Mobile Ad Hoc Network

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Abstract-- The field of wireless and mobile communication has reached on the top of all the communications. Mobile Ad Hoc Network (MANET) are the ad hoc (temporary) networks which are created for the communication purposes. The Ad Hoc concept is not new but having been in research from past 20 years. Using of Bluetooth, IEEE 802.11 are some Ad Hoc networks which are used most widely.

This paper attempts to get the overview of dynamic range of MANETs. It includes the latest researches, applications, characteristics and challenges of MANET.

Keywords-- Mobile network, Ad Hoc Network, Nodes, Wireless Communication, Networks.

I. INTRODUCTION

Mobile Ad Hoc Network is an Ad Hoc Network but Ad Hoc Network is not MANET. MANET is "Mobile Ad Hoc Networks". Mobile means moveable Ad Hoc means temporary basis Networks means the flexible data applications which uses networks to communicate Thus MANETs are the establishment of ad hoc networks for communication between two nodes. MANETs are the future wireless network which doesn't require any base station for their communication. While communicating in MANET no infrastructure is required as it doesn't need any central established router. Any node can act as a router at the time of communication. So, it is a self controlling infrastructure less network established for the communication purpose. The growth of Wi-Fi/802.11 and laptops made the MANET a largest research topic since the mid 1990s[5].There are different models also which are designed just understand the working of MANET. Due to the random motion of the nodes and the routers, there is a dynamic change in topology of the MANET. We do not get the same topology all the time. The earliest MANETs were called the "packet radio" network and were sponsored by DARPA in the early 1970s. MANETs need limited energy and computing resources [3].

II. TYPES OF MANET

The following are the considered types of MANET:

- *Vehicular Ad Hoc Networks (VANETs):* VANET uses cars as mobile nodes to create mobile networks. A VANET turns every participating car as router and node which connect the cares in the range of 100-300 meters and makes a connection between them.
  If a car moves out of the range of the connected network then its signal drops out and the next car which comes in the range is connected in the network [6].

- *Internet based Mobile Ad Hoc Networks (iMANETs):* iMANETs are ad hoc networks which connect the mobile nodes and fixed gateway nodes. In such type of ad hoc networks the ad hoc routing protocols are not applied [8].

- *Intelligent Vehicular Ad Hoc Networks (InVANETs):* InVANETs uses Wi-Fi IEEE802.11 and WiMAX 802.16 for effective communication between the vehicles in the dynamic connections. Providing vehicle – vehicle and vehicle – roadside communication considerably makes the driving easy and comfortable [1].

III. MANET ROUTING PROTOCOLS

Three categories in which MANET protocols fall into

- Table Driven Protocol (Proactive Rounting Protocol)
- On Demand Protocol (Reactive Rounting Protocol)
- Hybrid Protocols

Table I
Manet Routing Protocols
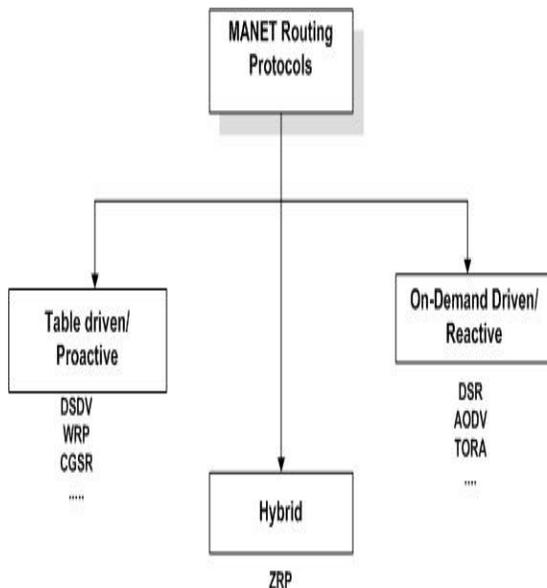
Table Driven Protocol: Table driven protocols are also known as Proactive Protocols. Each node uses routing information to store the location information of other nodes in the network and this information is then used to move data among different nodes in the network. E.g. Comes under this approach are DSDS, WRP, OLSR, CGSR etc [9].

On Demand Protocol: On Demand Protocols are also known as Reactive Protocols. It is used when a route is required by a node to a destination for which it doesn't have the routing information. It starts a route discovery process from one node to another to arrive its destination. E.g. comes under this approach are DSR, AODV, TORA etc.

Hybrid Protocol: It is the combination of both table driven and on demand routing protocols. They uses distance vectors for more precise metrics to establish the best path to the destination and report routing information only when their s a change in the topology. E.g. comes under this are ZRP, GRP etc [10].

IV. MOBILITY MODELS IN MANET

In MANET the nodes are roaming here and there in the network. It is hard to capture the actual movement of the nodes in the network. These mobility models are designed to evaluate the performance of ad hoc networks and characterize the movements of the nodes in which speed and direction vary with the time interval.

The mobility models consider in the MANET are:

- Random way point mobility model
- Random walk mobility model
- Random direction mobility model

Random way point mobility model: In this the position of each node is chosen randomly in the fixed area and then moves to the selected position in linear form with random speed. This movement has to stop after a certain period called pause time before starting the next movement. This model includes pause time in every change of speed/direction. The speed lies between [Speedmax, Speedmin]. Node randomly chooses its destination in the determined are and moves towards it with speed between min and max. When it reaches its destination it halts for the pause time and chooses its other destination and start moving towards its new destination.

