ISSN: 2581-3404 (Online) **IF: 5.445 (SJIF)**

International Journal of Innovative Research in Technology and Management, Volume-6, Issue-6, 2022.

Performance Evaluation of Reactive Mobile Ad-hoc Network Routing Protocols

Amrita Singh[1], Prof. Mahendra Singh Sisodia[2], Prof. Pankaj Pandey[3]

[1]M. Tech. Scholar, Department of CSE, JNCT, Bhopal (India)

[2]Professor, Department of CSE, JNCT, Bhopal (India)

[3]Head & Professor, Department of CSE, JNCT, Bhopal (India)

Abstract: *The mobile ad-hoc networks is considered a group of wireless mobile nodes that are capable of communicating with each other without the use of network infrastructure or any centralized administration. A MANET have a large number of potential applications like tactical networks, emergency services, commercial and civilian environments, home and enterprise networking, education, entertainment, sensor networks, context aware servicing and coverage extension. In this paper, our proposed modified scheme "EA-DSR" simulate in network simulator 2.34. In simulation process we used 10, 20, 30 and 50 nodes. The evaluation of performance is measured by packet delivery ratio, End to end delay and packet throughput. Our proposed scheme EADSR gives good results in compare with existing DSR method.*

Keywords: Mobile ad-hoc Network, Network simulator, Throughput, Packet delivery ratio.

Introduction

According to Cisco forecasts, it is expected that over 70% of the global population will have mobile connectivity. The global mobile data traffic will increase eight times compared to 2018, with over 13.1 billion mobile devices are connected to the Internet network. In which multimedia traffic accounts for ¾ of the global network traffic. Multimedia applications and services require the improvement of existing network systems. Therefore, designing more robust, believe, high-performance, and energy-efficient mobile networks is an urgent need [5]. MANET (Mobile Ad-hoc Networks) was formed in the 1970s as a set of mobile devices capable of self-organizing, self-configuring, and communicating with each other without relying on pre-existing infrastructures as fixed base stations. Because of their flexibility in data setup and transmission, applied MANETs in many domains serve humanity as healthcare, rescue, and disaster recovery, intelligent transportation system, retails, IoT ecosystems, and a series of different area. Along with the development of science and technology, intelligent transportation systems have been focused on research in recent times. A series of communication solutions between vehicles in the urban traffic environment have been proposed, as the traffic warning system , the emergency message transmission system . These solutions hypo-thesis that each vehicle is equipped with a radio transceiver, leading to vehicles communicating with each other without relying on base stations. As a result, each vehicle plays a role as a mobile ad-hoc network node, and form up Vehicle Ad-hoc Networks, also short called VANET.

ISSN: 2581-3404 (Online) IF: 5.445 (SJIF)
International Journal of Innovative Research in Technology and Management, Volume-6, Issue-6, 2022.

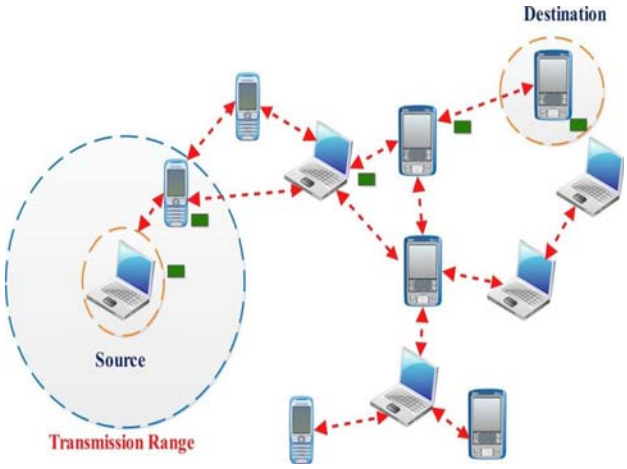

Figure 1: Ad Hoc Network [1].

