

How Important Mobile Ad Hoc Network (MANET) Is?

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Abstract:- A Mobile Ad-hoc Network (MANET) is a decentralized kind of wireless network. It does not rely on a pre-existing infrastructure, so that is known as Ad-hoc Network. In other words, routers in wired networks or access points in managed (infrastructure) wireless networks. With each & every node participates in routing by forwarding data for other nodes, so the determination of which nodes forward data is made dynamically on the basis of network connectivity and the routing algorithm in use. A mobile Ad-hoc Network is a self-configuring, dynamic network in which nodes are free to move. Mobile Ad Hoc Network (MANET) is a collection of two or more devices or nodes or terminals with wireless communications and networking capability that communicate with each other without the aid of any centralized administrator also the wireless nodes that can dynamically form a network to exchange information without using any existing fixed network infrastructure. And it's an autonomous system in which mobile hosts connected by wireless links are free to be dynamically and sometime act as routers at the same time, and we discuss in this paper the distinct characteristics of traditional wired networks, including network configuration may change at any time, there is no direction or limit the movement and so on, and thus needed a new optional path Agreement (Routing Protocol) to identify nodes for these actions communicate with each other path, An ideal choice way the agreement should not only be able to find the right path, and the Ad Hoc Network must be able to adapt to changing network of this type at any time. and we talk in details in this paper all the information of Mobile Ad Hoc Network which include the History of ad hoc, wireless ad hoc, wireless mobile approaches and types of mobile ad Hoc networks, and then we present more than 13 types of the routing Ad Hoc Networks protocols have been proposed. In this paper, the more representative of routing protocols, analysis of individual characteristics and advantages and disadvantages to collate and compare, and present the all applications or the Possible Service of Ad Hoc Networks.

Keywords: *MANET, Types of MNET, Characteristics of MANET, MANET Routing Protocol, Pros and Cons, Application and it's Problems.*

Introduction:-

MANET stands for Mobile ad-hoc Network also called as wireless ad-hoc network or ad-hoc wireless network that usually has a routable networking environment on top of a Link Layer ad hoc network. They consist of set of mobile nodes connected wirelessly in a self-configured, self-healing network without having a fixed infrastructure. MANET nodes are free to move randomly as the network topology changes frequently. Each node behaves as a router as they forward traffic to other specified node in the network.

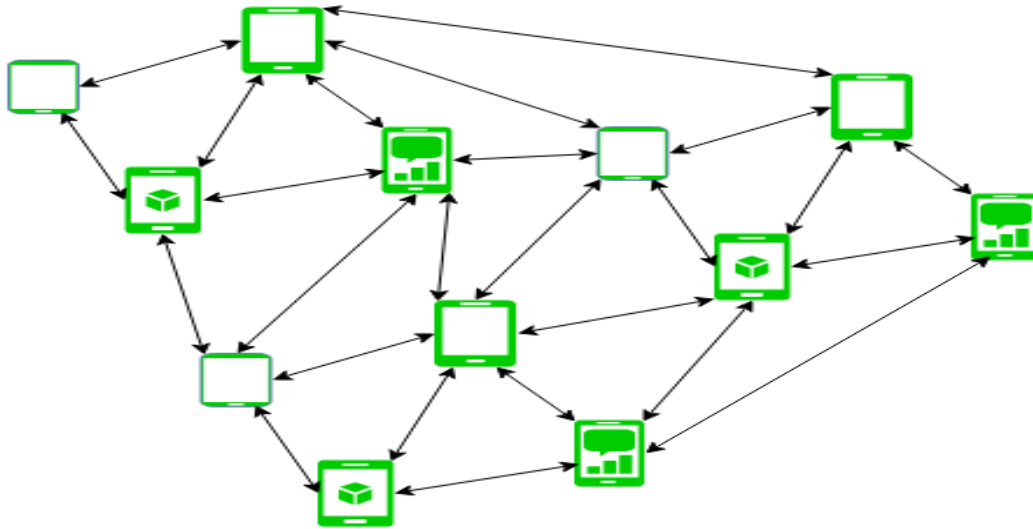


Fig:-Mobile Ad Hoc Network

1) Types of MANET:-

1. **Vehicular Ad hoc Network (VANETs)** –Enable effective communication with another vehicle or with the roadside equipment. Intelligent vehicular ad hoc networks (InVANETs) deals with another vehicle or with the roadside equipment.
2. **Smart Phone Ad hoc Network (SPANC)** –To create peer-to-peer network without relying on cellular carrier networks, wireless access points or traditional network infrastructure. Here peer can join or leave the network without destroying it.
3. **Internet based Mobile Ad hoc Network (iMANETs)** –It supports internet protocols such as TCP/UDP and IP. To link mobile nodes and establish routes distributed and automatically.
4. **Hub-Spoke MANET** –Multiple sub MANET’s may be connected in hub-spoke VPN to create a geographically distributed MANET. Normal Ad-hoc routing algorithm does not apply directly.
5. **Military or Tactical MANETs** –This is used by the military units. Emphasis on data rate, real time demand, fast re-routing during mobility, security, radio range, etc.
6. **Flying Ad hoc Network (FANETs)** –This is composed of unmanned aerial vehicle (commonly known as drone). Provides links to remote areas and mobility.

