

# Routing Issues And Challenges for Mobile ad-hoc Networks (MANETs): A Review

<sup>1</sup>Vikas Verma

(Computer Science &  
Engineering, SGT Univeristy)

<sup>2</sup>Dr. Pardeep Kumar

(Associate Professor,  
SGT University)

## ABSTRACT

Mobile ad-hoc networks also referred to as MANETs belong to a collaborative collection of different cellular devices from a heterogeneous community, the prolific characteristic is the capability to enroll in and give up the community any time. This results in a creation of a decentralized community of cell nodes that could connect, talk and bypass messages to each different without the requirement of an intermediate router. MANETs are usually used in numerous set of packages like military operations, emergency or catastrophe relief operations, commercial enterprise conferences, political conferences, mine cite operations. In those forms of networks the maximum crucial trouble is that of locating the first-class direction available between the 2 nodes consistent with the consumer necessities. Despite many fascinating future programs of cellular ad-hoc networks (MANETs), There are nevertheless a few crucial challenges and open issues to be solved. As a consequence, extensively on this paper we present an outline of MANETs, and their routing protocols. Then we present numerous tough issues and the future work.

**Keywords-** Ad-hoc Networks, Proactive, Reactive, MANETs, Hybrid, Delay Tolerant Networks (DTN), Multi-Hop

## 1. INTRODUCTION

Wireless network has played a major role in everyone's life. Many networks are connected with the advent of the internet. Since networks often provide important information, network protection is inevitable. Security can be provided on a variety of platforms such as installation, launch, transportation, network, MAC, body layer.

MANET represents the Mobile ad-hoc Network also known as the wireless ad-hoc network or ad-hoc wireless network which usually has a fixed network above the Link

Layer ad hoc network. without having the infrastructure fixed. MANET domains are free to move randomly as network topology is constantly changing. Each node behaves as a router as it transmits traffic to other specified nodes in the network. MANETs commonly have a routable networking surroundings on top of a link layer ad hoc network. MANETs include a peer-to-peer, self-forming, self-recuperation community. MANETs circa 2000–2015 typically communicate at radio frequencies (30 MHz – 5 GHz).

The main issues for MANETs are taken into consideration to be its routing protocol, which moreover have a tendency to hinder away the security and privacy, multicasting can also be any other kind of trouble with regards to an extensive network, energy consumption, efficiency, mobility of the nodes desires to be addressed as nicely [1]. Dynamically converting routes, limited bandwidth, confined battery are the limitations of MANETs which makes routing a tough mission [2]. There are a number of routing protocols proposed for mobile advert hoc networks (MANETs) which may be classified into specific techniques: topology-based and function-based routing protocols. In topology-based routing protocols packet forwarding is finished using link statistics that exists in networks.

These protocols may be in addition divided into proactive (table driven), reactive (on demand) and hybrid tactics. Most of the routing protocols assumes a relied on surroundings and lacks security features. Those protocols are subjected to a number routing attacks. In routing environment misbehaving nodes may also disrupt the conversation. Misbehaving nodes can be egocentric or malicious nodes. Malicious nodes may also release assaults which ends up in degradation of network overall performance [3]. MANETs basically assumes that there exist at the least one route among a supply node and a destination node at any time even in cell surroundings. But, if this assumption fail, connection between nodes is damaged and verbal exchange is not viable any extra. Delay Tolerant Networks (DTN) can provide conversation among nodes using save-convey-forward mechanism, even when connectivity between nodes isn't always assured and it become proposed for communique in disaster or extreme environments [4].

To tradeoff the pros and cons of MANETs and DTN protocols, hybrid protocols combining MANETs and DTN had been proposed these days. In these works, it's far typically assumed that a whole community is fragmented due to disaster or sparse density of nodes, and MANETs is used for communication between nodes inside the same fragmented community (intra-fragment communique) and DTN is used for verbal exchange among nodes belonging to one-of-a-kind fragmented networks (inter-fragment communication) [4].

Some of the selected options have gained prominence in recent years as follows: Dynamic Destination-Sequenced Distance-Vector (DSDV) Protocol, Wireless Routing Protocol (WRP), Cluster Change Gateway Routing (CSGR), Source Tree Adaptive Route (STAR), Fisheye State Routing (FSR) Provided Link State Route (OLSR) , and Topology Broadcast based on Advanced Transmission Procedure (TBRPF) are all examples of effective practice route, while Ad Hoc On-Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporary Ordered Route Algorithm (TORA), Relative Route of Diversity (RDMAR), and Signal Stability Route (SSR) examples of an active route. Zone Routing Protocol (ZRP) is a hybrid protocol, with aspects of effective and efficient agreements. Hierarchical State Routing and Landmark Ad Hoc Routing Protocol (LANMAR) are examples of a collection based on a collection based on a collection.