With the appearance of novel technologies and convenient mobile computing devices, the application of mobile ad-hoc networks (MANETs) has upraised for group computing services. It allows a set of wireless clients to form temporary work-groups and communicate with each other without using an access point (AP). MANETs are very interesting in multimedia and group-oriented computing for their quick formation ability of temporary networks. Some of these applications are sensible to packet delay but can tolerate the loss of packet and some other operations are packet loss responsive but can accept delay desired for real-time applications. Multicasting is an effective method to implement point-to-multipoint and multipoint-to-multipoint services but it needs networks with QoS enabled multicast routing which is very complex issues in MANETs. Because the individual applications may have specific QoS constraints and therefore the QoS models are more important in MANETs. Therefore, several QoS facilities must be unified into MANETs to make it suitable for multicast communication. A certain form of admission-control and resource-reservation concept are requested in MANET to deliver various QoS agreements like minimum required packet delivery ratio, throughput and network bandwidth, maximum acceptable packet drop rate, delay, jitter and control overhead.

II. VANET

Like MANET, the performance of the VANET depends on the size, communication model, and radio communication environment. In VANET, because mobile network nodes have to cooperate to transmit packets, the routing protocol has a vital role in enhancing network performance. Conventional routing protocols are proposed for MANET as AODV or DSR that use hops number as a routing metric are ineffective in the VANET environment. The breakthrough improvements of ad-hoc networks and mobile communication technologies led to the formation of the VANET architecture. VANET is an evolutionary network type of MANET to respond to communication requirements between vehicles in transport systems. VANET is part of intelligent transportation systems. Specifically, vehicles need to communicate with each other to exchange information about current traffic conditions, roads, traffic light status, or control messages to optimise vehicle movement, incident control, set up priority routes in an emergency. Another point different from MANET. In VANET, mobile devices have higher speed movement and predictable roads pattern. Besides, vehicles can join/leave only the system at certain intersections. As a result, the network structure is less changed than MANET. Because of large energy capacity storage vehicles, the energy efficiency problem no longer one of the most important in VANET. In addition, routes in VANET are often pre-set and fixed, especially highways, so VANET is often supported by roadside units (RSUs) or base station systems existing installed along the roads. An important point for network nodes in VANET, vehicles are often equipped with GPS systems, so location information and speed movement can be easily provided for routing algorithms.

III. Literature Survey

[1] Mobile ad-hoc wireless networks give us the high probability and high properties to create networks, without any central management or infrastructure, independent and temporary network, that is means wide ubiquitous networks. The intermediate nodes should be able to communicate between them to send and receive the data with ability using at anytime and anywhere, the mobility of the intermediate node between the source and destination gives us unstable topology maybe the connection between the nodes will be break often. Therefore, the strategies to design any wireless depend on path routing and protocol selection. In this paper they study and evaluate the effect of mobility on the routing protocols DSDV, AODV and DSR in two different scenarios, the density of nodes and different area in NS2.35 simulation by using three performance metrics in the evaluating the routing protocols are Average Throughput, Packet Delivery Ratio and Average End-to-End Delay.

[2] Mobile Ad Hoc Networks have evolved rapidly and are finding numerous applications in the areas of self-creating, self-organizing and self-administering wireless networks. The present paper describes use of and comparison of three routing protocols. The parameters used for comparison are throughput and delay in response by varying the number of mobile nodes. A random waypoint mobility model was used for fixing the mobile nodes. The simulation study is carried out using OPNET modeler 14.5. Simulation result shows that for increasing number of mobile nodes OLSR offers better throughput and minimum delay than AODV and GRP routing protocols.

