Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 2, No.2, February : 2025

THE ROUTING ENERGY EFFICIENT ALGORITHM FOR MOBILE AD-HOC NETWORK USING AODV AND DE-AODV

Dr.K.Nirmaladevi, M.Sangeetha, Assistant Professor,Dept. of Computer Science, KSR College of Arts and Science for Women, Tiruchengode,Tamil Nadu, India
G.Anwar Basha, Assistant Professor,Dept. of Computer Science, Navarasam College of Arts and Science for Women, Erode,Tamil Nadu, India. E-mail: anwarbashapt@outlook.com

Abstract – Mobile Ad-hoc Network is a self-configuring infrastructure using Before releasing Cyber Threat Information (CTI) for analysis, the data owner might choose a suitable level of trust and a sanitization process. Furthermore, this cleaning technique is carried out either by an endpoint or by the cloud service provider, depending on how confident the company is in the latter. In order to satisfy the greatest range of requirements for transferring confidential CTI data, research presents the trust architecture, cloud architecture, and installation technique. When compared to the encryption systems most frequently used in cloud technology, the testing reveals a high degree of data protection and a noticeable improvement in terms of cypher processing time and security services. Finally, the study provides a brief overview of the development and assessment carried out thus far by pilot applications, confirming the MANET.
Keywords— AODV, DE-AODV, EA-AODV, RAE-AODV.

I. INTRODUCTION

A MANET is an assembly of wireless mobile nodes with non-developing infrastructure that forms a transient, short-lived network [1]. Numerous problems, including dynamic topology, velocity capacity, energy resources, bit error rate, and multihop technology are present in these protocols. Due to the rise in the number of personal wireless electronic devices and the high cost of deploying permanent infrastructure for wireless networks, WLANs are now required even for residential users. With the use of wireless communication technology, a collection of transportable, battery-operated devices that are randomly placed create a transient network known as SWANS [Scalable Wireless Ad-hoc Network Simulator] and Conducted AODV.
The military uses the VANET, FANET, and VAV protocols for cooperation, whereas civilian applications use data forwarding to guarantee data connectivity.

Research is now being done on the creation of energy-efficient routing protocols for MANETs. Reinforcement with RL It is comparatively a recent trend in research to learn how to enable each node to its route request forwarding rate based on its energy profile to WAN[3]. The DE-AODV routing protocol uses packet transmission from source to destination to determine the best routing path in the network using the least amount of energy. Battery capacity routing (ESS-DSR) is evaluated in terms of network longevity, PDR, EED, and throughput [5]..

In MANETs, routing protocols use the DE-AODV protocol since mobile nodes run on battery power and spend more energy while choosing a route. The network interface's energy usage via DSDV and AODV on mobile computing devices.

The process of broadcast flooding in route headers of the outwork interface identifiable link layer during route discovery [7]. Because of its dynamic and adaptable character, the military's MANET communications, energy resources and rescues, and communications in crisis areas.The stability of the chosen routes for balancing residual energy in MANET routing algorithms is challenging. [8].

Proactive, reactive, and hybrid routing protocols make up the overview of routing protocols. In order to request route discovery on demand from relay nodes, one must first request the packet from the source to the destination. The hierarchical structure network's energy consumption ratio. By creating a feedback mechanism, the Learning Automata (LA) are based on a random environment.

The node stability measurement model and the network model both contribute to the node stability (NS) and current distance. The incentive program, quality information, baseline data, and sanctions.

The velocity's effect on control overheads: AODV accesses control overheads at a lower velocity than our routing algorithms, whereas ANNQARA has greater control overheads. The functionality of routing protocols utilizing mobility models. The group mobility model is the one that assesses the random waypoint mobility model. They announced the average jitter, average end-to-end delay processing module, average data traffic model, and CBR. Through DYMO and RIP, the decline of LANMAR and STAR is regulated. AODV, Bellman Ford, DSR, DYMO, FISHIYE, LANMAR, RIP, STAR, and ZRP are all included in this paper[9].

The arrangement Table-based and need-based protocols are used in mobile speed nodes. The information about the present state of affairs at the destination node is included in the cache maintained by the node protocol when it receives a route demand packet. RREQ-J (Route Request Packet Plus Link Identification Number) and MAC-J are utilized with the GBDSR algorithm. The preservation of the tree's structure and serial number[10].

