

AN OVERVIEW OF MANET AD HOC NETWORK

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Abstract Wireless ad hoc network is a special structure of the wireless communication network, whose communication relies on their cooperation among the nodes and achieves it in the manner of wireless multi-hop. Therefore, this kind of network does not rely on any fixed infrastructure, and has the properties of self-organizing and self-managing. In wireless network the ad hoc network is a key factor. The ad hoc network is made up of multiple nodes connected by links since link can be connection as well as disconnected at any time. The ad hoc network inherits the some traditional problem of mobile communications as well as wireless. Problems are bandwidth optimization, power control and transmission quality enhancement. Ad hoc network has properties of mobile communications and computer networks so it can be seen as a special type of mobile computer communications networks. The MANET is the one of the type of ad hoc network, is a infrastructure less wireless device that’s why it move to anywhere in any direction This paper explores the types of wireless ad hoc network as well as their functioning and applications, and routing path for transmission data.

Keywords— Wireless Ad hoc Network, MANET, And Wireless Network.

I. INTRODUCTION

In 1970’s the wireless network is increasingly popular in communication industry. These networks provide mobile users with ubiquitous computing capability and information access regardless of the users’ location. The mobile wireless networks are classified into two types: Infrastructure and Infrastructure less networks (multi-hop).The infrastructure network are connected through a wired to one the base Station (one computer) to another based station. But in infrastructure less network have no fixed routers, every node could be router. All nodes are capable of movement and can be connected dynamically in arbitrary manner. The infrastructure less networks is also knows as Mobile ad hoc Networks (MANET) [12].

An ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of existing network infra-structure or centralized administration. Due to the limited transmission range of wireless network interfaces, multiple network hops may be needed for one node to exchange data with another across the network [1, 10].

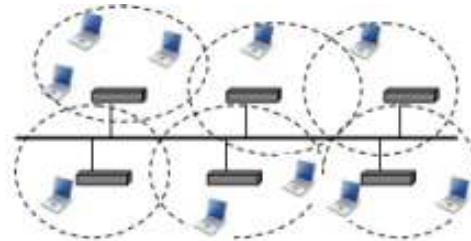


Figure 1 Wireless Network Structures (Infrastructure Network)

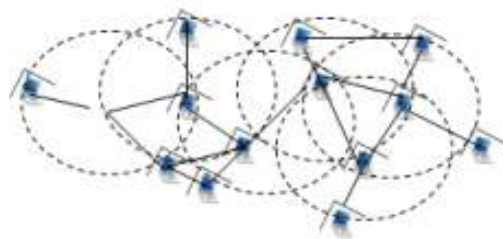


Figure 2 Wireless Network Structures (Infrastructure less Network)

In such a network, each mobile node operate not only as a host but also as a router, forwarding packets for other mobile nodes in the network, that may not be within the direct reach wireless transmission range of each other. Each node participates in an ad hoc routing protocol that allows it to discover multi hop paths through the network to any other node. The idea of an ad hoc network is sometimes also called an infrastructure-less networking, since the mobile nodes in the network dynamically establish routing among themselves

to form their own network on the fly [12]. Examples of the possible use of ad hoc networks include students using laptop computers to participate in an interactive lecture, business associates sharing information during a meeting [1,8].

The above the section I describe the introduction of wireless network. The rest of the paper is organized as follows. Section II describes the wireless ad hoc network, it is the type of wireless network and it does not have a pre-existing path from source to destination means infrastructure wireless network. Section III describes the types of wireless ad hoc network on the basis of functioning as well as their application. Section IV describes the types and routing techniques of MANET. In multipath routing, the multiple routes from different source to one destination at the time of route discovery. Section V describes the characteristics and challenges in MANET, characteristics include cooperation, dynamism of topology, and lack of fix infrastructure and resource constraints. Application of MANET is describe in section VI. Finally conclusion is describe in section VII.

II. WIRELESS AD HOC NETWORK

A wireless ad hoc network is decentralized types of wireless network. The network is ad hoc because it does not rely on a pre-existing infrastructure access point in infrastructure wireless network or the routers. The each node in the network are actively participate in the network for forwarding the data to the other nodes and so the determination of which nodes forward data is made dynamically based on the network connectivity. For the classical router, the ad hoc network uses the flooding for forwarding the data. Ad hoc network refers to a mode of operation of IEEE 802.11 wireless networks and also earliest wireless ad hoc networks were the "packet radio" networks (PRNETs).