The research work focused on various route programs such as Dynamic Source Routing (DSR), Optimized Link State routing (OLSR), Ordered Routing Algorithm (TORA) and Ad hoc On-demand Distance Vector (AODV), in their development and consolidation for route funding by MANETs active Internet Engineering Task Force (IETF) We have observed the impact of these processes on MANETs. Sections of the paper are constructed as follows: - In Section 2, related researches relevant to this paper are discussed. Section 3 describes the Routing issues for MANETs. A detailed challenges in MANETs is described in Sect. 4-. Finally, the conclusion and future scopes are discussed in Sect. 5.

## 2. Related Research Work

MANETs is a wireless community, in which the nodes can be dynamically relocated in any route. In current years, many researchers made a contribution closer to addressing multipath routing. Well-known popular multipath routing protocols in a MANETs are AOMDV, AODVM, MSR and SMR [5].

There are a number of classification standards for classifying routing protocols of mobile ad-hoc networks. A few commonplace amongst them are like on the basis of the way routing records is received and maintained with the aid of the nodes, metrics used for routing route advent, how statistics is routed. The categorization for protocols are reactive or proactive, single path/ multi-direction, desk pushed or source initiated, source routing or hop via hop routing, complete-limited or neighborhood-broadcast, periodic or

occasion-primarily based, flat or hierarchical, course choice approach. Initially the broader category is taken into consideration to be of proactive, reactive and hybrid protocol [1].

### **Reactive protocol**

Reactive protocols are looking for to installation routes on demand. If a node desires to initiate communication with a node to which it has no direction, the routing protocol will try and establish one of these route. **Proactive protocol**

A proactive approach to MANETs routing seeks to preserve a continuously up to date topology know-how. The whole community should, in idea, be recognized to all nodes. This consequences in a constant overhead of routing traffic, however no initial delay in conversation.

### **Hybrid protocol**

Hybrid protocols are searching for to mix the proactive and reactive tactics. There are following essential routing protocols for MANETs:

**Ad-hoc On-demand Distance Vector Routing (AODV)** [1] creates the facts approximately network routes while the network wishes it. Discovery of routes is achieved on the idea of query and respond cycles and the intermediate nodes are storing the statistics propagated.

J. Deepa [5] proposed the AODV protocol algorithms to improve the energy efficiency in networks when compared to other protocols like AODVM, AOMDV and IZM-DSR multipath routing protocol algorithm based on DSR and AODV. Path Request (RREQ) message will generate that will be flooded in a restrained manner to other nodes. This reasons manage visitors overhead to be dynamic and it'll result in an initial put off when initiating such communication. A path is taken into consideration determined whilst the RREQ message reaches either the destination itself, or an intermediate node with a valid course access for the vacation spot. For so long as a route exists among two endpoints, AODV stays passive. Whilst the path becomes invalid or lost, AODV will again issue a request.

The source node gets all RREP in response to its RREQ [2]. AODV avoids the “counting to infinity” problem from the classical distance vector set of rules through the use of sequence numbers for every path. The counting to infinity hassle is the situation where nodes replace every other in a loop.

**OLSR – (Optimized Link State Routing)** – It is a table-driven pro-active protocol. As the name suggests, it makes use of the hyperlink-country scheme in an optimized manner to diffuse topology records. In a traditional hyperlink-nation algorithm, link-state information is flooded throughout the community. OLSR uses this technique as properly, however since the protocol runs in wireless multi-hop scenarios the message

flooding in OLSR is optimized to hold bandwidth. The optimization is primarily based on a technique referred to as multipoint relaying.

Being a table-pushed protocol, OLSR operation specially consists of updating and keeping statistics in a variety of tables. The statistics in these tables is based on received manipulate site visitors, and manipulate traffic is generated based on statistics retrieved from these tables. The route calculation itself is likewise driven by means of the tables.

J. Deepa [5] proposed a protocol improves node lifetime whilst compared with conventional DSR as the very best ratio and the assessment is achieved based on network lifetime. The MMRE-AOMDV is called the multipath routing protocol, which extends from ad-hoc on-call for multipath distance vector (AOMDV) routing protocol. The principle intention of this protocol is to find the minimum node residual strength for each routing system based totally on path selection direction. Every other objective is to kind the multi-direction in descending order. A brand new route may be selected based totally on the very best residual energy because it emerges and reselects statistics packets to be forwarded. It may also stability the node's battery power intake and growth the general community lifetime.

Min Wook Kang [4] proposed a protocol with suitable selection of shipping predictability threshold values has higher shipping ratio than hsr protocol, on the fee of overhead ratio, and has comparable delivery latency with hsr protocol inside the considered parameter setting.

Which can be used for an environment, along with disaster state of affairs or military state of affairs.