[3] Internet of things (IoTs) has been the smartest technology proven worldwide these days. The application products of IoTs are Mobile ad hoc network (MANET) and Vehicular ad hoc network (VANET). Both of these two are infrastructure less networks as they do not need any fixed infrastructure for operations. In MANET mobile nodes can communicate via routing protocols generally used in defense areas and in VANET Internet of vehicles (IoV) mobile vehicles communicate with other & share related information such as route directions, traffic density. The most challenging task is to maintain the efficient delivery of data packet. In current study a performance analysis of an infrastructure less network is done using two advance protocols that are implemented in a virtual traffic scenario with active mobility concept. By using the N3 simulation for stable link-based zone routing protocol (SL-ZRP) & Intelligent routing ad hoc on demand distance vector (IR-AODV). The estimated results are achieved in the form of lesser end to end delay & improved PDR by SL-ZRP but the energy consumption was high by SL-ZRP. Current study will be applicable in the defense sector where spontaneous communication setup is organized.

[4] An Internet of Things (IoT) is a superior technology that will connect more number of wired/wireless devices through an internet. The Mobile Adhoc Network (MANET) is s wireless system which will connect the wireless devices through low bandwidth wireless links. Hence, Integrating MANET with IoT greatly improves the performance of the IoT subject to energy constrained and trusted security. Protecting the ad hoc routing from the black hole attacks, Byzantine flooding, Location disclosure attacks etc., seems to be a very difficult issue in the previous researches. To overcome the aforementioned security issues, a novel methodology called Cluster and Angular based Energy Proficient Trusted Routing (ACEPTR) protocol is proposed in this research article. Initially, Node Credit Score (NCS) is calculated to compute trust ratio for the nodes. The credit score calculation includes both Self-Trust computation and Joint-Trust computation. Once highest NCS is computed then angular energy based route selection process is carried out to form the clusters since cluster based routing reduces energy consumption extensively. The conventional communication control process is applied for finding node's transmission range so that data can be transmitted over angular energy based

highest NCS nodes. The simulation results obtained is compared with the conventional schemes and the metrics proved that the proposed scheme achieves better system performance.

[5] In recent years, the explosive growth of multimedia applications and services has required further improvements in mobile systems to meet transfer speed requirements. Mobile Adhoc Network was formed in the 1970s. It is a set of mobile devices that have self-configuring capable to establish parameters to transmit data without relying on an pre-installed infrastructure systems. Today, MANET is strongly applied in many fields such as healthcare, military, smart agriculture, and disaster prevention. In the transportation area, in order to meet the unique characteristics of the vehicle network, such as movement pattern, high mobility with the support of RSUs, MANET has evolved into Vehicle Ad-hoc Networks, also called VANET. Due to the mobility of the nodes, like MANET, the performance of VANET is relatively low and depends on the communication technologies. Designing more flexible, reliable, and smarter routing protocols to improve VANET performance for smart urban is a significant challenge. In this study, we conduct a survey of communication solutions for VANET in recent years. The results indicated a common framework for designing VANET communication solutions based on three main approaches: multi-metric, UAV/ Cloud/Internet, and Intelligent.

[6] Due to the need for the multicast connection required by multimedia applications such as video conferencing and natural disaster management, it was necessary to use a set of portable and connected wireless peripheral devices without the need for infrastructure and without a central router, by use wireless network as "a mobile ad hoc network (MANET)". Despite the difficulties facing this technology in the process of effective guidance and the expansion of the use of such networks, in this type of network because of its applications in the fields of civil and military systems that do not need an infrastructure for the network to provide communication, the researchers specialized in this field have improved the current routing protocols and design new protocols that are appropriate to the challenges that Routing protocols face due to continuous change In network topology over time. In this paper we improved the current routing protocols and design new protocols that are appropriate to the challenges that routing protocols face due to continuous change In network topology over time. The NS2 simulation environment was used for the purpose of a comprehensive evaluation of the performance of the TORA and AODV routing protocols By using properties of packet delivery fraction and end-to-end delay was calculated.