As for the mobile operation, ad hoc network are basically peer-to-peer multi-hop mobile wireless networks, where information packets are transmitted in a store-and-forward manner from a source to an arbitrary destination, via intermediate nodes [14].

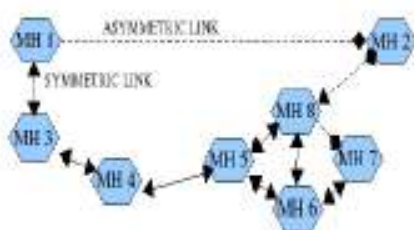


Figure 3 Ad hoc Network

The Mobile Hosts (MH) move, the resulting change in network topology must be made known to other nodes so that outdated topology information can be updated or removed. For example, as MH2 in fig.1 changes its point of attachment from MH3 to MH4 other node's part of the network should follow this new route to forward packets to MH2 [14].

Wireless networks can be classified based on the connectivity types of the various network elements, which are either Point to Point (PTP), Point to Multi-Point (PTM) or Multi-Point to Multi-Point (MPM) networks [5].

III. TYPES OF WIRELESS AD HOC NETWORK

Wireless ad hoc networks can be classified by their application:

- wireless mesh networks (WMN)
- wireless sensor networks (WSN)
- mobile ad hoc networks (MANET)

A. Wireless Mesh Networks (WMN)

A wireless mesh network (WMN) is a communications network made up of radio nodes organized in a mesh topology. Wireless mesh networks often consist of mesh clients, mesh routers and gateways, where nodes don't just send and receive data, but also serve as a relay for other nodes and each node collaborates in propagating data on the network. Laptops, cell phone and other wireless devices are the example of WMN. The coverage area of the radio nodes working as a single network is sometimes called a mesh cloud [4, 6].

B. Wireless Sensor Networks (WSN)

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to *monitor* physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location [7]. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on[5].

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected

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to one sensor. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting[7].

C. Mobile ad hoc networks (MANET) –

Mobile ad hoc network is a kind of wireless network, is self-configuring infrastructures less network devices are connected by wireless. The devices of MANET network is free to move independently in any direction that’s why linking with any other devices is easily done [10]. Each must forward traffic unrelated to its own use, and therefore be a router. The primary goal of Mobile ad hoc network is each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. The achievement of MANET is hug growth of laptops and wireless or Wi/Fi networking [1, 13].

A mobile ad hoc network (MANET) consists of mobile hosts equipped with wireless communication devices. The transmission of a mobile host is received by all hosts within its transmission range due to the broadcast nature of wireless communication and Omni-directional antennae. If two wireless hosts are out of their transmission ranges in the ad hoc networks, other mobile hosts located between them can forward their messages, which effectively build connected networks among the mobile hosts in the deployed area [10, 15]. Due to the mobility of wireless hosts, each host needs to be equipped with the capability of an autonomous system, or a routing function without any statically established infrastructure or centralized administration. The mobile hosts can move arbitrarily and can be turned on or off without notifying other hosts. The mobility and autonomy introduces a dynamic topology of the networks not only because end-hosts are transient but also because intermediate hosts on a communication path are transient [15, 13].

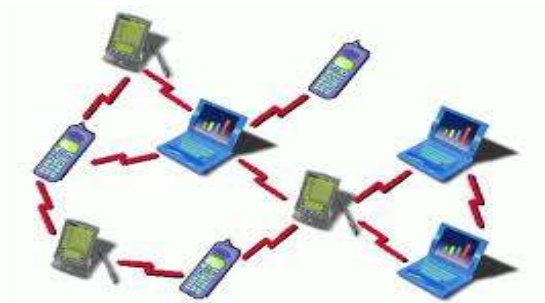


Figure 4 Mobile Ad hoc Network

Some example of Mobile Ad hoc networks are- Military applications, law enforcement, emergency response effort, commercial use and education [2].

IV. TYPES & ROUTING TECHNIQUES OF MANET

A. TYPES OF MANET-

- Vehicular Ad hoc Networks (VANETs) are used for communication among vehicles and between vehicles and road side equipment.
- Intelligent vehicular ad hoc networks (inVANETs) are a kind of artificial intelligence that helps vehicles to behave in intelligent manners during vehicle-to-vehicle collisions, accidents, drunken driving etc.
- Internet Based Mobile Ad hoc Networks (iMANET) are ad hoc networks that link mobile nodes and fixed Internet-gateway nodes. In such type of networks normal ad hoc routing algorithms don't apply directly [9].