Reham Arnous [3] uses the greedy forwarding method to forward packets so long as the specified geographical role facts of nodes is to be had. Whilst geographical position statistics of nodes is neglected, it maintains routing the packets the usage of the on call for mechanism. GPSR and other geographic routing algorithms deal with networks in which all nodes are aware of their positions. This set of rules provides a suitable routing solution for network in which only some nodes are privy to their positions.

As a way to deal with the limitations, Multi-hop routing mechanisms have consequently for use to attach remote nodes thru middleman ones that operate as routers by Hewa Majeed Zangana, 2020 [6].

Pratiksha Nigam and Ajay Tiwari [8] proposed After research of different situations it is executed that once the network is small, DSDY performs nicely even as in case of standard ad-hoc network AODY is the best protocol. Hybrid protocols are nice desirable for huge networks. The performance of DSR is worst in case of small and huge community so one need to avoid the usage of this protocol unless and until there's some hardware and software program quandary.

Gunseerat Kaur discussed [1] that the proactive protocols have big amount of records for upkeep with high fee and slow reaction on restructuring and disasters, course setup latency is low, no longer suitable for huge fantastically dynamic community. Reactive protocols have excessive latency time in path failure, excessive flooding can result in community clogging, scalability problem, low routing overhead, brief response for network restructure and node failure. Hybrid protocols are complex, benefits rely on the variety of nodes activated, low routing overhead, less path setup latency.

The overall fashion in MANETs is in the direction of mesh structure and large scale. Improvement in bandwidth and potential is required, which suggests the want for a higher frequency and better spatial spectral reuse.

**Hybrids – ZRP (Zone Routing Protocol)** - An example of this type of protocol is the quarter routing protocol (ZRP). ZRP divides the topology into zones and are searching for to make use of distinct routing protocols within and among the zones based at the weaknesses and strengths of those protocols [3]. ZRP is definitely modular, that means that any routing protocol may be used within and among zones. The dimensions of the zones is described by way of a parameter  $r$  describing the radius in hops [1]. ZRP situation with  $r$  set to at least one. Intra-quarter routing is completed by using a proactive protocol when you consider that those protocols preserve an updated view of the zone topology, which ends up in no initial postpone while communicating with nodes in the sector [3]. Inter-area routing is accomplished by means of a reactive protocol. This removes the want for nodes to preserve a proactive sparkling kingdom of the complete community [1].

ZRP defines technique called the border cast decision protocol (BRP) to manipulate site visitors between zones. If a node has no direction to a vacation spot supplied via the proactive inter zone routing, BRP is used to spread the reactive course request [1].

### 3. Routing Issues for MANETs

Routing is one of the most complicated problems to solve as ad-hoc networks have a continuing connectivity to different devices in its community. Because of multi hop routing no default direction is available. Each node acts as a router and forwards each other's packets to allow statistics sharing among mobile nodes [6].

Principal issues for MANETs are defined as below:

*Autonomous*- No centralized management entity is to be had to manipulate the operation of the one of a kind cellular nodes [9].

*Dynamic topology*- Nodes are cellular and can be linked dynamically in an arbitrary manner. Links of the network range well timed and are primarily based at the proximity of 1 node to some other node [1].

*Device discovery*- Identifying relevant newly moved in nodes and informing approximately their existence want dynamic update to facilitate automatic choicest course choice.

*Bandwidth optimization*- Wi-fi hyperlinks considerably decrease potential than the wired links [6].

*Limited assets* - Cell nodes depend upon battery electricity, that's a scarce aid. Storage potential and power are severely restricted.

*Scalability*- Scalability may be widely defined as whether the community is capable of provide an acceptable level of carrier even within the presence of a massive number of nodes [9]

*Confined physical security*- Mobility implies higher protection risks inclusive of peer-to-peer network architecture or a shared wi-fi medium available to each legitimate community customers and malicious attackers [9].

*Infrastructure less and self operated*- Self restoration feature demands MANETs must realign itself to blanket any node shifting out of its range.

*Poor transmission Quality* - This is an inherent trouble of wireless verbal exchange caused by numerous errors resources that result in degradation of the acquired signal [6].

*Ad-hoc addressing*- Challenges in fashionable addressing scheme to be applied. *Network configuration*- The whole MANETs infrastructure is dynamic and is the motive for dynamic connection and disconnection of the variable links.

*Topology maintenance*- Updating facts of dynamic links amongst nodes in MANETs is fundamental hard problem [9].



#### 4. Research Challenges

Several books and works have revealed the technical and research challenges facing wireless ad hoc networks or MANETs.

Reham Arnous proposed the challenge for MANETs that when a node gets a packet, it first assessments whether or not the packet header has a Valid source course or not. If a valid route exists, the packet type is then checked and handled consistent with its kind. In case of absence of a valid path, the receiving node initiates a direction-report in the packet header, inserts its identification then exams its direct neighbor list for the destination or check its cache for a direction [3]

The main challenge of MANETs is their vulnerability to security attacks and how to operate securely and efficiently while preserving its own resources [2].

