



Open access Journal

**International Journal of Emerging Trends in Science and Technology**

Impact Factor: 2.838

DOI: <http://dx.doi.org/10.18535/ijetst/v3i07.07>

## A Survey on History and Types of Manet

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### ABSTRACT

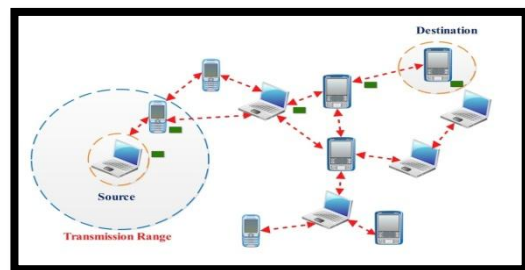
A MANET is an autonomous collection of mobile nodes that communicate with each other without centralized control or established infrastructure. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. This paper focuses on the evolution of MANET, the characteristics, applications and its types.

**Keywords:** MANET, History, Characteristics, Applications, Routing Protocol, Types of MANET.

### I. INTRODUCTION

A mobile ad hoc network (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services<sup>[1]</sup>. Ad-hoc network topology is dynamic, nodes enter and leave the network continuously there is no centralized control or fixed infrastructure to support network configuration or reconfiguration<sup>[3]</sup>. MANETs offer several advantages over traditional networks including reduced infrastructure costs, ease of establishment and fault tolerance, as routing is performed individually by nodes using other intermediate network nodes to forward packets, this multi-hopping reduces the chance of bottlenecks<sup>[1][2]</sup>. The Communication in MANET is taken place by using multi-hop paths. Nodes in the MANET share the wireless medium and the topology of the network changes dynamically. In MANET, breaking of communication link is very frequent, as nodes are free to move to anywhere. The density of nodes and the number of nodes are depends on the applications in which the users using MANET<sup>[6]</sup>. Routing is a challenging task in mobile ad hoc network. In MANET the nodes should cooperate to transfer the packets to destination node since each node of the network is able to communicate only with those nodes located within its transmission radius, while the

source and destination nodes can be located at a distance much higher than<sup>[15]</sup>. All the nodes in a multi-hop wireless ad hoc network cooperate with each other to form a network without the presence of any infrastructure such as access point or base station<sup>[17]</sup>.



Mobile Ad hoc Network

This paper also discusses about the applications of MANET and types of MANET. There are different types like VANET, FANET, iMANET, InVANET etc.

### II.HISTORY OF MANET

The life-cycle of ad-hoc networks could be categorized into first, second, and the third generation. Present ad-hoc networks systems are considered the third generation.

The first generation of ad hoc network can be traced back to 1970's. In 1970's, these are called Packet Radio Network (PRNET). The Defence Advanced Research Project Agency (DARPA) initiated research of using packet- switched radio

communication to provide reliable communication between computers and urbanized PRNET.

The second generation of ad-hoc networks emerged in 1980s, when the ad-hoc network systems were further enhanced and implemented as a part of the SURAN (Survivable Adaptive Radio Networks) program. This provided a packet-switched network to the mobile battlefield in an environment without infrastructure.

The third generation was emerged in 1990, the concept of commercial ad-hoc networks arrived with note-book computers and other viable communications equipment. At the same time, the idea of a collection of mobile nodes was proposed. Within the IETF, the MANET working group was born, and made effort to standardize routing protocols for ad hoc networks<sup>[4][5]</sup>. There are currently two kinds of mobile wireless networks. The first is known as infrastructure networks with fixed and wired gateways. The applications of this type of "one-hop" wireless network include wireless local area networks (WLANs). The second type of mobile wireless network is the infrastructure less mobile network, commonly known as the MANET<sup>[9]</sup>.

### III.CHARACTERISTICS OF MANET

A MANET consists of mobile platforms referred as nodes, which are free to move arbitrarily. The nodes may be located in airplanes, ships, trucks, cars, or very small devices, and there may be multiple hosts per router. A MANET is an autonomous system of mobile nodes. MANET nodes are equipped with wireless transmitters and receivers using antennas which may be omnidirectional (broadcast), point-to-point, or some other combination<sup>[8]</sup>. Some of the characteristics of MANET are as follows:

1. Dynamic topologies: In mobile ad hoc networks, nodes are free to move arbitrarily, the network topology is multi hop, so the nodes may change randomly and rapidly at unpredictable times, and may consist of both bidirectional and unidirectional links.
2. Autonomous and infrastructure-less: MANET does not rely on any established infrastructure or centralized administration. Each node operates in distributed peer-to-peer mode acts as an

independent router and generates independent data.