[7] The objective of multicast or unicast protocols is to ensure an efficient route formation and flow control mechanism which is a very challenging issue for many group computing services in MANETs. MANETs can support several real-time applications like emergency rescue, and disaster relief operations which require minimum Quality of Service (QoS) to handle high traffic. Providing QoS for multimedia and group-oriented computing in MANETs becomes a real challenge due to the wireless medium and the mobility of operating nodes. Therefore, an investigation of routing protocols for one-to-many or many-to-many computing is important that supports acceptable QoS in MANETs. Numerous QoS metrics have been considered for the assessment like packet delivery ratio, latency, packet loss rate, control overhead, and throughput. By considering different network topologies and scenarios with different performance parameters, the primary goal of this study is to explore the challenges and factors for QoS services in MANET's multicast communication. The outcomes of investigation can be used to design the future MANET protocol for multimedia applications. The performance results indicate that the increasing number of sending/receiving nodes may increase the overhead or latency of the network but capable of providing higher network throughput, carried out in NS-2.

[8] Optimized Link State Routing Protocol (OLSR) is an efficient routing protocol used for various ad hoc networks application. It employs the Multipoint Relay (MPR) technique to reduce network overhead traffic. A mobility model's main goal is to realistically simulate the movement behaviors of actual users. However, the high mobility and mobility model is the major design issues for an efficient and effective routing algorithm for real Mobile Ad hoc Networks (MANETs). Therefore, this research paper aims to analyze and evaluate the performance of the OLSR protocol concerning various random and group mobility models. Two simulation scenarios were conducted over four mobility models, specifically the Random Waypoint (RWP), Random Direction (RD), Nomadic Community (NC), and the Reference Point Group Model (RPGM) consider a low as well as high random range mobility of the nodes. Moreover, BonnMotion Software and Network simulator NS-3 used to implement the simulation scenarios. Further, the performance of the OLSR protocol analyzed and evaluated based on latency, routing overhead, and packet loss ratio metrics.

III. Result Analysis

The DSR is one of the reactive protocols based on source routing algorithms. The selection of a path is the source's responsibility. It does so by initiating a request packet and sending it to its neighbors. The packet header will contain the information of all intermediate nodes or hops in the route until the destination is reached. The route that was recently discovered will be stored in the cache route of the node. The control message that is periodically exchanged in proactive is no longer used because it relays on the MAC layer to discover the failure of the link. Consequently, it has two advantages over proactive protocols, i.e., in terms of battery consumption and network overhead [6]. Two processes are used in the DSR protocol. The first is to discover the route from the source to the destination. The second is to maintain the route. Route discovery takes place when the source needs to communicate with a specific node. First, the source starts searching in its cache route for the route to the destination. If the source finds the route, it will communicate immediately. If it does not find the route in its cache route, the source will start to discover the route by flooding or broadcasting the route request packet to all neighboring nodes within the transmission range, and the source will add its information in the header of the request packet; the neighbors will search in their caches for the destination node. If one of them finds the path, the replay packet will be created and send to the source. If no such route is found in their cache route, each node will add its address to the request packet and rebroadcast to neighboring nodes within their transmission range until it reaches to the destination or the intermediate node that has information about the route to the destination. If the destination is not found within time to live (TTL), the packet will be expired, and the source will generate a new route request with an increased TTL value.

