

An Overview of Mobile Adhoc Network

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Abstract - We have seen the rapid advancement in the field of internet due to wireless networking technologies. It gives rise to many new applications. In the past of few decades, we have seen the advancement in wireless networks. The emerging capabilities of mobile devices have given a new direction to the internet, which decreases the cost and allow us to use infrastructure wireless networks and infrastructure less wireless networks (i.e. Mobile Ad Hoc Wireless Network). MANET is a network with many autonomous nodes i.e. mobile devices. MANET uses dynamic topology, wireless links, decentralized network and doesn't need any cellular infrastructure. With so many applications that MANETs provides us, there are still some challenges that have to overcome.

Keywords—MANET, Adhoc Network, Challenges, Security.

I. INTRODUCTION

A mobile ad hoc network (MANET) is a continuously self-configuring, infrastructure-less network of mobile devices connected wirelessly or we can say that a MANET is a type of adhoc network that can change locations and configure itself on the fly. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The Communication in MANET is take place by using multi-hop paths. Nodes in the MANET share the wireless medium and

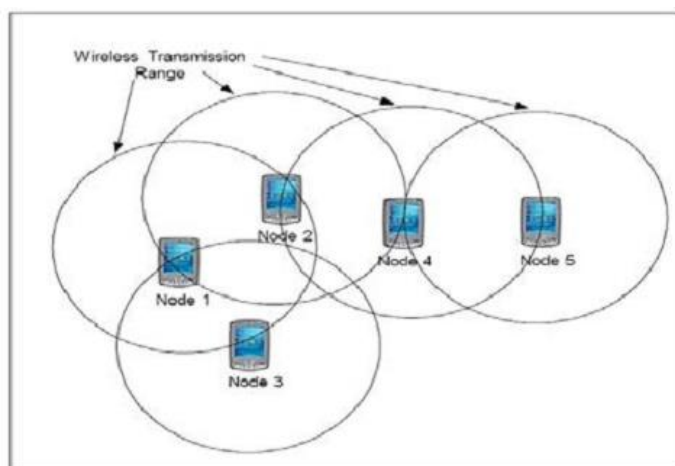


Fig.1: Structure of MANET

And topology of the network changes erratically and dynamically. In MANET, breaking of communication link is

very frequent, as nodes are free to move to anywhere. The density of nodes and the number of nodes are depends on the applications in which we are using MANET. Mobile Ad-hoc network (MANET) becomes one of the most capable fields for research. MANET is a Latin word which means “for this,” or “for this purpose only”. Figure 1 shows the structure of MANET.

MANET has given rise to many applications like Tactical networks, Wireless Sensor Network, Data Networks, Device Networks, etc. With many applications there are still some design issues and challenges to overcome.

II. MANET'S CHARACTERISTICS

A mobile adhoc network has following characteristics:

A. Distributed operation

There is no background network for the central control of the network operations; the control of the network is distributed among the nodes. The nodes involved in a MANET should cooperate with each other and communicate among themselves and each node acts as a relay as needed, to implement specific functions such as routing and security.

B. Multi hop routing

When a node tries to send information to other nodes which is out of its communication range, the packet should be forwarded via one or more intermediate nodes.

C. Autonomous terminal.

In MANET, each mobile node is an independent node, which could function as both a host and a router.

D. Dynamic network topology

Nodes are free to move arbitrarily with different speeds; thus, the network topology may change randomly and at unpredictable time. The nodes in the MANET dynamically establish routing among themselves as they travel around, establishing their own network.

E. Light-weight terminals

In maximum cases, the nodes at MANET are mobile with less CPU capability, low power storage and small memory size.

F. Shared Physical Medium

The wireless communication medium is accessible to any entity with the appropriate equipment and adequate resources. Accordingly, access to the channel cannot be restricted.

G. Self-creation, self-organization and self-administration

Mobile and spontaneous behavior which demands minimum human intervention to configure the network.

H. User mobility

High user density and large level of user mobility.

I. Band-width optimization

The capacity of a Wireless links in the sense of number of nodes is very much lower as compare to the wired networks. So, in this network, the problem of congestion will arise when an application demands more number of nodes to join the network, results in higher network capacity where the optimum use of bandwidth will come into the picture.

J. Physical Security

Wireless links mean the risk of security will be higher, like in to a peer to peer communication or a shared wireless medium is accessible for network users as well as attackers. Firewall for any attacks must be considered into the wireless network [4].

K. Constrained of Energy for operation

Few or every node in a MANET may depend on batteries for their energy because of its mobility. For these nodes, a most important condition is optimum power management.

III. ADVANTAGES OF MANET

The advantages of an Ad-Hoc network include the following [1]:

- They provide access to information and services regardless of geographic position.
- They are robust due to decentralize administration.
- These networks can be set up at any place and time.
- Independence from central network administration. Self-configuring network, nodes are also act as routers. Less expensive as compared to wired network.
- Scalable—accommodates the addition of more nodes.
- Improved flexibility.

IV. CHALLENGES OF MOBILE ADHOC NETWORK

Ad hoc networking has been a popular field of study during the last few years because of its self-forming, self-maintaining, self-healing architecture. The challenges are, no fixed access point, dynamic network topology, contrary environment and irregular connectivity. Ad hoc network immediately forms and accommodate the modification and limited power. Finally, mobile ad hoc network have no trusted centralized authority. Due to the dynamic changing property, the mobile ad hoc network faces some challenges are given below:

A. Scalability

Due to mobility of nodes, scale of ad-hoc network changing all the time. The scalability in ad-hoc network depends on the size of network and forwarded packet capacity in the network. So scalability is a major issue concerning security. Security

mechanism should be capable of handling a large network as well as small ones.