3. Multi-hop routing: Every node acts as a router and forwards each other's packets to enable information sharing between mobile hosts.
4. Variation in link and node capabilities: Each node may be equipped with one or more radio interfaces that have varying transmission/receiving capabilities and operate across different frequency bands. This heterogeneity in node radio capabilities can result in possibly asymmetric links
5. Energy constrained operation. Some or all of the nodes in a MANET may rely on batteries or other exhaustible means for their energy. The batteries carried by each mobile node have limited power supply, processing power is limited, which in turn limits services and applications that can be supported by each node<sup>[7][11]</sup>.
6. Limited physical security: Mobile wireless networks are generally more prone to physical security threats than wired networks. The increased possibility of eavesdropping, spoofing, and denial of service attacks should be carefully considered. Existing link security techniques are often applied within wireless networks to reduce security threats. As a benefit, the decentralized nature of network control in MANETs provides additional robustness against the single points of failure of more centralized approaches.<sup>[12]</sup>
7. Network scalability: Many mobile ad hoc network applications involve large networks with tens of thousands of nodes, as found eg.in sensor networks and tactical networks A large network consisting of nodes with limited resources are not straightforward, and present many challenges that are still to be solved in areas such as: addressing, routing, location management, configuration management, interoperability, security, high capacity wireless technologies, etc<sup>[14]</sup>.

#### IV. APPLICATIONS OF MANET

With the increase of portable devices as well as progress in wireless communication, ad hoc network is gaining importance with the increasing number of widespread applications<sup>[14]</sup>. Ad hoc networking can be applied anywhere where there is little or no communication infrastructure or the existing infrastructure is expensive or inconvenient to use<sup>[1]</sup>.

##### Some of the applications of MANET are:

- i. Military battlefield: Ad-Hoc network would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information head quarter.
- ii. Collaborative work: Collaborative work is essential in some business environments, the need for collaborative computing might be more important outside office environments than inside and where people need to have outside meetings to cooperate and exchange information on a given project<sup>[1]</sup>.
- iii. Personal area network and Bluetooth: A personal area network is a short range, localized network where nodes are usually associated with a given person. Short-range MANET such as Bluetooth can simplify the inter communication between various mobile devices such as a laptop, and a mobile phone<sup>[7]</sup>.
- iv. Local level: Ad-Hoc networks can autonomously link an instant and temporary multimedia network using notebook computers to spread and share information among participants e.g. conference or classroom. Home networks is another appropriate application where devices can communicate directly to exchange information.
- v. Commercial Sector: Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. Information is relayed from one rescue team member to another over a small hand held<sup>[9]</sup>.

#### V. ROUTING PROTOCOLS

##### 1. TABLEDRIVEN/ PROACTIVE PROTOCOL

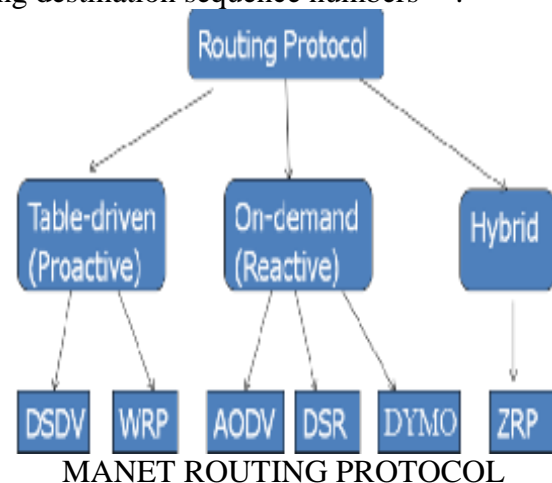
Every nodes in Proactive routing protocol store the information in form of tables and if any changes occurs in the network, the tables need to be updated. There is no route discovery delay in finding a new route<sup>[16]</sup>.

**1.1 DSDV (Destination-Sequenced Distance-Vector):** It is a proactive routing protocol. Every mobile node maintains a routing table which lists all the available destinations, the metric and next hop to each destination and a sequence number generated by the destination node<sup>[23]</sup>. The packets are transmitted between the nodes of an ad hoc network using routing table stored in each mobile node. Each node updates the routing table with advertisement periodically<sup>[17]</sup>.

##### 2. ON-DEMAND/REACTIVE PROTOCOL

Reactive protocols tend to decrease the control traffic messages overhead at the cost of increased latency in discover a new routes. In reactive protocols there is no need of distribution of information. It consumes bandwidth when the data is transferred from source to destination<sup>[18][20]</sup>.

**2.1. AODV (Ad-hoc On-Demand Distance Vector Routing):** AODV establishes a route to a destination only on demand. AODV is capable of unicast, broadcast and multicast routing[19]. AODV avoids the counting to infinity problem by using destination sequence numbers<sup>[10]</sup>.



