

A Comprehensive Overview on Manet

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Abstract - Mobile Adhoc NETWORK (MANET) is a collection of mobile nodes that dynamically form a temporary network and are capable of communicating with each other without the use of a network infrastructure or any centralized administration. We present in this paper, the history of MANET, characteristics, challenges (issues) involve in MANET and its some applications.

Keywords: Mobile Ad Hoc Networks (MANET), history, characteristics, challenges in MANET, applications

I. INTRODUCTION

In the last couple of years, the use of wireless networks has become more and more popular. There exist three types of mobile wireless networks: infrastructured networks, ad-hoc networks and hybrid networks which combine infrastructured and ad-hoc aspects [1]. An infrastructured network (Figure 1(a)) consists of wireless mobile nodes and one or more bridges, which connect the wireless network to the wired network. These bridges are called base stations. A mobile node within the network searches for the nearest

base station (e.g. the one with the best signal strength), connects to it and communicates with it. The important fact is that all communication is taking place between the wireless node and the base station but not between different wireless nodes. While the mobile node is traveling around and all of a sudden gets out of range of the current base station, a handover to a new base station will let the mobile node communicate seamlessly with the new base station. In contrary to infrastructured networks, an ad-hoc network lacks any infrastructure. There are no base stations, no fixed routers and no centralized administration. All nodes may move randomly and are connecting dynamically to each other. Therefore all nodes are operating as routers and need to be capable to discover and maintain routes to every other node in the network and to propagate packets accordingly. Mobile ad-hoc networks may be used in areas with little or no communication infrastructure: think of emergency searches, rescue operations, or places where people wish to quickly share information, like meetings etc.

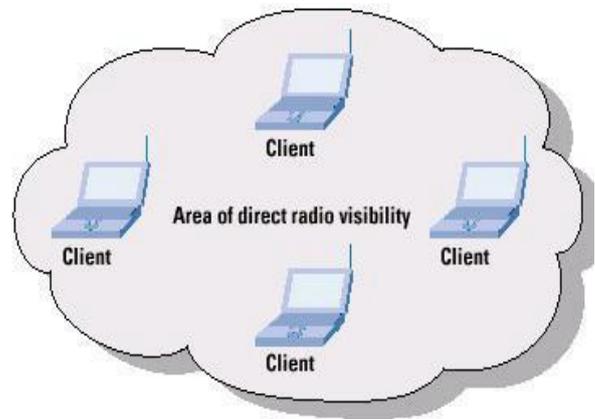
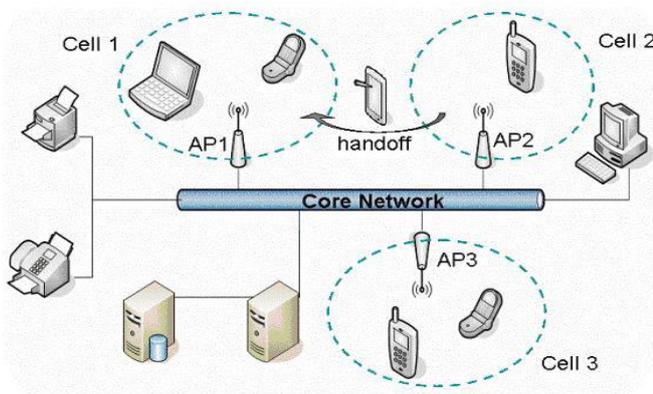


Figure 1: Infrastructured and ad-hoc Networks

A Mobile Ad hoc NETWORK (MANET) is made up from a set of MANET routers (MRs). These MRs organize and maintain a routing structure among themselves over dynamic wireless interfaces. As any Internet Protocol (IP) router, a MR may have an attached set of nodes. These nodes access the MANET via the MR to which they are attached. Due, in part, to relative movements of MR and, in part, to environmental effects (especially wireless characteristics), the network topology and communication links in a MANET may change state more frequently than in fixed wired or fixed wireless networks. These attributes and others influence

Internet Protocol (IP) design for MANETs. MANETs may in some cases operate as stand-alone networks, or they may be used to extend the wireless mobile range of a more fixed infrastructure network designs.

II. HISTORY

We can characterized the life cycle of mobile ad hoc network into first, second and third generation. Present ad hoc network are considered the third generation [2] [3]. The first generation of ad hoc network can be traced back to 1970's. In 1970's, these are called Packet Radio Network (PRNET) [4]. The Defence Advanced Research Project Agency (DARPA) initiated research of using packet-switched radio communication to provide reliable communication between computers and urbanized PRNET.

