OVERVIEW AND APPLICATIONS OF MOBILE ADHOC NETWORK

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ABSTRACT: *Ad hoc networking allows portable devices to establish communication independent of a central infrastructure. However, the fact that there is no central Infrastructure and that the devices can move randomly gives rise to various kind of problems, such as routing and security. Here we are presenting an overview of adhoc network and its applicability.*

Keywords— adhoc, routing, security.

I: INTRODUCTION

Wireless cellular systems have been in use since 1980s. We have seen their evolutions to first, second and third generation's wireless systems. Wireless systems operate with the aid of a centralized supporting structure such as an access point. These access points assist the wireless users to keep connected with the wireless system, when they roam from one place to the other. The presence of a fixed supporting structure limits the adaptability of wireless systems. In other words, the technology cannot work effectively in places where there is no fixed infrastructure. Future generation wireless systems will require easy and quick deployment of wireless networks. This quick network deployment is not possible with the existing structure of current wireless systems. Recent advancements such as Bluetooth introduced a new type of wireless systems known as mobile ad-hoc networks. Mobile ad-hoc networks or "short live" networks operate in the absence of fixed infrastructure. They offer quick and easy network deployment in situations where it is not possible otherwise. Ad-hoc is a Latin word, which means "for this or for this only." Mobile ad-hoc network is an autonomous system of mobile nodes connected by wireless links; each node operates as an end system and a router for all other nodes in the network. Nodes in mobile ad-hoc network are free to move and organize themselves in an arbitrary fashion. Each user is free to roam about while communication with others. The path between each pair of the users may have multiple links and the radio between them can be heterogeneous. This allows an association of various links to be a part of the same network.

What is it?

A mobile ad-hoc network is a collection of mobile nodes forming an ad-hoc network without the assistance of any centralized structures. These networks introduced a new art of network establishment and can be well suited for an environment where either the infrastructure is lost or where deploy an infrastructure is not very cost effective.

The popular IEEE 802.11 "WI-FI" protocol is capable of providing ad-hoc network facilities at low level, when no access point is available. However in this case, the nodes are limited to send and receive information but do not route anything across the network. Mobile ad-hoc networks can operate in a standalone fashion or could possibly be connected to a larger network such as the Internet.

Mobile ad-hoc networks can turn the dream of getting connected "anywhere and at any time" into reality. Typical application examples include a disaster recovery or a military operation. Not bound to specific situations, these networks may equally show better performance in other places. As an example, we can imagine a group of peoples with laptops, in a business meeting at a place where no network services is present. They can easily network their machines by forming an ad-hoc network. This is one of the many examples where these networks may possibly be used.

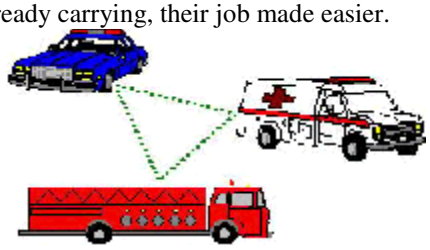
II: APPLICATIONS OF AD-HOC NETWORK:

Ad-hoc networks are suited for use in situations where an infrastructure is unavailable or to deploy one is not cost effective. One of many possible uses of mobile ad-hoc networks is in some business environments, where the need for collaborative computing might be more important outside the office environment than inside, such as in a business

meeting outside the office to brief clients on a given assignment. Work has been going on to introduce the fundamental concepts of game theory and its applications in telecommunications. Game theory originates from economics and has been applied in various fields. Game theory deals with multi-person decision making, in which each decision maker tries to maximize his utility. The cooperation of the users is necessary to the operation of ad-hoc networks; therefore, game theory provides a good basis to analyze the networks.

A mobile ad-hoc network can also be used to provide crisis management services applications, such as in disaster recovery, where the entire communication infrastructure is destroyed and resorting communication quickly is crucial. By using a mobile ad-hoc network, an infrastructure could be set up in hours instead of weeks, as is required in the case of wired line communication. Another application example of a mobile ad-hoc network is Bluetooth, which is designed to support a personal area network by eliminating the need of wires between various devices, such as printers and personal digital assistants. The famous IEEE 802.11 or Wi-Fi protocol also supports an ad-hoc network system in the absence of a wireless access point.