##### 3. HYBRID ROUTING PROTOCOL

Hybrid routing protocol is the combination of both reactive and proactive routing protocols. It is proposed to reduce the control overhead of proactive routing protocols and also decrease the

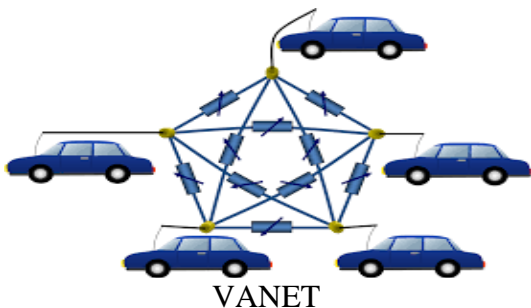
latency caused by route discovery in reactive routing protocols [22].

**3.1 ZRP (Zone Routing Protocol):** It is a hybrid routing protocol that divides the network into zones. ZRP provides a hierarchical architecture where each node has to maintain additional topological information requiring extra memory [21].

## VI. TYPES OF MANET

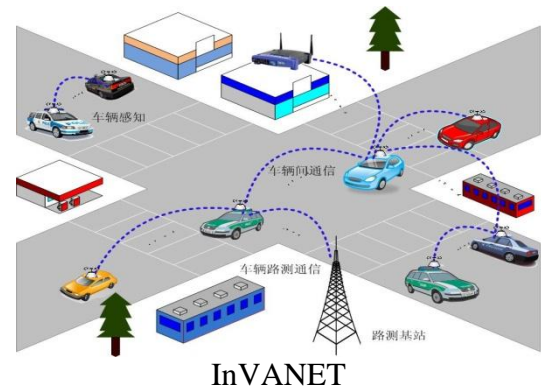
**1 VANETs (Vehicular Ad-hoc Networks):** A VANET is a technology that uses moving cars as nodes in a network to create a mobile network. VANETs support a wide range of applications - from simple one hop information dissemination of, to multi-hop dissemination of messages over vast distances. It turns every car into a wireless router or node allowing cars approximately 100 to 300 meters of each other to connect and create a network with a wide range. As cars fall out of the signal range are dropped out of the network, other cars can join in connecting vehicles to one another so that a mobile Internet is created [25].

Applications of VANETs are: **Electronic brake lights** allow a driver or an autonomous car or truck to react to vehicles braking even though they might be obscured.



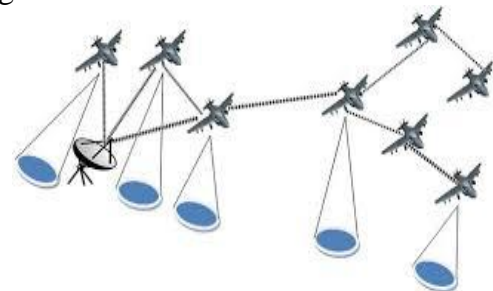
**Traffic information systems** which uses VANET communication to provide up to the minute obstacle reports to a vehicle's satellite navigation system [24].

**2. InVANETs (Intelligent vehicular ad-hoc networks):** InVANET defines an intelligent way of using Vehicular Networking. It integrates on multiple ad-hoc networking technologies such as WiFi IEEE 802.11, WAVE IEEE 1609, Bluetooth, IRA for easy, accurate, effective and simple communication between vehicles on dynamic mobility. Effective measures such as media communication between vehicles can be enabled as well methods to track the automotive vehicles is also preferred [28].



InVANET helps in defining safety measures in vehicles. Vehicular Ad-hoc Networks can be viewed as component of the Intelligent Transportation Systems (ITS).

**3. FANETs (Flying Ad hoc networks):** FANETs are a special case of mobile ad hoc networks. In FANET the topology of the network can change more frequently as compare to MANET or VANET. One of the most important design challenges for the multi UAV systems is the communication. Unmanned Aerial Vehicle (UAV) systems fly autonomously without carrying any human help [26]. FANET develop a group of small UAVs will form a special kind of ad hoc network Architecture. This type of networking architecture is called Flying Ad Hoc Networks (FANETs) which also have unique challenges other than MANETs or VANETs. In FANET each UAVs can connect directly through the satellite or ground station to establish an ad hoc network among all UAVs [27].



**4. iMANET (Internet Based Mobile Ad-hoc Networks):** Internet Based Mobile Ad-hoc Networks are ad-hoc networks that link mobile nodes and fixed Internet-gateway nodes. In such type of networks normal ad hoc routing algorithms don't apply directly [24].

## VII. CONCLUSION

This paper gives a detailed overview about the evolution of mobile ad-hoc network and its characteristics. Routing is a challenging task in

mobile ad hoc network in this paper a brief description of various types of routing protocols are provided.

Different types of Mobile ad hoc networks are also presented. The study of this paper will be helpful to understand types of mobile ad hoc networks and its various application area.