It has been difficult to develop routing protocols for MANETs due to their dynamic topology, bandwidth-constrained wireless links, and resource-hungry nodes. They cause the network to be divided, which lowers the lifespan node count and lowers the ad hoc wireless network's energy consumption ratio. In order to maximize network longevity, the energy consumption ratio at the nodes must be minimized. T declare, each node waits for a period of time (Twait) until it gets all of the RREP messages intended for the node. The NS2 simulation can utilize this method RREQ and RREP to its sequence numbers and unused state they estimate proposed algorithm, EA-AODV.[11].

An organization of movable nodes, such as portable nodes, cell phones, or other hardware inside a remote system device, is referred to as a MANET. These nodes are used for data sharing, traffic data transmission, and other relief activities after disasters. The node density, remaining energy, and available bandwidth of the proposed PSOPB (Particle Swarm Optimized based Probabilistic Broadcasting) are based on the relative mobility model nodes energy drain rate link capacity, respectively [12].

Due to variations in multipath fading, shadowing effect, propagation path loss, and interference, host mobility affects the quality of wireless link signals. Link packet error rate (LPER), link received signal strength (LRSS), link expiry time (LET), and probabilistic link reliable time (PLRT) metrics [13].

The self-organized, mobile, and wireless domains in the network routing protocols architecture are connected by radio links between mobile nodes in the MANET form. Typically, broadcast communication is used for table-driven, on-demand routing algorithms, as opposed to unicast communication in ad hoc networks. The likelihood of all nodes being asleep is P=(n-1)-P. The messages are received by nearly every node in the network.

II. RELATED WORKS

A MANET is a type of wireless network in which nodes are able to move dynamically in any direction. The energy-efficient routing protocol allows mobile nodes to have an unlimited power and energy consumption ratio. According to this proposal, MANET nodes can function as routers that can transmit and receive multimedia packets. the energy-efficient nodes that make use of the network's total lifetime. It offers ESS-DSR, CMMBCR, AODV-DE, and DSR. It explains the DE-AODV routing protocols as well as the node implementation, route node, route alimentation, and route correction. This study proposes DE-AODV and AODV algorithms. The suggested work is utilized to monitor and compute link reliability in QOS. RBP is used to improve the network's energy efficiency. In this study, the network's received data are expressed in terms of the EE-AODV, DSDV, OLSR, FSR.

Palaniappan et al[13],We describe in this work how QOS monitoring agents gather and determine link dependability metrics, including link expiration time. They use the multipath collection technique based on source routing and AOMDV in these works. The only routing protocols employed in fuzzification techniques are low and high level ones. The energy-efficient stable routing utilizing QOS monitoring agent approaches (EESRQMA) is described in the NS2 simulation findings. Based on node speed, delay, PDR, and residual energy, only 50 nodes are used at the time of transmitting. The relationship between speed and residual energy, delivery ratio, and delay.

Chettibi et al[3], this paper describes the MANET deployment rapid and inexpensive due to to the self-configuring infrastructure. The overall performance of these three routing protocols are reactive, proactive and hybrid. Energy Aware (EA) routing protocols are applicable at data and rectify the solution. Reactive Local protocols are proposed the set of states andre-engineer rewards. Applications of Temporal Difference (TD) to Robot Navigation, Game Playing, and Network Routing Protocols are quite successful. utilized in NS2 to carry out the RL routing protocols. SARSA-AODV, Q(μ)-AODV, and Q-AODV. The effects of increased load traffic, the packet delivery ratio, end-to-end delays, the energy consumption ratio of protocols, and network lifetime.

AnurajMishar et al[4], this paper explains, we elaborate the three levels. Proactive, Reactive and Hybrid routing protocols are available. Proactive like OLSR. Reactive like DSDV, Hybrid like ZRP, ZHLS. The message propagation using RREQ, RREP, RWPM.