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Basically PRNET uses the combination of Areal Location of Hazardous Atmospheres (ALOHA) and Carrier Sense Multiple Access (CSMA) for multiple access and distance vector routing [5] [2] [3]. The PRNET is then evolved into the Survivable Adaptive Radio Network. (SURAN) in the early 1980's. SURAN provides some benefits by improving the radio performance (making them smaller, cheaper and power thrifty). This SURAN also provides resilience to electronic attacks. Around the same time, United State Department of Defence (DOD) continued funding for programs such Globe Mobile Information System (GloMo) and Near Term Digital Radio (NTDR). GloMo make use of CSMA/CA and TDMA molds, and provide self-organizing and self-healing network (i.e. ATM over wireless, Satellite Communication Network). The NTDR make use of clustering and link state routing and organized an ad hoc network. NTDR is worn by US Army. This is the only "real" ad hoc network in use. By the growing interest in the ad hoc networks, a various other great developments takes place in 1990's. The functioning group of MANET is born in Internet Engineering Task Force (IETF) who worked to standardized routing protocols for MANET and gives rise to the development of various mobile devices like PDA's palmtops, notebooks, etc. Meanwhile the Development of Standard IEEE 802.11 (i.e. WLAN's) benefited the ad hoc network. Some other standards are also developed that provide benefits to the MANET like Bluetooth and HIPERLAN.

III. CHARACTERISTICS OF MANET

3.1. Dynamic Topologies:

The nodes of the network move are free to move arbitrarily with different speeds. Thus the network topology may change randomly and at unpredictable times.

3.2. Energy-constrained Operation:

Some or all the nodes in the ad hoc network rely on batteries or other exhaustible means for their energy. The design of the network is to be optimized to conserve the energy consumed by the mobiles.

3.3. Limited Bandwidth

Wireless links continue to have significantly lower capacity than infrastructured networks. In addition, the realized throughput of wireless communications – after accounting for the effects of multiple aces, fading, noise, and interference conditions, etc., is often much less than a radio's maximum transmission rate and the networks are to be optimized to perform with the maximum efficiency within the limited bandwidth.

3.4. Security threats:

When compared to the wired means of communication, wireless means of communication is more affected for security. The increased possibility of eavesdropping, spoofing, and minimization of denial-of-service type attacks should be carefully considered. The security of the MANET is to be optimized so that the information transferred is secured.

IV. APPLICATIONS OF MANET

In the occasion where there is a group effort required, the MANET plays a major role in wireless communication and

provides effective communication. Some of the typical applications include.

- 1) Military battlefield: 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.
- 2) Collaborative work: For some business environments, the need for collaborative computing might be more important outside office environments than inside and where people do need to have outside meetings to cooperate and exchange information on a given project.
- 3) Local level: Ad-Hoc networks can autonomously link an instant and temporary multimedia network using notebook computers to spread and share information among participants at an e.g. conference or classroom. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information.
- 4) Personal area network and Bluetooth: A personal area network is a short range, localized network where nodes are usually associated with a given person. Short-range MANET such as Bluetooth can simplify the inter communication between various mobile devices such as a laptop, and a mobile phone.
- 5) Commercial Sector: Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. At the time of disaster, it is easy to develop a wireless network rather than a wired network. The places where wired network may be affected by the disasters, MANET can be implemented. As far as the Personal Area Networks (PAN) is concerned, they need not much coverage. They just need the coverage of very limited area. MANETs server the purpose in such situations.

V. CHALLENGES

Regardless of the variety of applications and the long history of mobile ad hoc network, there are still some issues and design challenges that we have to overcome [6]. This is the reason MANET is one of the elementary research field. MANET is a wireless network of mobile nodes; it's a self organized network. Every device can communicate with every other device i.e. it is also multi hop network.

1. The scalability is required in MANET as it is used in military communications, because the network grows according to the need, so each mobile device must be capable to handle the intensification of network and to accomplish the task.
2. MANET is an infrastructure less network, there is no central administration. Each device can communicate with every other device, hence it becomes difficult to detect and manage the faults. In MANET, the mobile devices can move randomly. The use of this dynamic topology results in route changes, frequent network partitions and possibly packet losses [1].

3. Each node in the network is autonomous; hence have the equipment for radio interface with different transmission receiving capabilities these results in asymmetric links. MANET uses no router in between.
4. In network every node acts as a router and can forward packets of data to other nodes to provide information partaking among the mobile nodes. Difficult chore to implement ad hoc addressing scheme, the MAC address of the device is used in the stand alone ad hoc network. However every application is based on TCP/IP and UDP/IP.

VI. CONCLUSION

The aim of this paper is to understand the challenges and application of MANET, so as to boost the research work in this field. During the study we understand that, Mobile Ad-hoc Networks (MANETs) are expected to be very useful and important infrastructure for achieving future ubiquitous society. Designing MANET protocols and applications is a very complicated task since it is hardly possible to build large-scale and realistic test beds in real world for performance evaluation. The listed challenges and applications in our paper will give a new way for researchers to make development in this area.

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