

# Study of Mobile Ad-hoc Network's Challenges and Characteristics

Ishu Varshney, G. Ananth Kumar

Assistant Professor, Department of Computer Science & Engineering, G. L. Bajaj Institute of Technology & Management, Greater Noida (U.P) India

## ABSTRACT

MANET is a collection of various mobile nodes that are helpful to communicate with each other without any centralized control which are wireless and work as dynamic network. The current generation is much advanced in using such type of networks, which is very flexible and portable to the end users, which is most economical. The applications of this MANETs are used world wide due to its advantages, but still there are some issues which need to be resolved, known as challenges. This paper is on the various challenges and characteristics of MANET.

**Keywords :** MANET, Wireless, Mobile Nodes

## I. INTRODUCTION

MANET is specifying as a network that has many autonomous nodes that often composed of mobile devices. It is a wireless network consisting entirely of mobile nodes that communicate on-the-move without base stations. [1] Nodes in these networks will both generate user and application traffic and also carried out network control and routing protocols.

Rapidly changing connectivity, network partitions, collision interference, and power constraints together pose new issues in network control particularly in the design of huge level protocols such as routing etc. [2] The ad-hoc network pertains some issue regarding communication. Each must forward traffic unrelated to its own use, therefore be a router. In building a MANET is equipping every device that maintain the data required to route traffic and such networks may operate by themselves. [2] They may contain multiple and different transceivers between nodes.

This results in largely dynamic and autonomous topology.



**Figure 1 :** Mobile Ad-hoc Network

The main purpose of this paper is to investigate some of the important characteristics and challenges of MANETs. Here, discuss the characteristics of MANETs in section II. Section III addresses the different challenges of Mobile Ad-hoc Network and

Section IV conclude our study and present future work, lastly ended with references.

## II. CHARACTERISTICS

The characteristics of mobile ad-hoc network are as follows:

### 1. Performance of the Terminal

The independent mobile nodes in a group, known as MANET. It performs the role of both host and the router i.e it can perform the task of switching. Both Terminal and switches are alike in MANET.

### 2. Optimum Bandwidth

The capacity of the wired network in terms of links is very high as compared to the Wireless network. The possibility of occurrence of congestion is high in the wireless network because, any requirement of additional nodes in the network, which are not available, can lead to it. It requires the higher capacity of network, where we use optimum bandwidth.

### 3. Device Heterogeneous

Mobile Devices or mobile nodes in MANET are heterogeneous in nature. Mobile nodes can be phones, laptops or it can be tablets etc. with different configurations.

### 4. Decentralized Governing

As the working of the links in the ad-hoc network changes frequently, it is difficult to implement any protocol through MANET. So it is suggested to have the decentralized governing body, instead of centralized, to implement any protocol, on the nodes.

### 5. Distributed Environment

The mobile nodes used the Distributed Environment, to control the network. There is no separate control over the mobile network apart from distributed system. It helps the nodes to have the communication mutually between the other nodes, and sometimes acts as a router, and helps the data to transfer securely.

### 6. Dynamic nature of Network

As the nodes are mobility in nature, in the mobile networks, the topology of the network is also dynamic, i.e. will be changing dynamically, and can be a chance for loss of packets too.

### 7. Conservation of Energy

In the current trend, there are numerous electronic devices existing with various functionalities. All these work with the energy back-up devices such as batteries. The main intention is to conserve and optimize the energy consumption in mobiles.

### 8. Thin Nodes

The group of mobile nodes is known as MANET. It has very less storage, low in memory, and the capability of CPU is low. To perform the computing on such nodes, we must implement optimized algorithm process.

### 9. Lossy Links

The nodes of the MANET are mobile in nature, that's why any node can go out of range of the network at any time. This causes frequently loss links between the nodes.

### 10. Multi-Hop Routing

If any node is not available during the transmission of the data, it takes the help of intermediate nodes to reach it and then the communication between the target node is done.

### **11. Scalability of Network**

To implement any type of the network, the nature of scalability is very important for that network. It can support only the static type of networks/wireless networks.,eg: PAN, Sensor network etc. we need to face many issues while implementing such type of networks. Some of issues are addressed here like routing, addressing, security, configuration etc.

### **12. Infrastructure for Network**

The mobile network itself resembles the mobility in the network. There is no special static network required. It can be connected as per the requirement.

### **13. Shared Broadcast Radio Channels**

All nodes in MANET shared radio interface for receiving and transmitting data packet or information.

### **14. Self-Organized**

MANET can be deployed without any central point or access point. Nodes in the MANET are intelligent to handle all the network functions including their own data transmission and hence are self-organized.

### **15. Unconventionality Abilities of Node**

There is a possibility for the each device used in the network, to have many interfaces with the receiving and sending capabilities. These may also work across various radio frequencies, due to which there may be a chance of getting irregular links. Due to various nodes with different configurations, the processing capability may be affected. For such kind of network, the usage of protocols and algorithms can be complicated. To avoid this, we have to take steps for the dynamic adjustments as the alternate solutions like load distribution, congestion etc.

### **16. Ease for Accessing Resources**

The mobile ad-hoc network is a mode of communication, by which communication with any node can be done, provided it have adequate resources. So, it is very easy to access the resources for continue further communication.