Applications for MANETs are wide ranging and have use in many critical situations: An ideal application is for search and rescue operations. Such scenarios are characterized by the lack of installed communications infrastructure. This may be because all of the equipment was destroyed, or perhaps because the region is too remote. Rescuers must be able to communicate in order to make the best use of their energy, but also to maintain safety. By automatically establishing a data network with the communications equipment that the rescuers are already carrying, their job made easier.



A commercial application for MANETs includes ubiquitous computing. By allowing computers to forward data for others, data networks may be extended far beyond the usual reach of installed infrastructure. Networks may be made more widely available and easier to use.

Another application of MANETs is sensor networks. This technology is a network composed of a very large number of small sensors. These can be used to detect any number of properties of an area. Examples 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.

However MANETs are not perfect. The challenges of scalability, mobility, bandwidth limitations, and power constraints of these networks have not been completely alleviated to date. At the center of these difficulties with MANETs are issues concerning the determination of the rules (protocols) governing the communication between the entities (nodes) in the network? One important question is how to facilitate the dynamic discovery of the most efficient route between two nodes within the network. It is important to take into account the mobility of the nodes and the lack of a fixed topology in the network.

III: MANET PROTOCOL OVERVIEW

Mobile Ad-Hoc Networks are collections of mobile nodes, dynamically forming a temporary network without preexisting network infrastructure or centralized administration. Mobile nodes can be arbitrarily located and are free to move randomly at any given time. No dedicated routers, .each node in a MANET network acts as a router and is responsible for discovering and maintaining routes to other nodes.

The primary goal of the MANET routing protocol is correct and efficient route establishment to facilitate communication within the network between arbitrary nodes. The main aims of all routing protocols designed for MANETs are to achieve a high level of performance, in terms of high throughput, low latency and low energy expenditure by individual nodes. All routing protocols implicitly assume that nodes in a MANET cooperate with each other in delivering packets. Nodes in a MANET can be classified into three categories from the point of view of a packet. A node may be a sender, receiver, or a forwarding node for the packet. A forwarding node tries its best to send a packet toward its destination.

These protocols are classified broadly into two categories.

A. Proactive
B. Reactive

The main routing protocols for MANET can be classified into two categories, proactive and reactive, depending on how a protocol collects information about the topology of the network. Proactive protocols try to reduce latency in packet delivery by aggressively disseminating topology information

throughout the network. This, however, has a detrimental effect that much of the available bandwidth in the wireless medium is used for sending control messages. Hence, a challenging problem in designing a proactive protocol is to reduce the effect of control messages in the network while still achieving an acceptable level of latency.

Reactive protocols try to minimize the wastage of bandwidth by reducing the amount of control messages in the network. They try to find routes on-demand and do not depend on proactive collection of topology information for finding routes. However, this approach quite often increases latency in packet delivery. A challenging problem in designing reactive protocols is to reduce latency while maintaining the low volume of control messages. Mobile nodes executing reactive protocols quite often resort to indirect means such as overhearing passing wireless traffic to improve their knowledge of network topology.

There are other protocols that combine the advantages of both proactive and reactive protocols while eliminating their disadvantages. These protocols use a proactive protocol within a small neighborhood of each node so that the volume of control messages remains manageable and use a reactive protocol over the entire network. The zone routing protocol (ZRP) is the most notable among these protocols

IV: CONCLUSION

In conclusion, mobile ad-hoc networks allow the construction of flexible and adaptive networks with no fixed infrastructure. These networks are expected to play an important role in the future wireless generation. Future wireless technology will require highly-adaptive mobile networking technology to effectively manage multi-hop ad-hoc network clusters, which will not only operate autonomously but also will be able to attach at some point to the fixed networks.

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