2) Characteristics of MANET :

- **Dynamic Topologies:** Network topology which is typically multihops, may change randomly and rapidly with time, it can form unidirectional or bi-directional links.
- **Bandwidth constrained, variable capacity links:** Wireless links usually have lower reliability, efficiency, stability, and capacity as compared to wired network. The throughput of wireless communication is even less than a radio’s maximum transmission rate after dealing with the constraints like multiple access, noise, interference conditions, etc.
- **Autonomous Behavior:** Each node can act as a host and router, which shows its autonomous behavior.

- **Energy Constrained Operation:** As some or all the nodes rely on batteries or other exhaustible means for their energy. Mobile nodes are characterized with less memory, power, and lightweight features.
- **Limited Security:** Wireless network are more prone to security threats. A centralized firewall is absent due to its distributed nature of the operation for security, routing, and host configuration.
- **Less Human Intervention:** They require minimum human intervention to configure the network, therefore they are dynamically autonomous in nature.

3) MANET Routing Protocols :

In Mobile Ad hoc Network (MANET), nodes do not know the topology of their network; instead they have to discover it by their own as the topology in the ad-hoc network is dynamic topology. The basic rule is that a new node whenever enters into an ad-hoc network, must announce its arrival and presence and should also listen to similar announcement broadcasts made by other mobile nodes.

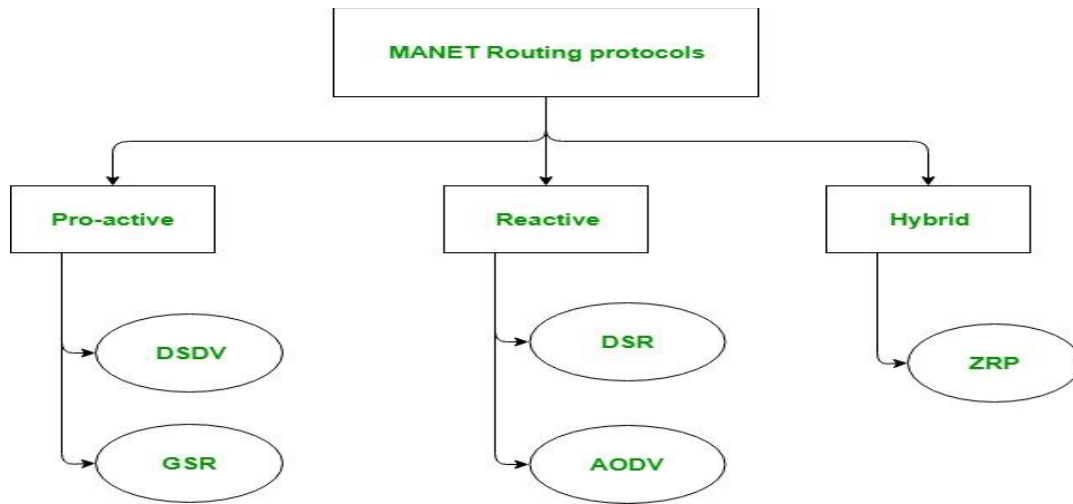


Fig:-MANET Routing Protocol

1. Pro-active routing protocols: These are also known as table-driven routing protocols. Each mobile node maintains a separate routing table which contains the information of the routes to all the possible destination mobile nodes.

Since the topology in the mobile ad-hoc network is dynamic, these routing tables are updated periodically as and when the network topology changes. It has a limitation that is doesn't work well for the large networks as the entries in the routing table becomes too large since they need to maintain the route information to all possible nodes.

1. Destination Sequenced Distance Vector Routing Protocol (DSDV):It is a pro-active/table driven routing protocol. It actually extends the distance vector routing protocol of the wired networks as the name suggests. It is based on the Bellman-ford routing algorithm. Distance vector routing protocol was not suited for mobile ad-hoc networks due to count-to-infinity problem. Hence, as a solution Destination Sequenced Distance Vector Routing Protocol (DSDV) came into picture.

Destination sequence number is added with every routing entry in the routing table maintained by each node. A node will include the new update in the table only if the entry consists of the new updated route to the destination with higher sequence number.

2. Reactive routing protocols :These are also known as on-demand routing protocol. In this type of routing, the route is discovered only when it is required/needed. The process of route discovery occurs by flooding the route request packets throughout the mobile network. It consists of two major phases namely, route discovery and route maintenance.

