

INTRODUCTION TO MANET

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Abstract - MANET is an abbreviation for mobile ad hoc network it is also referred to as wireless ad hoc network it is an uninterrupted self-configuring, infrastructure-less network of mobile devices connected without making use of wires. In a MANET architecture, devices can move independently in any direction and therefore changes their links to other devices frequently. Because MANETs are transportable, they utilize wireless connections to interact with different networks. In this article an overview to MANET along with its utilization in wireless systems will be discussed. A brief consideration regarding the types of MANET architectures and its advantages and disadvantages in wireless communication networks is being done in this article.

Key Words: Features of MANET, Architecture of MANET, Routing protocols, Challenges, Applications of MANET.

1. INTRODUCTION

MANET is an ad hoc network which does not require any infrastructure support for carrying data packets between two nodes. MANET is an ad hoc network for mobile or much simply called as mobile ad hoc network which is a continuous self ordered, infrastructure-less network of mobile devices connected wirelessly. Mobile ad hoc networks possess a flat network infrastructure. It has a shared medium which is highly demandable for radio communication. In MANET architecture every computer or node means any device is a router as well as end host. The nodes or devices in the MANET architecture are in general autonomous. MANET has a dynamic topology architecture which highly promotes mobility. In the MANET architecture, every node also works as a router since they route packets for other nodes.

1.1 FEATURES OF MANET

There are various features of MANET as listed below:

- Partitioned operations
- Autonomous terminal
- Multi hop routing
- Dynamic network topology
- Fluctuating link capacity
- Light weight terminals

- Partitioned operation: The nodes engaged in a MANET should cooperate among themselves. Every node is behaving like a relay.
- Autonomous Terminal: In MANET architecture every mobile terminal is an autonomous node which may operate as a host or a router. Therefore end points and switches cannot be identified.
- Multi hop routing: In multi hop MANET transmitting data packets from a source to destination out of direct wireless transmission range the packets are to be transmitted through one or more intermediate nodes.
- Dynamic network topology: The mobile nodes in the network dynamically create routing between themselves as they move forward forming their own network.
- Fluctuating link capacity: In MANET one communication path is shared by many sessions. The channel on which the nodes communicate is subjected to noise, fading, and interference, and has less bandwidth than a guided network. In some cases the path between any pair of users can traverse multiple wireless links and the link themselves can be heterogeneous.
- Light weight terminals: Mostly MANET nodes are mobile devices with less CPU processing capability, small memory size and low power storage.

2. MANET ARCHITECTURAL MODEL

The architectural model for MANET preserves the integrity of the IP architecture while allowing for the particularities of MANETs.

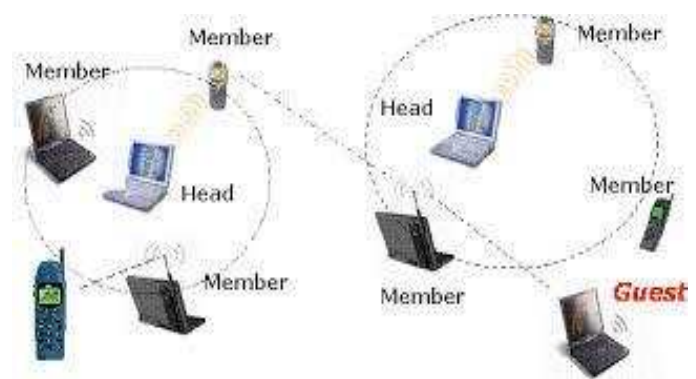


Fig -1: Architectural view of MANET

The term MANET (Mobile Ad hoc Network) it is referred to a multi hop packet-based wireless network which is a set of mobile nodes that can communicate and move at the same time, without using any kind of fixed wired infrastructure. MANETs are actually self-organizing and adaptive networks that can be formed and deformed on-the-fly without the need of any centralized administration. This exclusive characteristic allows the use of MANETs in many particular civilian and military situations as well as in the emerging sensor networks technology.