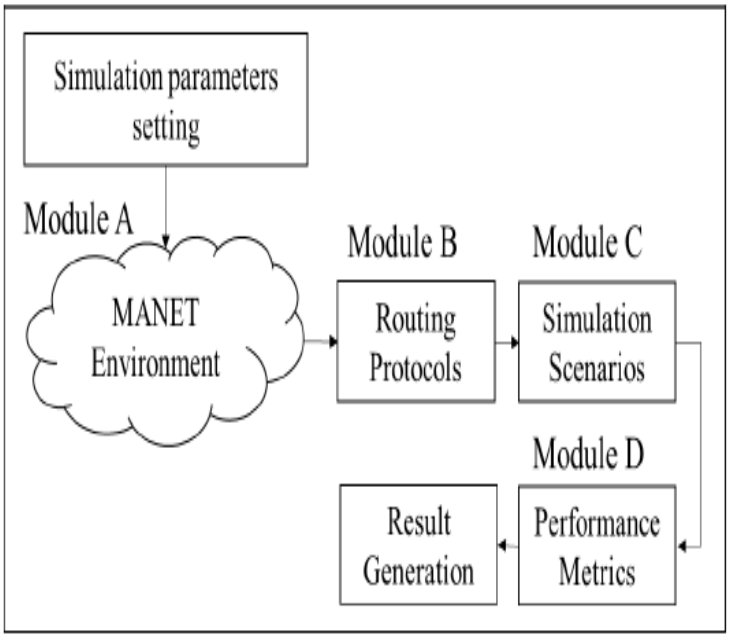

Figure 2: Simulation model design.

In this work, the protocol EA-DSR is proposed as an optimization of the currently functioning efficient

ISSN: 2581-3404 (Online) **IF: 5.445 (SJIF)**
International Journal of Innovative Research in Technology and Management, Volume-6, Issue-6, 2022.

than DSR protocol. This adaptive protocol utilizes the battery power of the node and links signal strength as the metrics for the route selection. The signal strength of node depends upon the distance that exists between the neighboring linked nodes. The choosing of the path is done on the basis of path with maximum battery power and signal strength. The MINMAX method is used for route selection.

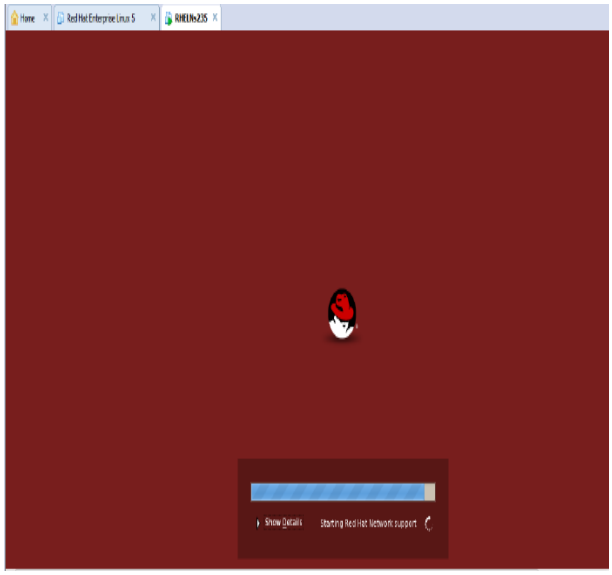

Figure 3: Shows that initially environment with network simulator for the simulation and also present the progress bar.

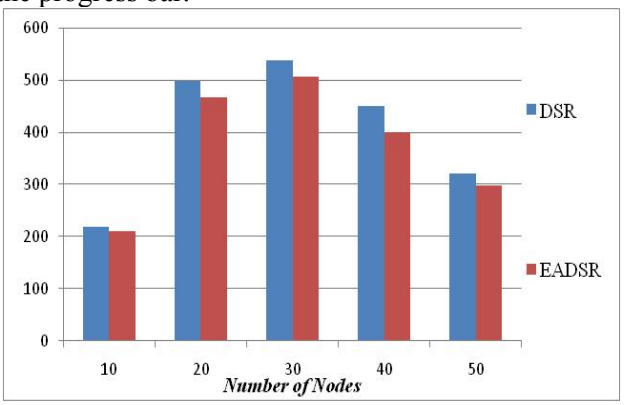

Figure 4: This picture represents the end to end delay performance parameters value using the dynamic source routing protocol and enhanced adaptive dynamic source routing protocol.