### **17. Unstable Communications**

The communication in the mobile ad-hoc network, are highly dynamic, due to which there is a possibility of losing the packet. There will be drop in the throughput. There will not be any stability in the mobile ad-hoc networks.

## **III. CHALLENGES**

Challenges of mobile ad-hoc network are discussed below:

### **Decentralized Management**

MANET have Decentralized Management as the nodes can move freely. It is difficult of attack such type of nodes.

#### **3.1 Limitations of Power Backups**

There are many devices used in the current trend, which are used by power backups. Some of the criterial affects the Power backup of the device like portability, weight and size of the devices.

#### **3.2 Broadcasting in wireless Network**

Transmission of the data by using a device ,comes under the concept of broadcast, which covers the transmitted area. In the broadcast, the data will be transferred from sender to receiver only. The device can access any medium when it cannot disturb any device during communication. The possibility of loss of data packets is more in the broadcasting network.

### 3.3 Co-Operation between nodes.

The Routing algorithm for MANET, the nodes are co-operative. So, the hacker/attacker can hack the route of mobile ad-hoc network, pretends himself as an agent and then interrupt the network operations.

### 3.4 Dynamic Network reflects its Topology

It effects the relation among the nodes, due to the Dynamic topology. If the nodes are detected, then the topology of the network also changes. The dynamic network reflects the topology of the network.

### 3.5 Node Identification

If the nodes are newly identified and are informed about their existence, then they are required to update in the routing table, which helps in the optimal selection routing.

### 3.6 Ease of Snooping on Wireless Transmission

The data in the wireless network is shared by all the devices of the network. The data which is transmitted by all the device in the network, during transmission, all acknowledged by all those devices through which the data is passed. The attacker can peep through the data which is being transmitted in the network. There can be the security issue through this process, known as snooping.

### 3.7 Hidden Node problem

There will be loss of packets due to collision at the receiving end, when the node at the receiving end is not in the range of the sender. But from the receiving point, the range of nodes will be in the range of receiver. Such nodes are traded as hidden in the sender perspective. This is known as hidden node problem.

### 3.8 Inter-Networking for communication

The internetworking is important in the network for communication. The communication between the MANET and the IP based network is also an important aspect. It helps for the good communicating practice which improves the efficiency of the network.

### 3.9 Mobile Routing using IP

The IP layer in Mobile routing increases the capability of the routing process and can be used over the heterogeneous network.

### 3.10 Multi-casting in Wireless Network

It is very useful in the wireless communication, to support multiparty. The multicast routing protocols are needed to manage with the mobility nature.

### 3.11 Routes status in Mobile Networks

The nature of the mobile network is very dynamic due to its mobility in nature. There is a frequent change in the nodes, as a result, the path of this changes frequently. It always results in the alternation of the existing path.

### 3.12 Packet Losses in Mobile Networks

In the network, as the packet moves along with the ad-hoc network, and due to the frequent change of the paths, there will not a proper secure to the data, and can be a chance of Packet Loss in such type of networks.

### 3.13 Frequent Network Partitions

In the ad-hoc network, the nodes will be affected frequently due to the mobility. Every time the new nodes changes due to the switch of the network from node to node dynamically, there may be chance of Frequent Network Partition.

### 3.14 Result in Packet Losses for Transmission Error

There are many reasons for Packet loss. Transmission Error is one of the reasons too. In the ad-hoc network, the frequent change of the nodes give rise to the breakage of the path of the network. This results in the Transmission Error. There are some more reasons for occurrence of Transmission error such as: availability of unknown terminal, interventions, node positions etc. These all factors help to have the Packet Loss due to the Transmission Error.

### 3.15 QoS in Dynamic Environment

The major challenge is to provide Quality of Service (QoS) in the Dynamic changing Environment. It is difficult to predict the constant services will be provided by the devices in the changing environment. An Adaptive QoS is require to be implemented to support many more services over the network.

### 3.16 Problem of Overhead

As in the dynamic environment and in the mobile ad-hoc networks, there is a frequent change in the location. This is the cause of unnecessary overhead, due to the some of the static routes present in the routing table.

### 3.17 Security Issues

There are numerous issues in the security aspect of mobile ad-hoc networks. This network is highly vulnerable to the various attacks, which makes the challenge to the Security aspect. In the as-hoc network, the complete working is done through the mutual understanding between the node, which is the major loophole for the Attacks.

### 3.18 Location-based Routing

The location in the routing is limited to the specific area and limited due to the positions of the nodes and

the allocated regions. This is strict and restricted in the broadcast networks

## IV. CONCLUSION AND FUTURE SCOPE

This paper provides an overview of challenges and characteristics of MANET's. The emerging trends in the technology brings the new era in wireless network. The features like economical, automatic configuration etc , makes this network more popular. There are many applications embedded with the MANET , which gives outreach results. There are many more protocols are available to implement routing in MANET , but still facing many challenges in terms of security. The current trend in MANET is highly useful and of high frequency, helpful in many applications. Eventhough we have many other networks which will overcome the challenges of MANETs, the research is going on to remove the flaws in it, and face the challenges in most accurate way to get the better results.

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**Cite this article as :**

Ishu Varshney, G. Ananth Kumar, "Study of Mobile Ad-hoc Network's Challenges and Characteristics", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 6 Issue 4, pp. 237-242, July-August 2019.  
Journal URL : <http://ijsrst.com/IJSRST196447>