

# Mobile Ad Hoc Network

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## ABSTRACT

The term “Ad Hoc” means when needed, it means a network that is temporary or setup immediately when needed for random temporary access. So an Ad Hoc network is a group of “locally-available” devices that can connect and talk to each other directly whenever needed without the need of any router or server. This network breaks when the connected devices go out of the network i.e. disconnect from the network, so the network breaks with the closing of the Ad-Hoc connection.

## WIRELESS AD HOC NETWORKS TYPES:

Different classes are there in which categorization of wireless ad hoc networks is done. These include:

- **VANET (vehicular ad hoc network):** Communication between vehicles takes place using this. ad hoc technologies and artificial intelligence is used by intelligent VANETs for establishing communication during emergency
- **MANET (mobile ad hoc network):** Mobile devices ad hoc network
- **SPAN (Smartphone ad hoc network):** Ad hoc wireless network developed on smartphones using present technologies such as Bluetooth and Wi-Fi
- **Army tactical MENT:** Used for communication on the move in army, a tactical wireless ad hoc network that depends on instant operation and range for establishing networks.
- **Wireless mesh network:** Ad hoc network having direct communication between several nodes for relaying information all through the network.

## **MOBILE AD HOC NETWORK**

Mobile Ad Hoc Network or MANET can be explained as a transportable network that can be created and implemented as & when required based on the requirement. These networks skip or avoid the hardware of a traditional network. These are local area networks (LANs) that allow devices in a range of each other to connect wirelessly, instead of using a fixed server or router to act as a central hub for connected devices.

Mobile Ad-Hoc networks "(MANETs) assume an undeniably vital job in numerous situations and applications, particularly, in basic settings that need fixed network foundation, for example, crisis safeguard, compassionate guide, and in accumulation military and law requirement. Since most MANETs are multi-bounce in nature, coordinated and flexible directing is an essential capacity with necessities obviously unmistakable from those in fixed networks. In the interim, numerous MANET arrangement situations include activity in unfriendly conditions, implying that assaults are either expected or, in several procedures, conceivable.

Security and protection are some real issues in Ad-Hoc networks since it gives a path to the foes to dispatch different destroying assaults on the objective system. The main objective is to provide secrecy insurance is given to source, course and goal. Because of this the assailant thinks that it's hard to discover the source and goal. The way of bundle stream is escaped the aggressor. Mobile Ad-Hoc network might be conveyed in an expansive territory where to interface different hubs in an uneven or remote zone for earnest correspondence in the occurrence of cataclysmic events. The area of an individual or substance can be followed effectively and it very well may be exchanged to control rooms utilizing portable hubs of a Large MANET system. In this manner, to structure some new mobile Ad-Hoc communication protocols. Mobile Ad-Hoc network investigation is a developing field and parcel of territory like transfer speed estimating controls utilization of mobile IP protocols, security breaks.

## **MANETS FEATURE**

- No hardware or fixed infrastructure, the mobile devices involved talk and transfer data directly to each other autonomously.
- Self-repairing.
- Auto configured.
- Also known as Wireless Ad-hoc Network (WANET), on the fly networks or spontaneous networks.

- Each device itself acts as a router and transfers data packets to another device/node.

## WORKING OF MANETS

The workings of MANETs are as follows:

- Work as an individual exclusively or in a group as a part of a huge network like the internet.
- No access point or hardware.
- Direct & autonomous communication between mobile devices.
- The devices search each other themselves and start communicating.
- If a node is far away, then the nodes between the source and destination nodes act as routers and transfer data one by one to make it reach the destination node.
- The devices can join or leave the network anytime i.e. dynamic node addition or removal happens.
- The devices have their own backups of energy like they have batteries for power.

## APPLICATION OF MOBILE AD-HOC NETWORKS

MANETs are used in various fields like:

- **Gaming Services:** For collaborative gaming in local area networks in schools, competitions, etc.
- **Military Services:** For immediately sending information to all remote troops or battalions, for meetings, etc.
- **Commercial Use:** Local Conferences, Events, Seminars.
- Industrial sector.
- Emergency services like earthquakes, disaster relief, fire fighting, natural disasters which need services without infrastructure.
- **Education Sector:** In classrooms, labs of schools, colleges, etc. for sharing lectures, etc.
- Bluetooth communication.

## CHARACTERISTICS OF MOBILE AD-HOC NETWORKS

Following are the characteristics explained below:

- **No Centralized Control:** The working is completely dependent on the behavior and support of the participating devices.

- **Random Change of Devices:** Devices keep on coming and leaving the network at a huge pace and voluntarily.
- Frequent changes in network topology i.e. the arrangement of devices in the network
- Limited battery power
- Limited human interference
- **Less Security:** These networks have bigger threats than on wired networks.
- The devices involved in these networks being so smaller nowadays can easily be a victim of theft.
- They can be attacked easily.
- Each device acts as a router as well as ahead of the network, so each device plays twofold or double roles.
- **Limited Bandwidth:** These networks have very little capacity and range of data transmission.
- Low resources such as memory power, battery power, backups, etc.
- Performance is high with low expenses and scalability advantages.