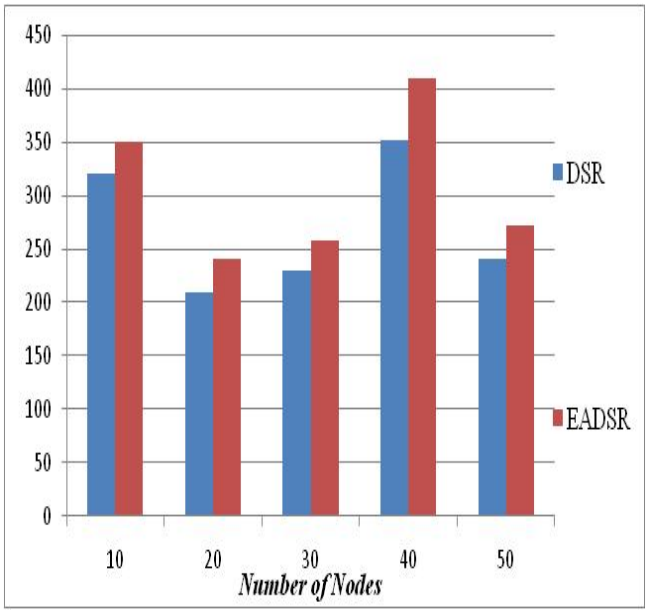

Figure 5: This picture represents the throughput performance parameters value using the dynamic source routing protocol and enhanced adaptive dynamic source routing protocol.

IV. Conclusion

A Mobile Ad-hoc network is a combination of different nodes, created for communicating each other without any infrastructure. Transmitting of packets from source to destination is one of the greatest challenges because the packet should reach the destination without disturbances like delay, packet loss. In this dissertation modified the dynamic source routing protocol for the detection of malicious node. The modified protocol is called enhanced adaptive dynamic source routing protocol (EADSR). The EADSR work is very efficient in comparison to dynamic source routing protocol. For the evaluation of performance our modified protocol tested in different network scenario tested through simulations for different distributions of nodes.

References:

[1] Ahmed Muhi Shantaf, Sefer Kurnaz, Alaa Hamid Mohammed, "Performance Evaluation of Three

Mobile Ad-hoc Network Routing Protocols in Different Environments", IEEE 2020, pp. 1-6.

[2] Madhavi S. Avhankar, Janardan A. Pawar, Snehankita Majalekar, "Mobile Ad Hoc Network Routing Protocols – Using OPNET Simulator", International Journal of Scientific and Research Publications,, 2022, pp. 28-34.

[3] Arun Kumar, R. K. Singh, Sandip Vijay, "Comprehensive Performance Analysis of Energy Efficient Infrastructure‑Less Network", Wireless Personal Communications, 2022, pp. 1-14.

[4] V. Thirunavukkarasu, A. Senthil Kumar, P. Prakasam, "Cluster and angular based energy proficient trusted routing protocol for mobile ad-hoc network", Peer-to-Peer Networking and Applications, 2022, pp. 1-13.

[5] Vu Khanh Quy, Vi Hoai Nam, Dao Manh Linh, Nguyen Tien Ban, Nguyen Dinh Han, "Communication Solutions for Vehicle Ad‑hoc Network in Smart Cities Environment: A Comprehensive Survey", Wireless Personal Communications, 2022, PP. 2792-2817.

[6] MuthannaJaafar Abbas, Haider Mohammed Turki Alhilfi, "Performance evaluation of two models in the reactive routing protocol in MANET'S", Indonesian Journal of Electrical Engineering and Computer Science, 2021, pp. 391-397.

[7] Sumon Kumar Debnath, "Evaluation of Multicast and Unicast Routing Protocols Performance for Group Communication with QoS Constraints in 802.11 Mobile Ad-hoc Networks", I. J. Computer Network and Information Security, 2021, pp. 1-15.

[8] Ali H. Wheeb, "Performance Analysis of OLSR Protocol in Mobile Ad Hoc Networks", International Journal of Interactive Mobile Technologies, 2022, pp. 106-118.

[9] Ali H. Wheeb, "Flying Ad hoc Networks (FANET): Performance Evaluation of Topology Based Routing Protocols", International Journal of Interactive Mobile Technologies, 2022, pp. 137-150.

