). <https://doi.org/10.1016/j.jisa.2017.08.001>.
- [5] M.Bheemalingaiah, M. M. Naidu, D. Sreenivasa Rao, P. Vishvapathi, Performance Analysis of Power aware Node-disjoint Multipath Source Routing in Mobile Ad Hoc Networks, "IEEE 7th International Advance Computing Conference, (2017). <https://doi.org/10.1109/IACC.2017.0084>.
- [6] Pradhan, D.; Priyanka, K.C. Rajeswari. SDR Network & Network Function Virtualization for 5G Green Communication (5G-GC). In *Future Trends in 5G and 6G: Challenges, Architecture, and Applications*; CRC: Boca Raton, FL, USA, 2021. [Google Scholar]
- [7] Thrasyvoulos Spyropoulos, and et. al., Routing for disruption tolerant networks: taxonomy and design, "Wireless Network, Vol. 16 (8), Pp. 2349-2370, (2010). <https://doi.org/10.1007/s11276-010-0276-9>.

- [8] Yuanyuan Zeng, and et. al., Directional routing and scheduling for green vehicular delay tolerant networks, *Wireless Networks*. Vol. 19 (2), Pp. 161-173, (2013). <https://doi.org/10.1007/s11276-012-0457-9>.
- [9] De Rango, F., Guerriero, F., & Fazio, P. (2012). Link-stability and energy-aware routing protocol in distributed wireless networks. *Parallel and Distributed Systems, IEEE Transactions on*, 23(4), 713-726.
- [10] Mueller, S., Tsang, R. P., & Ghosal, D. (2004). Multipath routing in mobile ad hoc networks: Issues and challenges. In *Performance tools and applications to networked systems* (pp. 209-234). Springer Berlin Heidelberg.
- [11] Balaji, V., & Duraisamy, V. (2011). Varying Overhead Ad Hoc on Demand Vector Routing in Highly Mobile Ad Hoc Network. *Journal of Computer Science*, 7(5), pp. 678-682.
- [12] Pradhan D, Sahu PK, Ghonge MM, Tun HM. Security Approaches to SDN-Based Ad hoc Wireless Network Toward 5G Communication. In *Software Defined Networking for Ad Hoc Networks 2022* Feb 9 (pp. 141-156). Cham: Springer International Publishing.
- [13] Giordano, S. (2002). Mobile ad hoc networks. *Handbook of wireless networks and mobile computing*, 325-346.
- [14] Hassan, Mustafa Hamid, and Ravie Chandren Muniyandi. "An Improved Hybrid Technique for Energy and Delay Routing in Mobile Ad-Hoc Networks." *International Journal of Applied Engineering Research* 12.1 (2017): 134-139.
- [15] Kumari, N., Gupta, S. K., Choudhary, R., & Agrwal, S. L. (2016, March). New performance analysis of AODV, DSDV and OLSR routing protocol for MANET. In *2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom)* (pp. 33- 35). IEEE
- [16] Satav, P. R., & Jawandhiya, P. M. (2018, August). An Energy Efficient Route Selection in MANET with AOMDV Routing Algorithm. In *2018 International Conference on Research in Intelligent and Computing in Engineering (RICE)* (pp. 1-5). IEEE
- [17] Prashar, L., & Kapur, R. K. (2016, September). Performance analysis of routing protocols under different types of attacks in MANETs. In *2016 5th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)* (pp. 405-408). IEEE
- [18] Ghonge MM, Mane S, Pradhan D. Demystifying the Role of Blockchain Technology in Healthcare and Transaction. In *Blockchain Technologies and Applications for Digital Governance 2022* (pp. 60-84). IGI Global.

- [19] Nagalakshmi, S., Poonia, R., & Biradar, S. (2015). Performance Evaluation and Comparison of On-Demand Routing Protocols for Ad Hoc Networks: DSR, AODV, AOMDV, TORA. *International Journal of Advanced Networking and Applications*, 7(2), 2666.
- [20] Nazhad, S. H. H., Shojafar, M., Shamshirband, S., & Conti, M. (2018). An efficient routing protocol for the QoS support of large- scale MANETs. *International Journal of Communication Systems*, 31(1), e3384.
- [21] Sharma, A. K., & Trivedi, M. C. (2016, February). Performance comparison of AODV, ZRP and AODVDR routing protocols in MANET. In *2016 Second International Conference on Computational Intelligence & Communication Technology (CICT)* (pp. 231-236). IEEE.
- [22] Dash, A., Pradhan, D., Tun, H. M., & Naing, Z. M. (2022). Integration of AI to Enhance 5G Capabilities in Smart Cities. In *Journal of Image Processing and Artificial Intelligence* (Vol. 8, Issue 3, pp. 14–20). MAT Journals. <https://doi.org/10.46610/joipai.2022.v08i03.003>
- [23] Shrivastava, Poonam, Amit Kumar Singhal, and Abhishek Gupta. "Performance Improvement of Mobile Ad-hoc Networks through Energy Conservation Scheme." *International Journal of Computer Applications* 71.2 (2013)
- [24] Sajjad Jahanbakhsh Gudakahriz et al., Energy Efficient Routing in Mobile Ad Hoc Networks by Using Honey Bee Mating Optimization, *Journal of Applied Research and Technology* ISSN: 1665-6423 vol. 11, N0. 6, December 2013
- [25] Dash, A., Pradhan, D., Tun, H. M., & Naing, Z. M. (2022). m-MTC for Optimized Communication in 5G. In *Journal of Network Security Computer Networks* (Vol. 8, Issue 3, pp. 1–8). MAT Journals. <https://doi.org/10.46610/jonscn.2022.v08i03.001>
- [26] Pradhan, D., Tun, H. M., Wah, N. K. S., Oo, T., K C, P., & Dash, A. (2022). Efficient Usage of Energy in 5G toward Sustainable Development inclined to Industry 4.0 Connectivity. In *2022 IEEE Region 10 Symposium (TENSYP)*. <https://doi.org/10.1109/tensymp54529.2022.9864351>
- [26] Al-Shareeda MA, Manickam S. Man-in-the-middle attacks in mobile ad hoc networks (MANETs): Analysis and evaluation. *Symmetry*. 2022 Jul 27;14(8):1543.
- [27] Calvanese F, Jacquesson T, Manet R, Vasiljevic A, Lasolle H, Ducray F, Raverot G, Jouanneau E. Neoadjuvant B-RAF and MEK inhibitor targeted therapy for adult papillary craniopharyngiomas: a new treatment paradigm. *Frontiers in Endocrinology*. 2022;13.
- [28] Pradhan D, Priyanka KC. A comprehensive study of renewable energy management for 5G green communications: Energy saving techniques and its optimization. *Journal of Seybold Report* ISSN NO. 2020;1533:9211.

[29] Oo WM, Tun HM, Nway TM, Pradhan D, Sahu PK, Naing ZM. Design, Analysis and Fabrication of Dual Band Microstrip Patch Antenna for (L2) Band GPS and WiFi Applications. In 2022 International Conference for Advancement in Technology (ICONAT) 2022 Jan 21 (pp. 1-5). IEEE.

[30] Pradhan D, Tun HM. Security Challenges: M2M Communication in IoT. J. Electr. Eng. Autom. 2022 Oct;4(3):187-99. <https://doi.org/10.36548/jeea.2022.3.006>