## **TYPES OF MOBILE AD HOC NETWORK**

### **Daisy Chain Network**

A daisy chain is used to direct the connection of network nodes and nodes of the computer. It is a typical type of network topology. Varied topology supports objectives, persistent, fault-tolerant and user-friendly. It is also simple to implement. One node of the network is connected to the next in line or chain. It can be linear where the initial and last nodes aren't linked and it can also be formed as a ring by connecting the initial and last nodes. The ring topology enables bidirectional passing whereas, in linear, the message must flow from one system to another in a single direction. It is low adaptable but it resembles like electric series circuit where a fault in one system affects the other linked components. A well-built network can isolate the faulty sections without disturbing the process of other systems. In a ring structure, the transportation of data is made in both directions. So if any faulty node occurs, it cut off the concerned parts from the rest of the network.

Other network topologies include a hub as a central system to pass the message from other nodes. Star topology is capable to handle multiple

outages of nodes without disconnecting the working machines.

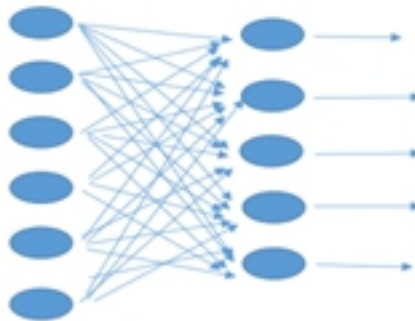
The daisy chain network is well known for its simplicity and scalability. The user can add extra nodes along the chain up to a maximum extent. A daisy chain network can have a long-distance from one end to another but it is not suitable in all circumstances where nodes must be distributed all over the geographic area. Hence it is applied in the Metropolitan Area Network.

### **DNN Neural Network**

Artificial Neural Network (ANN) can either be shallow or deep. When ANN has more than one hidden layer in its architecture, they are called Deep Neural Networks. These networks process complex data with the help of mathematical modeling. Deep Neural Networks (DNN) is otherwise known as Feed Forward Neural Networks (FFNNS). In these networks, data will be flowing in the forward direction and not in the backward direction, and hence node can never be accessed again. These Networks need a huge amount of data to train, and they have the ability to classify millions of data. Deep Neural Networks have an input layer, an output layer and few hidden layers between them. These networks not only have the ability to handle unstructured data, unlabeled data, but also non-linearity as well. In Deep Neural Network the signal from one neuron is transferred to another neuron. When the output of the neuron has a high value, then, the dimension corresponding to that has high importance.

### **Feed forward Neural Networks**

Feed forward neural network is that the artificial neural network whereby connections between the nodes don't type a cycle. It goes through the input layer followed by the hidden layer and so to the output layer wherever we have a tendency to get the desired output. The figure represents the design of a multi-layer feed-forward neural network. It represents the hidden layers



and also the hidden unit of every layer from the input layer to the output layer. The operation of hidden neurons is to intervene between the input and also the output network. The upper order statistics area unit extracted by adding a lot of hidden layers to the network.

The on top of the figure represents the one layer feed forward neural specification. During this, the input is passed on to the output layer via weights and neurons within the output layer to figure the output signals.

### **WEAKNESSES OF MANET**

MANETs are very flexible for the nodes, this means nodes can freely join and leave the network. There is no main body that can do controlling on the nodes entering and leaving the network. Because of these characteristics of MANET, it is vulnerable to attacks that we discuss it below:

#### **NONSECURE BOUNDARIES:**

Due to no clear secure boundary, MANET is vulnerable to various kinds of attacks. It's the nature of MANET that nodes have the freedom to join and leave the network. Node can join to the network automatically if the network is in the radio range of the node, and thus it can transfer information with other nodes in the network. As a result of no secure boundaries, MANET is more affected by attacks. When security compromises, attacks can result to spoofing of node's identity, data tempering, confidential [information leakage](#), and impersonating node .

#### **COMPROMISED NODE:**

Some of the attacks are to get access inside the network in order to get control over the nodes in the network to exploiting them; it means to accomplish their [malicious activities](#). Since mobile nodes in MANET are free to move, join, or leave the network, this means that the mobile nodes are autonomous; it is very difficult for the nodes to prevent malicious behavior of nodes which they are communicating with. It is very easy for a compromised node to change its position because of ad hoc mobility, therefore often making it more hard and troublesome to trace the malicious activity. It has been realized that these threats from compromised nodes inside the network is more perilous than attack threats from outside the network.

#### **NO CENTRAL MANAGEMENT:**

MANET is a self-arranged network, which is including of mobile nodes that communicate with each other without a central control. Each of these nodes acts as a router and thus can forward and receive packets. MANET works

without any preexisting foundation. This absence of centralized management causes MANET more insecure to attacks. In [ad hoc networks](#), detecting attacks and monitoring the traffic in highly dynamic and for large scale is very troublesome according to no central management.

### **PROBLEM OF SCALABILITY:**

In traditional networks scalability of the network is clarified in the starting phase of the network designing. The case is completely different from the MANET because MANET nodes are mobile and due to their mobility, the scale of the MANETs is changing. It is so hard to know and foretell the numbers of nodes in the MANETs in the future. The nodes are free to move inside and outside the MANET which makes it very scalable and shrinkable. According to this characteristic of MANETs, the protocols and all the services that a MANET provides must be adaptable to such changes.

### **CONCLUSION**

MANETs have so much dynamism into them which makes them a necessary technology for the rapid changes happening in the world of communication. With the increase of mobile devices such as laptops, cell phones, ipads etc., such networks like MANETs are of huge significance and cannot be avoided completely.