Kawaz et al[6], they analyzed the n-number of routing protocols, they have unexpected topology. Its proposed onQOS and multichannel energy-efficient MAC protocols are used in MANETs. The AODV and AOMDVR protocols have cleared it. Total energy consumed by all nodes, Average Consumed Energy (ACE), Average Residual Energy (ARE), PDF (Packet Delivery Fraction), TR (Throughput Rate), E2ED (End to End Delay), Routing Load (RL), and NRL (Normalized Routing Load) are among the performance matrices that are employed..

Laura Marie Feeney et al[7], in this related work, the broadcast flooding process in route discovery like DSR and AODV. Wireless Link and MAN are declared the both stations and access points are a destination oriented protocol based on distribution Bellman ford algorithms. Its maintains the DSR to avoid routing loops. Its proposed work by, Energy consumption states, equations broadcast traffic, point to point traffic, discarding traffic and constants.

Ali Norouzi et al[10], The information of their demand and table driven routing protocols. PRN (Packet Radio Network) has considered the mobile terminals of mobile networks and special wireless network, is base station and fixed substructure. Its based on GBDSR, GRPH, MAC,MAC-J packet. DSR is the demand protocol has the lowest parasite changes to movement rate and completely depends on nevertheless, table driven routing protocols are not highly dependent of rate of constant behavior.

III. PROPSED WORK IN MOBILE AD-HOC NETWORK IN ENERGY EFFICIENT ROUTING PROTOCOLS

Compared to other current protocols, this one has a lower energy consumption ratio, throughput, packet delivery ratio, and packet loss. That approach uses Quality of Service (QOS) monitoring in addition to link reliability metrics calculation. By extending the degree of NLT (Network Life Time).

3.1 Overview

Routing protocols' energy level is crucial; formerly, they relied solely on battery power and used more energy, which raised the degree of network node lifetime forecast routing. This study proposes an energy-based route selection employing DSDV, OLSR, FSR, EE-AODV, DE-AODV, and EA-AODV. Each protocol has the ability to choose a node for packet transmission from source to destination based on its maximum energy. The routing procedures cannot proceed while the node maintains the minimum energy because its energy level is low. When a connection fails, the De-AODV, EA-AODV, and RAE-AODV protocols dynamically use the highest battery level, which lowers overall energy consumption and lengthens the network's routing lifetime.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 2, No.2, February : 2025

3.3 Node Distribution Modules

The number of nodes in a MANET is indicated by its architecture, which also describes how packets flow to their destination. On a distributed network, mobile nodes can move around freely. They quickly and independently deploy on the network, self-configuring. Every node performs the roles of a source, destination, intermediary, and router. Nodes can be changed since the configuration is dynamic and their computational resources are limited in the energy level system.

3.4 Recognition of the Route Node

Several mobile nodes are swapped out in an intervening area on the assigned conditions level in a MANET. The nodes are most likely transmitting, sleeping, and active. All nodes are kept in active mode throughout packet transmission over a specific route using the DE-AODV, EE-AODV, DSDV, OLSR, and FSR protocols. The selection path of the route node and its adjacent nodes.

3.5 Route Option of Mobile Nodepackets

The process of choosing the most efficient path from one source to a destination is known as route selection. Each node has the ability to determine how much energy is needed for data packet transmission and reception.

3.6 Data Sensing and Data Receiving of Efficient Routing:

S – Sensed Attribute Node
Ht_h – Hard, S_{th} – Soft,
P- Packet Data
Ri – Residual Energy
F-Flag
If S < = H_{th} AND Ri> 0 then
Send P {
Send F = 1
Else if S_{th}< = S<H_{th}AND Ri> 0 then
Send P
Send F = 0
Else
Receive H = 1
While if H_{th}> = H < S_{th} AND R_i> 1 then
}
No Transmission
End if.

IV. RESULT AND DISCUSSION

The Network Simulator's (NS2) performance is confirmed by the suggested system simulation study. The suggested DE-AODV, EA-AODV, and RAE-AODV protocols are the main topic of this paper. At a specific energy level, the packets arrive at their destination. Based on the lowest and greatest energy levels—low, sluggish, and high—it chooses a node.

A cost function, RY, is introduced as RY = f (Hop count, EED, Bandwidth, P (Speed)) in order to perform this algorithm. They are dependable and versatile in reducing the quantity of packages.