[10] Sumendra Yogarayan, "Wireless Ad Hoc Network of MANET, VANET, FANET and SANET: A Review", Journal of Telecommunication, Electronic and Computer Engineering, 2021, pp. 13-18.

[11] Ashraf Mohamed Abdelhamid, "Ad-hoc Networks Performance based on Routing Protocol Type", IEEE, 2022, pp. 464-467.

[12] Zhiyan A. Younis, "Mobile Ad Hoc Network in Disaster Area Network Scenario; A Review on Routing Protocols", International Journal of Online and Biomedical Engineering, 2021, pp. 49-77.

[13] Sultan Mohammed Alkahtani, Fahd Alturki, "Performance Evaluation of Different Mobile Ad-hoc Network Routing Protocols in Difficult Situations", International Journal of Advanced Computer Science and Applications, 2021, pp. 158-169.

[14] ShujuanWang, Jiao Yin, "Distributed relay selection with network coding for data dissemination in vehicular ad hoc networks", International Journal of Distributed Sensor Networks 2017, Vol. 13.

[15] Cheng Wang, Xiang-Yang Li, , Changjun Jiang, Huiya Yan, "The Impact of Rate Adaptation on Capacity-Delay Tradeoffs in Mobile Ad Hoc Networks", 2016. pp 1-14.

[16] Fei Wu, Cunqing Hua, Hangguan Shan, Aiping Huang, "Cooperative multicast with moving window network coding in wireless networks", Ad Hoc Networks 25 (2015) 213–227.

[17] Jinbei Zhang, Yixuan Li, Zhuotao Liu, Fan Wu, Feng Yang, Xinbing Wang, "On Multicast Capacity

and Delay in Cognitive Radio Mobile Ad-hoc Networks", IEEE, 2015. pp 1-13.

[18] Houling Ji, Victor C.S. Lee, Chi-Yin Chow, Kai Liuc, Guoqing Wu, "Coding-based Cooperative Caching in On-demand Data Broadcast Environments", Elsevier, 2016. pp 1-25.

[19] D.G. Reina et al., "A survey on probabilistic broadcast schemes for wireless ad hoc networks", Ad Hoc Netw, 2014. pp 1-29.

[20] Golsum Najafia, Sajjad Jahanbakhsh Gudakahriz , " A Stable Routing Protocol based on DSR Protocol for Mobile Ad Hoc Networks ", I.J. Wireless and Microwave Technologies, 2018, 3, 14-22 .

[21] Gaurav Singal, Vijay Laxmi, M.S. Gaur, Swati Todi, Vijay Rao, Akka Zemmari, "MCLSPM: Multi-constraints Link Stable Multicast Routing Protocol in Adhoc Networks", IEEE 2016. Pp 1-6.

[22] Y. Harold Robinson, M. Rajaram, "Energy-Aware Multipath Routing Scheme Based on Particle Swarm Optimization in Mobile Ad Hoc Networks", Hindawi Publishing Corporation e Scientific World Journal Volume 2015, Pp 1-10.

[23] M. Rajesh, J. M. Gnanasekar, "Congestion Control Using AODV Protocol Scheme for Wireless Ad-Hoc Network", Advances in Computer Science and Engineering, PP 19-37.

[25] Geetika Dhand, S.S.Tyagi, " Performance Analysis of various Routing Protocols in Mobile Ad-hoc Networks", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 10 (2018) pp. 7378-7382.

[26] Lubdha M. Bendale, Roshani. L. Jain, Gayatri D. Patil, " Study of Various Routing Protocols in Mobile Ad-Hoc Networks", IJSRNSC, VOL-6, ISSUE-1, 2018.

[27] Habib Mostafaei, "Energy-Efficient Algorithm for Reliable Routing of Wireless Sensor Networks", IEEE Transactions On Industrial Electronics, Vol. 66, No. 7, July 2019, pp. 5567-5575.