Random walk mobility model: In this mobility model node moves form current location to new location by choosing a random direction and speed from predefined range. If node reaches a simulation boundary, it bounces back with an angle determined by incoming direction. The node starts moving in that direction. It is a memory less approach. The current direction and speed is independent of the past direction and speed. It generates unrealistic start and stops.

Random direction mobility model: In this model, instead selecting a destination, node select its destiny in which it is moving. Each node starts a simulation by selecting a degree between 0 and 359 and finds a destination on the boundary in this direction of travel. Upon reaching its destination, node stops for a predefined pause time and select a new direction between 0 and 180 degree. Now node finds its destination in this boundary and moving toward this with new speed and direction.

V. MANET ARCHITECTURE

The nodes in the MANET are classified according to their capabilities. A client or Small Mobile Host (SMH) is a node with less power, resources, storage capacity and processing. A Server or Large Mobile Host (LMH) is a node with large storage space. As server has large space, it contains the DBMS which have all the required information and they provide the information to the nodes to satisfy their need. Client can store the DBMS's required information in their cache memory like the DBMS query and processing information. As both client and server are mobiles, so there is a rapid change in their topology.

Thus new protocols are required which can work appropriately with this dynamic communication network. Network nodes can be classified in three modes that are designed to reduce the power consumption. They are classified as follow:

- *Active Mode (Or Transmit Mode):* This is the mode which uses the most power. It allows both transmission and reception of message and consumes 3000 to 3400 mw.
- *Doze Mode (Or Receive Mode):* The CPU is capable of processing the information. It is also capable of receiving the notification messages from the other nodes. It consumes 1500 to 1700 mw.
- *Sleep Mode (Or Standby Mode):* The CPU does no processing and also the node has no capability of sending or receiving the message. The node is inactive and consumes only 150 to 170 mw. In this mode the node let itself in the off state for short period of time without requiring power-up or re-initialization. The node in sleep mode is not currently available in the network [7].

VI. BROASCASTING APPROACHES IN MANET

The following broadcasting approaches are there in MANET.

- *Unicasting:* In this a message is sent from source to a single destination.
- *Multicasting:* In this message is sent from source to a set of destinations.
- *Broadcasting:* In this the message is flooded from source to all other nodes in a specified network.
- *Geocasting:* In this message is sent from source to all other nodes in a specified geographical network [2].

VII. CHARACTERISTICS OF MANET

- Communication via wireless means.
- Nodes can perform the role of both hosts and routers.
- No centralized controller and infrastructure is required.
- Dynamic network topology.
- Can be setup anywhere.
- Energy constraint.
- Limited security.

VIII. MANET APPLICATIONS

With the increasing portability and wireless communication the importance of ad hoc networks is also increasing. Some applications of MANET are:

- *In military:* MANETs are used in the military areas to keep the soldiers in contact with each other and with their headquarters.
- *Rescues:* MANETs are used at the time of rescues operations. Since at the time of rescue, wired connections are not able to setup at these locations so we use the wireless connections for communicating at the time of rescue. Thus MANETs are used at that time [4].
- *Local level:* At local level means when we use MANETs in classrooms and during conference. When we want to share information between two devices at home also, we use MANETs in which we make a temporary link between them at the time of sharing and when sharing completed, the link finishes.
- *Personal Area Network (PAN):* Short range MANET can simplify the interconnection between the various mobile devices such as between laptop, mobile, palmtop etc. Tedious wires are replaced by the wireless communication. Such wireless networks create ad hoc networks and are very useful when we require urgent connections for short span of time.

IX. MANET CHALLENGES

Regardless the attractive potential, there are some challenges as well which MANET faces. These are as given below:

- *Routing in dynamic topology:* As the topology changes frequently with time in the MANET, so it's a challenge for data routing between two paired nodes.
- *Security:* As wireless networks are vulnerable to security and same for the ad hoc networks since they are also based in wireless communication concept.
- *Reliability:* Wireless links introduce the reliability problem as limited range of wireless transmission is there and the packet loss and data transmission errors may occur.
- *Quality of service:* Providing good quality of service in the constantly changing environment in a challenging task.
- *Inter-Networking:* In addition of providing an interconnection between ad hoc networks, connection between MANET and fixed connection is also expected from many year

X. CONCLUSION

In this paper we discussed how MANETs are used in the communication. MANETs are the ad hoc networks in which one node communicates with other through wireless medium. In this paper the various types of MANET are covered. With types it also covers the routing protocols used in the MANET. There are also the Mobility models of MANET which are their in this paper. A brief intro of MANET architecture is also given just to know the various modes which a node takes in this network. The broadcasting approaches which the MANET uses. With all this we discuss the characteristics, various applications and challenges MANET confronts.

The future scope of the Ad Hoc Networks is very pleasant as it follows the concept of anytime and anywhere. As the rapid evolutions in the field of mobiles are also increasing the concern regarding the MANET where each node controls itself without any requirement of infrastructure. The ease of deployment, lack of infrastructure requirement, auto configuration feature, low cost and potential applications make it an essential part in today's communication era. We have seen a rapid growth in the MANET research area.

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