There are 100 nodes that use the simulation area. The area used for simulation is 5,500 square feet. The antenna type is an Omni directional module, and the packet size is 512 bytes. The suggested protocol is utilized in Dynamic Ad-hoc On-demand Distance Vector.

4.1 The Simulation Parameters

Number of nodes : 100
Simulation Area : 1000*1000 meter
Packet Size : 512 bytes

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 2, No.2, February : 2025

Protocol used	: AODV, OLSR, DSDV, FSR
Antenna type	: Omnidirectional
Pause Time	: 30 Second
Bandwidth	: 2mbps
Transmission range	: 500 m
Mobility Models	: Random Waypoint / Energy model
MAC layer	: IEEE 802.11g
Traffic Type	: CBR, MAC

V. EXPERIMENTAL AND SIMULATION RESULTS

In the present work, NS2 has been executed the general experiments. The performance of existing on AODV, OLSR,DSDV,FSR protocol has been studied well. The following characteristics are PDR (Packet Delivery Ratio), performance accuracy in AODV, OLSR, FSR ,Throughput and finally End to End Delay process was analyzed and compared the all protocols to confirm the efficiency.

5.1Packet Delivery Ratio

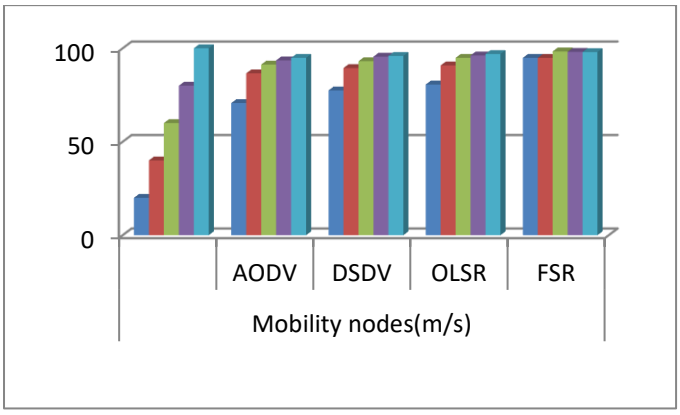
The packets that are delivered and received compute the packet delivery ratio. The ratio of data packets effectively sent to destination nodes to the total number of data packets received for those destination nodes is known as PDR.

$$PDR = \sum (\text{Received Packets}) / \sum (\text{Sended Packets}) * 100$$

The analysis of the obtained PDR's efficiency in the AODV, OLSR, DSDV, and FSR protocols. Three network routing algorithms are designed to boost the delivery rate when the node count increases from 20 to 100.

Table 1: Performance Comparison of PDR Vs Mobility for AODV, OLSR, DSDV and FSR

Mobility nodes(m/s)	AODV	DSDV	OLSR	FSR
20	70.7106	77.4596	80.6225	94.8683
40	86.6025	89.4427	90.8295	94.8683
60	91.2870	93.0949	94.8683	98.3192
80	93.5414	95.5248	96.1769	98.1070
100	94.8683	95.9166	96.9535	97.9795



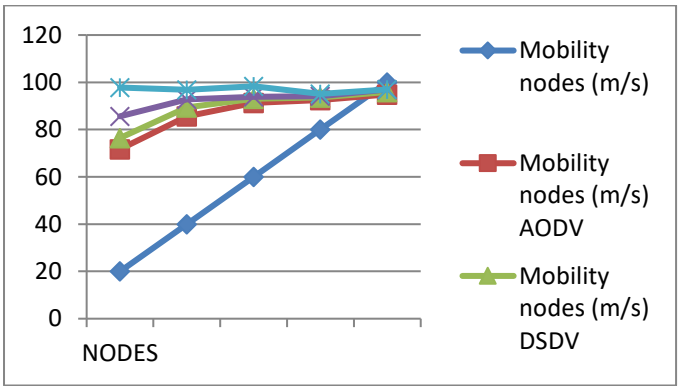
Graph 1: PDR in AODV,DSDV,OLSR,FSR

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 2, No.2, February : 2025

5.2 Performance Accuracy in AODV, DSDV, OLSR, FSR

Table 2: Performance Comparison of PDR Vs Mobility for AODV, DSDV, OLSR, FSR.