B. ROUTING TECHNIQUES OF MANET

Multipath Routing-

The process of discovering (finding) the multiple routes from the different source and single destination at the time of single route discovery correspond to multi-path routing [3]. In MANET, the multi-path routing handling prevailing issues such as scalability, security and network lifetime, etc [1]. This protocol enhances the end-to-end throughput and offers load balancing in MANET’s.

Multipath Routing Issues-

Multipath Routing has some disadvantages [1]:

a. Route Request Storm

Multi path reactive routing protocols are created a huge quantity of route request messages. When the intermediate nodes requires to process the duplicate request message, there is a chance of unnecessary to overhead packets be set up in the networks.

b. Inefficient Route Discover

Certain multi-path routing protocols avoid intermediate node from forwarding a reply from its route cache in order to determine node-disjoint or link disjoint paths. Hence the source has to wait till it gets a reply from destination. Thus the process of route discovery performed by the multipath

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routing protocol needs more time when compared with DSR or AODV protocols.

V. CHARACTERISTICS & CHALLENGES OF MANET

A. CHARACTERISTICS

The major characteristics of MANET are [11]-

Cooperation

If the source node and destination node are out of range with each other then the communication between them takes place with the cooperation of other nodes such that a valid and optimum chain of mutually connected nodes is formed. This is also called as multi-hop communication. In multi hop communication each node is to act as a host as well as router simultaneously.

Dynamism of Topology

The nodes of MANET are randomly, frequently and unpredictably mobile within the network. These nodes may leave or join the network at any point of time, thereby significantly affecting the status of trust among nodes and the complexity of routing. Such mobility entails that topology of the network as well as the connectivity between the hosts is unpredictable. so the management of the network environment is a function of the participating nodes.

Lack of fixed infrastructure

The absence of a fixed or control infrastructure is a key feature of MANETs. This eliminates the possibility to establish a centralized authority to control the network characteristics. Due to this absence of authority, traditional techniques of network management and security are scarcely applicable to MANETs.

Resource Constraints

MANETs are a set of mobile devices which are of lower limited power capacity, computational capacity, memory, bandwidth etc. So in order to achieve a secure and reliable communication between nodes, these resource constraints make the task more enduring all of the routing protocols in MANETs depends on active cooperation of nodes to provide routing between the nodes and to establish and operate the network.

B. CHALLENGES IN MANET

- Unicast routing
- Multicast routing
- Speed
- Dynamic network topology
- Scalability
- Quality of Service
- Mobile agent based routing
- Power aware routing
- Secure routing [12].

VI. MANET APPLICATIONS

Military-

Ad hoc networking would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information head quarter's .consider a scenario is deployed over a battle field. The ad hoc network formed by the air vehicle in the sky can provide a backbone for land based platforms to communicate when they are out of direct range, or when obstacles prevent direct communication. The ad hoc network therefore extends down to the land based forces and allows communication across the Voice and video, as well as sensing and data applications can be supported [9].

Disaster Relief –

In cases of disasters, the existing infrastructure is often damaged or destroyed. Natural disasters e.g. lead to the loss of electricity and Internet connectivity, Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. An ad hoc network can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake,, to overcome the problems incurred by missing infrastructure, helping to better cope with the consequences of such calamities. Mobile units carry networking equipment to support routing operations. Information is relayed from one rescue team member to another over a small handheld. Other commercial scenarios include e.g. ship-to-ship ad hoc mobile communication, law enforcement etc [9].

VII. CONCLUSION

This paper proposed an overview of MANET ad doc network. The wireless network is divided into two categories-infrastructure network and infrastructure-less network. In infrastructure-less network (wireless

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communication), send the data from source to destination without establishing any connection of wires, means the source node and destination is known but path of transmission is not specified, each time the different route is selected. The MANET have an same functionality, MANET device is free for move anywhere in any direction and goal is each device maintains information required to properly route traffic. MANET devices can be operating independently or otherwise connected to the internet. The MANET is used in various fields because of its beneficial functionality. This paper include the types of AD HOC network based on its functionality and also the Types of MANET, MANET Routing techniques, characteristics and Challenges of MANET as well as its Applications.

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