## REFERENCES

1. Jeoren Hoebeke, Ingrid Moerman, Bart Dhoedt and Piet Demester “ An Overview of Mobile ad hoc Networks: Applications & Challenges .“
2. Kavita Taneja, R.B. Patel “An Overview of Mobile Ad hoc Networks: Challenges and Future.”
3. Senthilkumar P., Baskar M. and Saravanan K., “A Study on Mobile Ad-Hoc Networks (MANETS)”, JMS, Vol. No.1, Issue No.1, September 2011.
4. Humayun Bakht “History of Mobile Ad hoc Networks”.
5. Ram Ramanathan and Jason Redi “A Brief Overview Of Ad Hoc Networks: Challenges and Directions” IEEE Communications Magazine- 50th Anniversary Commemorative Issue/May 2002.
6. Andrea Goldsmith “Wireless Communications” Cambridge University Press.
7. Aarti and Dr. S.S Tyagi, “Study of MANET: Characteristics, Challenges, Application and Security Attacks”, IJARCSSE International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 3, May 2013.
8. Macro Conti Stefano Basagni (2004) Mobile Ad hoc Networking. John Wiley and Sons inc.
9. Mohit Kumar and Rashmi Mishra —An Overview of MANET: History, Challenges and Applications, Indian Journal of Computer Science and Engineering (IJCSE), Vol. 3 No. 1 Feb-Mar 2012.
10. Ruchi R., Dawra M., “Performance characterization of AODV protocol in MANET”, IJAR CET, Vol No 1, Issue No 3, May 2012.
11. M. Frodigh, P. Johansson, and P. Larsson.—Wireless ad hoc networking: the art of networking without a network, Ericsson Review, No.4, 2000, pp. 248-263.
12. Hao Yang, Haiyun & Fan Ye — Security in mobile ad-hoc networks : Challenges and solutions, Pg. 38-47, Vol 11, issue 1, Feb 2004.
13. The Hand book of AdHoc Wireless Networks (chapter 30), CRC press LLC, 2003.
14. Barr R., Z.J. Haas and R.V. Renesse, "Scalable Wireless Ad hoc Network Simulation", in Handbook on Theoretical and Algorithmic Aspects of Sensor, Adhoc Wireless and Peer-to-Peer Networks, pp. 297-311, 2005.
15. Roy B., Banik S., Dey P., Sanyal S and Chaki N, “Ant Colony based Routing for Mobile Ad-Hoc Networks towards Improved Quality of Services”, JETCIS, Vol. No 3, Issue No. 1, January 2012.
16. D. Johnson, “ Routing in Ad Hoc Networks of Mobile Hosts,” Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications, Dec.1994.
17. E. Royer and C.-K. Toh, "A Review of Current Routing Protocols for Ad-Hoc Mobile Wireless Networks," IEEE Personal Communications Magazine , April 1999, pp. 46-55.
18. Ashok M.Kanthe, Dina Simunic and Ramjee Prasad Comparison of AODV and DSR on-Demand Routing Protocols in Mobile Ad hoc Networks.
19. Prem Chand and M.K. Soni “Performance comparison of AODV and DSR ON-Demand Routing protocols for Mobile ad-hoc networks” Published in July 2012.
20. Morigere Subramanya Bhat, Shwetha .D, Manjunath .D and Devaraju J.T.”Scenario Based Study of on demand Reactive Routing Protocol for IEEE-802.11 and 802.15.4 Standards” ISSN: 2249-57 Vol 1(2), 128-135 published in October-november 2011.
21. Nickles Beijar “Zone Routing Protocol” Networking Laboratory, Helsinki University of Technology.
22. “Routing protocols in ad hoc networks: A survey” by Azzedine Boukerch, Begumhanurgut, Nevin Aydin,

- Mohammad Z. Ahmad, Ladislau Bölöni, Damla Turgut -2011, Pages 3032.
23. "Ad Hoc Wireless Networks, Architecture and Protocols", by C. Siva Ram Murthy and B.S Manoj Prentice Hall PTR, 2004.
  24. "Mobile Ad Hoc Networks", by Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, IEEE press, A John Wiley & Sons, INC. publication, 2003.
  25. Harsch, C., Festag, A., & Papadimitratos, P. (2007). Secure position-based routing for VANETs. In Proceedings of IEEE 66th vehicular technology conference (VTC-2007), Fall 2007 (pp. 26–30), September 2007.
  26. Dynamic Routing for Flying Ad Hoc Networks. Stefano Rosati, Member, IEEE, Karol Kruszewski, Member, IEEE, Grégoire Heitz, Dario Floreano, Senior Member, IEEE, and Bixio Rimoldi, Fellow, IEEE.
  27. Networking Models in Flying Ad-Hoc Networks (FANETs): Concepts and Challenges Ozgur Koray Sahingoz.
  28. Ali, S., & Bilal, S. (2009). An intelligent routing protocol for VANETs in city environments. In Proceedings of 2nd international conference on computer, co.