Mobility nodes (m/s)	AODV	DSDV	OLSR	FSR
20	71.7106	76.4596	85.6224	97.8386
40	85.6025	89.4427	92.8295	96.8683
60	91.2870	93.0949	93.8683	98.3192
80	92.5414	93.5248	94.1769	95.1070
100	94.8683	95.9166	96.9535	96.9795



Graph 2: Performance of AODV,DSDV,OLSR,FSR

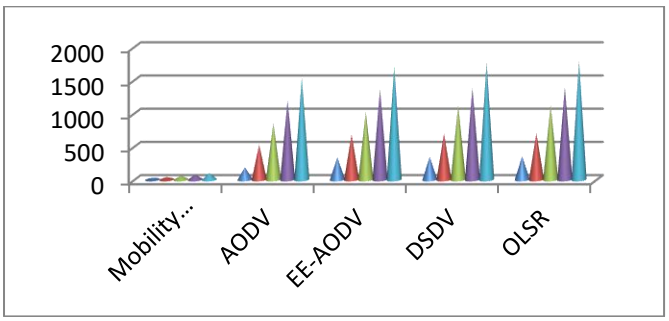
5.3 Throughput

When evaluating the performance of a network model and network security, throughput is essential. The total number of packet bits for the higher layer per second was described. Throughput performance compared to AODV, DSDV,OLSR, FSR among other current approaches.

Throughput = Number of Delivered Packets / Transmission range * Packet Size

Table 4: Performance Comparison of PDR Vs Mobility for AODV, EE-AODV, DSDV, OLSR, FSR.

Mobility (m/s)	AODV	EE-AODV	DSDV	OLSR
20	187.33	341.33	345.33	355.30
40	529.66	682.66	695.76	700.01
60	853.33	1024.00	1120.01	1130.50
80	1194.66	1365.33	1385.33	1390.00
100	1536.00	1706.66	1770.66	1790.02



Graph 4: Throughput of AODV, EE-AODV, DSDV, OLSR,FSR

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 2, No.2, February : 2025

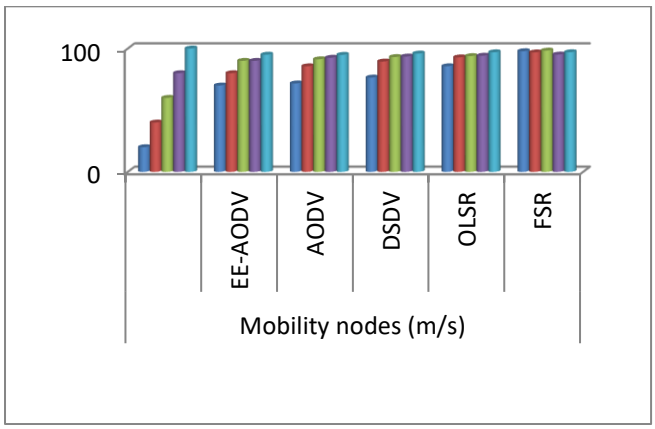
5.4 End to End Delay Process

The end-to-end delay process includes the Ad-hoc On Demand Distance Vector, Dynamic Energy Ad-hoc On Demand Distance Vector, Energy Aware Ad-hoc On Demand Distance Vector, and Reliability Assured Energy Ad-hoc On Demand Distance Vector. The processing level of delay time needed to receive the data packet and retransmit it to each node is guaranteed by the mobility model and random way point model, which together comprise the minimum and maximum energy.

EED = ∑ (Arrival Time – Sent Time) / ∑ (number of connection)

Table 5: End to End Delay of AODV, DSDV, OLSR and FSR.