1. **Dynamic Source Routing protocol (DSR):** It is a reactive/on-demand routing protocol. In this type of routing, the route is discovered only when it is required/needed. The process of route discovery occurs by flooding the route request packets throughout the mobile network. It consists of two phases:

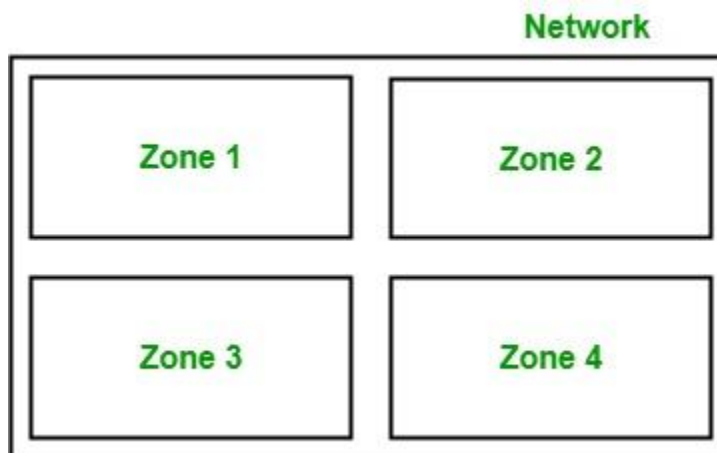
- **Route Discovery:** This phase determines the most optimal path for the transmission of data packets between the source and the destination mobile nodes.
- **Route Maintenance:** This phase performs the maintenance work of the route as the topology in the mobile ad-hoc network is dynamic in nature and hence, there are many cases of link breakage resulting in the network failure between the mobile nodes.

2. **Ad-Hoc on Demand Vector Routing protocol (AODV):** It is a reactive/on-demand routing protocol. It is an extension of dynamic source routing protocol (DSR) and it helps to remove the disadvantage of dynamic source routing protocol. In DSR, after route discovery, when the source mobile node sends the data packet to the destination mobile node, it also contains the complete path in its header. Hence, as the network size increases, the length of the complete path also increases and the data packet's header size also increases which makes the whole network slow.

Hence, Ad-Hoc on Demand Vector Routing protocol came as solution to it. The main difference lies in the way of storing the path, AODV stores the path in the routing table whereas DSR stores it in the data packet's header itself. It also operates in two phases in the similar fashion: Route discovery and Route maintenance.

3. **Hybrid Routing protocol:** It basically combines the advantages of both, reactive and pro-active routing protocols. These protocols are adaptive in nature and adapts according to the zone and position of the source and destination mobile nodes. One of the most popular hybrid routing protocol is **Zone Routing Protocol (ZRP)**.

The whole network is divided into different zones and then the position of source and destination mobile node is observed. If the source and destination mobile nodes are present in the same zone, then proactive routing is used for the transmission of the data packets between them. And if the source and destination mobile nodes are present in different zones, then reactive routing is used for the transmission of the data packets between them.



4) **Pros And Cons:**

Pros:

1. Separation from central network administration.
2. Each nodes can play both the roles as router and host showing autonomous nature.
3. Self-configuring and self-healing nodes, does not require human intervention.

Cons:

1. Resources are limited due to various constraints like noise, interference conditions, etc.
2. Lack of authorization facilities.
3. More prone to attacks due to limited physical security.

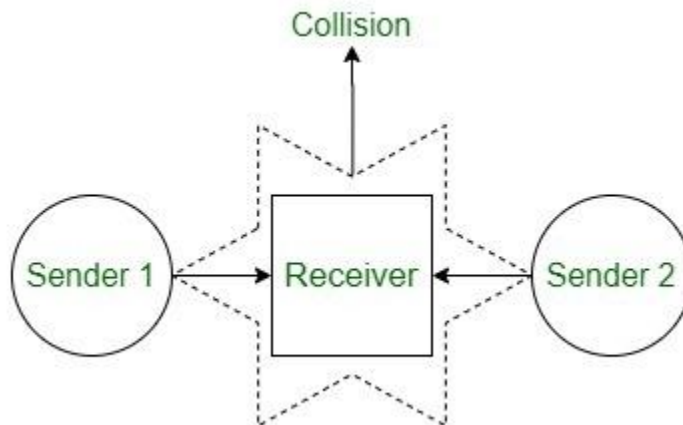
5) Application and It's Problems :

Usages of Ad-Hoc network :

- **Military** –An ad hoc networking will give access to the army to maintain an network among all the soldiers, vehicles and headquarters.
- **Personal area network (PAN)** –It is a short range, local network where each nodes are usually related with a given range.
- **Crisis Condition** –Because it is fairly easy to create it can be used in time of crisis to send emergency signals.
- **Medical Application** –It can use to monitor patient.
- **Environmental Application** –It can be used to check weather condition, forest fire, tsunami etc.

Problems :There are several problems that Ad Hoc network faces –

- Limited wireless range
- Packet losses
- Energy conservation because of limited batteries.
- Low-quality communications.
- Hidden-node problem creates collision if two devices try to communicate with same receiver.
- Exposed-node problem.



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