2.1 MANET ARCHITECTURE

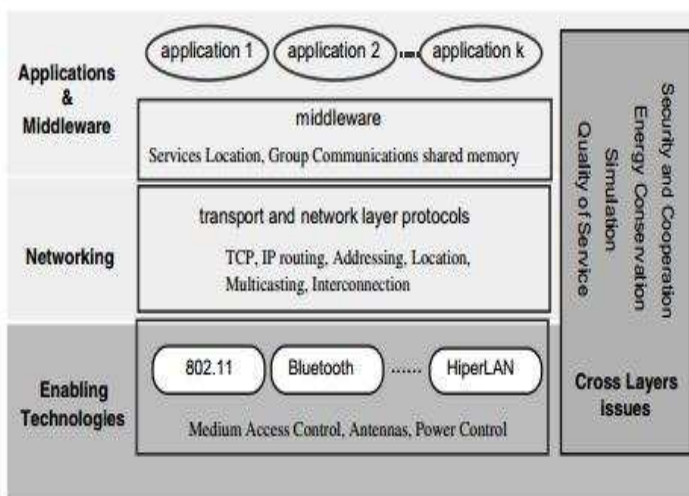


Fig-2: Architecture of MANET

The architecture of MANET is as shown in the figure-2 above. It is divided into three main parts they are,

1. Enabling Technologies

2. Networking

3. Middleware & Application

1. Enabling Technologies: Enabling technologies are further divided depending on their area of coverage.

- **BAN (Body Area Network):** The communication range of BAN is 1 to 2 meters. It provides connectivity to the wearable computing devices.
- **PAN (Personal Area Network):** The communication range of PAN is up to 10 meters. It provides connectivity between mobile devices as well as stationary devices.
- **WLAN (Wireless Local Area Network):** the communication range of WLANs is 100 to 500 meters. It can connect a building or a group of buildings.

2. Networking: In MANET architecture most of the principle functionalities of the networking protocols

need to be redesigned for self configuring, dynamic, unstable, peer-to-peer communication environment. The initial target of networking protocols is to use the one-hop transmission services, given by the enabling technologies to evolve end-to-end reliable services, from a sender to the receiver. To inculcate an end-to-end communication the sender needs to find the receiver inside the network. The major task of a location service is to dynamically map the address of the receiver device to its present location in the network.

3. **Middleware & Application:** The wireless technologies like WiFi, Bluetooth, IEEE 802.11, WiMAX and Hyper LAN remarkably encourages the deployment of ad hoc technology and new ad hoc networking applications mainly in specific fields like emergency services, disaster recovery and environment monitoring. The versatility of MANET makes this innovation adaptive for some practical situations like, in PAN, home networking, law enforcement operation, commercial and educational applications, and sensor network. Mobile ad hoc frameworks recently created adopt the methodology of not having a middleware, yet rather depend on every application to handle every one of the services it needs.

3. TYPES OF MANET

The types of MANETs are described below

- **Vehicular ad hoc network (VANET):** VANETs are created by applying the principles of mobile ad hoc networks (MANETs). It enables effective communication with another vehicle or helps to communicate with roadside equipments.
- **Internet Based Mobile Ad hoc Networks (IMANET):** It is a type of wireless ad hoc network that supports Internet protocols such as TCP/UDP and IP. The IMANET uses a network-layer routing protocol to link mobile nodes and establish routes automatically.
- **Intelligent vehicular ad hoc networks (INVANET):** It makes use of artificial intelligence to tackle unexpected situations like vehicle collision and accidents.
- **Flying ad hoc network (FANET):** FANETs are composed of unmanned aerial vehicle, providing mobility and connectivity to remote areas.

There are further more types of MANETs depending on their application; few of them are discussed above in section 3.

4. ROUTING PROTOCOL IN MANET

Routing protocols are set of rules which govern the path of message packets from source to destination in a network. Routing protocol in a MANET is mainly classified into three categories that are proactive and reactive and Hybrid.