Mobility nodes (m/s)	EE-AODV	AODV	DSDV	OLSR	FSR
20	70.	71.7106	76.4596	85.6224	97.8386
40	80.	85.6025	89.4427	92.8295	96.8683
60	90	91.2870	93.0949	93.8683	98.3192
80	90	92.5414	93.5248	94.1769	95.1070
100	95	94.8683	95.9166	96.9535	96.9795



Graph 5: End to End Delay
AODV, EE-AODV, DSDV,OLSR, FSR

CONCLUSION

Throughput, end-to-end delay, Normalized Control Overhead, and Packet Delivery Ratio for AODV, EE AODV, DSDV, OLSR, and FSR are the efficiency levels in this work. The simulation analysis showed enhanced throughput, Packet Delivery Ratio with minimum average energy and energy consumption ratio level is validated in DSR, DSDV, and AODV. to list the clustering strategies that are essential to network security and wise decision-making. Reliability Aware Energy, Energy Aware Level, and Dynamic Energy Level are taken into consideration in the overall study of performance indicators. The AODV lower methods for route maintenance and updating are excellent, ranging from modest to high expenditure. There is a very high ratio of energy power consumption to energy economy.

REFERENCES

[1] R.Arthi, E.Padma, Dr.N.Shanthi, " A Compartive Study of Routing Protocols in Ad-hoc Networks", International Journal of Computing, Communication and Networking, Vol 3, Issue 7, pp 52-58, September 2014.

[2] K.Nirmaladevi, Dr.K.Prabha, "A Selfish node Aware with optimized clustering for reliable routing prrotocol in Manet", Measurement Sensors, Elsevier, 2023.
[3] S.Chettibi, S.Chikhi, "Adaptive Maximum Lifetime Routing in Mobile Ad-hoc Networks using Temporal Difference Reinforcement Learning", Evolving Systems, Vol 6, Issue 8, August 2013.
[4] Anurag Mishra, " Compartive Analysis of AODV and DSDV Routing Protocols for Mobile Ad-hoc Networks", International Journal of Trend in Scientific Research and Development (IJTSRD), Vol 1, Issue 5, July-August 2017.
[5] J.Deepa, J.Sutha, " A New Energybased Power Aware Routing methods in Mobile Ad-hoc Netwok", Cluster Computing, https:// doi.org/10.1007/s10586-018-1868x, February 2018.
[6] Fawaz, Khalid and Wang Dan, " Energy Consumption Evaluation of AODV and AOMDV Routing Protocols in Mobile Ad-hoc Networks", Internationl Journal of Advanced Computer Science and Applications, Vol 9, Issue 8, 2018.
[7] Laura Marie Feeney, " An Energy Consumption Model for Performance Analysis of Routing Protocols for Mobile Ad-hoc Networks", Mobile Networks and Applications, vol 6, Issue 6, 2001.
[8] Sheng Hao, Huyin Zhnag, Mengkai Song, " A Stable of Energy Efficient Routing Algorithm Based on Learning Automata Theory for MANET", Journal of Communictations and Networks, doi: 10.1007/s41650 n- 0012-7.
[9] K.Nirmaladevi,Dr.K.Prabha, "Augmented Network Stability and lifetime of self organization based clustering in Manet using group mobility", International Journal of System Assurance Engineering and Management, Springer, 2022.
[10] Subodh Kumar, G.S Agarwal, Sudhir Kumar Sharma, " Impact of Mobility on MANET's Routing Protocols using Group Mobility Models", Wireless and Microwave Technologies, doi: 10.5815/ijwmt.2017.02.01.
[11] Ali Norouzi, B.Berk Ustundag, " Improvement of DSR Protocol using Group Broadcasting", International Journal of Computer Science and Network Security, Vol 10, Issue 6, June 2010.
[12] Sumit Kumar, Shabana Mehfuz, " Intelligent Probabilistic Broadcasting in Mobile Ad-hoc Network a PSO Approach", J Reliable Intell Environment, doi: 10.1007/s40860-016-0023-9.
[13] K.Nirmaladevi, Dr.K.Prabha, "An Energy Efficient of Mobile Pattern Ad-hoc networks in Reactive Routing Protocols", International Journal of Innovative Technology and Exploring Engineering, Scopus, 2019.
[14] Xiali "n Li, Xin Bian, Mingri Li, "Routing Selection algorithm for MANET based on neighbor node density", Energy harvesting in MANET 2023, Sensors, 2024.
[15] Hakan Bagci, Adnan Yazici, "An energy aware fuzzy approach to unequal clusterng in wireless sensor networks", Applied Soft Computing, Vol 13, Issue 4, April 2013.