The important challenges faced by way of the MANETs may be extensively categorized as:

Those demanding situations are posed by means of a extensive variety of environments consisting of mobile statistics offerings, wireless warm-spots, information stations, mobile peer-to peer, advert-hoc mesh networks for broadband access, vehicular networks, sensor networks and pervasive systems[2]. Those wi-fi software scenarios result in a diverse set of service necessities for the destiny as summarized beneath:

Naming and addressing flexibility. Mobility guide for dynamic migration of end-customers and community gadgets. Location offerings that offer information on geographic role. Self-enterprise and discovery for distributed manipulate of community topology.

Security and privateness concerns for mobile nodes and open Wi-fi channels.

Decentralized management for far off monitoring and manage. Cross-layer assist for optimization of protocol performance. Sensor community functions such as aggregation, content material routing and in community processing. Cognitive radio guide for networks with physical layer edition.

Economic incentives to encourage efficient sharing of resources.

#### 5. CONCLUSION AND FUTURE SCOPE

We discuss some normal issues and challenges within the cell advert hoc networks, most of that are caused by the characteristics of the mobile ad hoc networks along with mobility, constantly converting topology, open media and constrained battery power



At some stage in the survey, we additionally discover some factors that may be similarly explored within the future, which include a few aspects of the intrusion detection strategies can get further advanced. We will try to discover deeper in this research area.

At present, the overall fashion is towards mesh structure and huge scale studies on “multi-hop” structure confirmed it a promising technique to the implementation of ad hoc networks. As the evolvement is going on, in particular the need of dense deployment including battlefield and sensor networks, the nodes in MANETs might be smaller, inexpensive and capable. Universal overall performance of AOMDV is much better than others.

## 6. REFERENCES

1. Kaur, G., & Thakur, P. (2019, July). Routing Protocols in MANET: An Overview. In *2019 2nd International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICT)* (Vol. 1, pp. 935-941). IEEE.
2. Karthigha, M., Latha, L., & Sripriyan, K. (2020, February). A Comprehensive Survey of Routing Attacks in Wireless Mobile Ad hoc Networks. In *2020 International Conference on Inventive Computation Technologies (ICICT)* (pp. 396-402). IEEE.
3. Arnous, R., El-kenawy, E. S. M. T., & Saber, M. (2019). A Proposed Routing Protocol for Mobile Ad Hoc Networks. *International Journal of Computer Applications*, 975, 8887.
4. Kang, M. W., & Chung, Y. W. (2020). An improved hybrid routing protocol combining manet and dtn. *Electronics*, 9(3), 439.
5. Deepa, J., & Sutha, J. (2019). A new energy based power aware routing method for MANETs. *Cluster Computing*, 22(6), 13317-13324.
6. Zangana, H. M. CHALLENGES AND ISSUES of MANET.
7. Saudi, N. A. M., Arshad, M. A., Buja, A. G., Fadzil, A. F. A., & Saidi, R. M. (2019). Mobile ad-hoc network (MANET) routing protocols: A performance assessment. In *Proceedings of the Third International Conference on*

*Computing, Mathematics and Statistics (iCMS2017)* (pp. 53-59). Springer, Singapore.

8. NIGAM, P., & TIWARI, A. (2021). PERFORMANCE EVALUATION OF ROUTING PROTOCOLS IN MOBILE AD-HOC NETWORKS.
9. Chitra, P., & Ranganayaki, T. A Study on Manet: Applications, Challenges and Issues.
10. Pawar, M. V., & Anuradha, J. Intrusion Detection and Prevention in WSN and MANET using Machine Learning Techniques and Existing Challenges.
11. Rath, M., Pati, B., & Swain, J. (2021). Communiqué issues in MANET and VANET protocols with network security disquiet. In *Research Anthology on Securing Mobile Technologies and Applications* (pp. 173-193). IGI Global.
12. Devi, M., & Gill, N. S. (2019). Mobile Ad Hoc Networks and Routing Protocols in IoT Enabled. *Journal of Engineering and Applied Sciences*, 14(3), 802-811.
13. Arnous, R., El-kenawy, E. S. M. T., & Saber, M. (2019). A Proposed Routing Protocol for Mobile Ad Hoc Networks. *International Journal of Computer Applications*, 975, 8887.
14. Kumar, K. V., Jayasankar, T., Eswaramoorthy, V., & Nivedhitha, V. (2020). SDARP: Security based Data Aware Routing Protocol for ad hoc sensor networks. *International Journal of Intelligent Networks*, 1, 36-42.
15. Smys, S. (2019). Energy-aware security routing protocol for WSN in big-data applications. *Journal of ISMAC*, 1(01), 38-55.