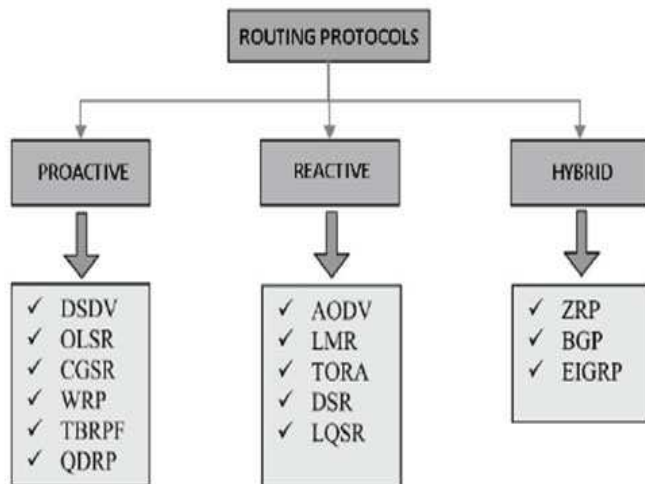


Fig-3: Types of Routing in MANET

Figure above shows the table for classification of MANET.

- **Proactive Routing:** Proactive routing protocols are also called as table driven routing protocols. In this protocol every node maintain routing table which contains information about the network topology. This feature although useful for datagram traffic, acquires substantial signaling traffic and power consumption. The routing tables are updated regularly whenever the network topology changes. Proactive protocols are not suitable for large networks as there is a need to maintain record for each and every node in the routing table of every node. These protocols maintain different number of routing tables varying from protocol to protocol. There are many routing protocols like DSDV, OLSR, CGSR, WRP, TBRPF, QDRP etc.
- **Reactive Routing:** Reactive routing protocol is also called as on demand routing protocol. In this protocol route is discovered whenever it is needed. The nodes set up route discovery on demand basis. Source node checks its route cache for the available route from source to destination if the route is not available then it initiates route discovery process. Examples of reactive routing are DSR, AODV, LMR, TORA, LQSR etc.
- **Hybrid Routing:** Hybrid protocols inherits the features of both reactive and proactive routing protocols, typically attempting to exploit the

reduced control traffic overhead from proactive systems although reducing the route discovery delays of reactive systems by maintaining some form of routing table.

5. APPLICATIONS OF MANET

There is a widespread application of mobile ad hoc network in the commercial, Military and private sectors. Mobile Ad-hoc Networks allow users to access and exchange information regardless of their geographic position or proximity to infrastructure. In contrast to the infrastructure networks, all nodes in MANETs are mobile and their connections are dynamic.

Military Sector: Nowadays in military equipments there are computer device connected. Ad-hoc networking would allow the military to take advantage of common place network technology to maintain an information network between the soldiers, vehicles, and military information headquarters.

Commercial Sector: Ad hoc Networks can be used in emergency or rescue operation during disasters. Rescuers must be able to communicate in order to help the people. By automatically establishing a data network with the communication equipment that the rescuers are already carrying the task is made easier. Other commercial scenarios include e.g. ship-to-ship ad hoc mobile communication, law enforcement, etc.

Sensor Networks: In this technology the network consist of many small sensors. These can be used to detect any number of properties of an area. The sensor networks include temperature, pressure, toxins, pollutions, etc. The capabilities of each sensor are very limited, and each must rely on others in order to forward data to a central computer. Individual sensors are limited in their computing capability and are prone to failure and loss. Mobile ad-hoc sensor networks could be the key to future homeland security.

3. CONCLUSIONS

A tremendous advancement has been witnessed in the field of mobile communication in the past few years. Thus various opportunities are opened up in the field of ad hoc networks these days. MANET is a group of wireless mobile hosts which builds a temporary network without the requirement of any centralized administration or backbone support services. MANET proved itself a versatile network nowadays but is quite unreliable due to its less attack handling capability i.e. it is less immune to attacks. Routing is the utmost part of any network which also retains its significance in MANET architecture. Various types of routing protocols are used for different types of MANET architectures to ensure the desired path for transmission of message packets between source and destination.

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