B. Routing

Routing in wireless ad hoc networks is nontrivial due to highly dynamic environment. An Ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any preexisting network infrastructure or centralized administration. In a typical Ad hoc network, mobile nodes come together for a period of time to exchange information. While exchanging information, the nodes may continue to move, and so the network must be prepared to adapt continually to establish routes among themselves without any outside support.

C. Quality of Service

The ad hoc network is dynamically creating the organization whenever the node wants to communicate with their neighbor node. Due the dynamic changing topology in ad hoc network, providing QoS is a tedious task. The heterogeneity of existing Internet applications has challenged network designers who have built the network to provide best-effort service only. Voice, live video and file transfer are just a few applications having very diverse requirements. Qualities of Service (QoS) aware solutions are being developed to meet the emerging requirements of these applications. QoS has to be guaranteed by the network to provide certain performance for a given flow, or a collection of flows, in terms of QoS parameters such as delay, jitter, bandwidth, packet loss probability, and so on.

The factors of QoS are described below:

- *Packets are tangle for the shared media on adjacent links of a flow:* Tangle between the packets in the same stream at various nodes. Such tangleness occurs in the wireless channel which is shared by nodes in the neighbor.
- *Interference between the nodes affects the transmission quality:* In ad hoc network, QoS is affected by radio interference. Interference strongly arises in ad hoc because nodes are beyond the transmission range. While the nodes are in the transmission, the remaining power is enough to interfere with transmission interference in non-neighboring nodes may drop the packet.
- *Limited resources:* Due to the dynamic changing of link flow, ad hoc network provide varying resources.
- *Sufficient admission control:* The admission control take decision about whether the available bandwidth is enough for link flow in available resources. Ad hoc networks providing finite bandwidth capacity may affect the end quality of service.
- *Highly dynamic:* Ad hoc network characteristics are dynamic changing topology and this dynamic changing occurs due to radio transmission and mobility.

D. Client-Server Model Shift

In the Internet, a network client is typically configured to use a server as its partner for network transactions. These

servers can be found automatically or by static configuration. In Ad hoc networks, however, the network structure cannot be defined by collecting IP addresses into subnets. There may not be servers, but the demand for basic services still exists. Address allocation, name resolution, authentication and the service location itself are just examples of the very basic services which are needed but their location in the network is unknown and possibly even changing over time. Due to the infrastructure less nature of these networks and node mobility, a different addressing approach may be required. In addition, it is still not clear who will be responsible for managing various network services. Therefore, while there have been vast research initiatives in this area, the issue of shift from the traditional client-server model remains to be appropriately addressed.

E. Security

A vital issue that has to be addressed is the Security in Ad hoc networks. Applications like Military and Confidential Meetings require high degree of security against enemies and active/passive eavesdropping attacker. The security issue in ad hoc network is dynamic topology, bandwidth, and small device size and limited battery life. Due to the dynamic nature, it is difficult to maintain secured transmission in the network. The ad hoc network does not depend on any pre-existing infrastructure so that the node can leave and join the network in such a situation where security may fall down. Two types of attack occur in ad hoc network, first is passive attack, this attack does not change the transmitted data in the network. But, it can allow unauthorized user to discover the message. Second, is active attack, it is a severe attack and prevents the message flow between the node in the network. It may allow the unauthorized user to modify the message. The malicious node can be identified by dropped packet, battery drained, bandwidth consumption, unreliable packets, delay, connection break and false routing. Ad hoc networks are particularly prone to malicious behavior. Lack of any centralized network management or certification authority makes these dynamically changing wireless structures very vulnerable to infiltration, eavesdropping, interference, and so on. Security is often considered to be the major "roadblock" in the commercial application.

F. Energy Conservation

A mobile adhoc network [2, 3] is a dynamic distributed system of wireless mobile nodes in which the nodes can move in any direction independent of each other. In MANET, there is no central infrastructure and the mobile devices are moving randomly and they may give rise to various kinds of problems such as energy efficiency and power consumption within a network.

G. Node (MH) Cooperation

Node misbehavior due to selfish or malicious reasons can significantly degrade the performance of ad hoc networks. The selfish behaviors are forced by nodes plan to protect their own partial resources for instance battery energy, time and bandwidth. These nodes are very calculating as they use other nodes possessions for their broadcasts but hesitate to split their

resources to assist other nodes processes. This phenomenon is usual because there is no middle controller or essential authority in MANET.

V. SECURITY GOALS

Security is a crucial aspect of MANET. The aim of a security service is to secure network before any attack happened and made it harder for a malicious node to breaks the security of the network. That is why securing a MANET is a challenging task. Some goals to assess whether a MANET is secure or not are as follows:

A. Availability

Availability means the benefits are attainable to authorized parties at suitable time. Availability relates to both services and data. It ensures the survivability of the network facilities despite contradiction of service attack. Availability challenge arises due to MANET's dynamic topology and open boundary.

B. Authentication

Authentication sanction a node to protect the originality of peer node it is communicating with. Authenticity is ensured because only the genuine sender can create a message that will decrypt correctly with the shared key. Authentication is vital affirmation that participants in communication are validated and not imitate.

C. Data Confidentiality

Confidentiality protects that computer associated benefits are acquired by authorized parties only. It means only those who have right to access should really obtain that access. To keep the information secret from all organization that do not have right to access them we have to retain confidentiality. Privacy and secrecy are synonyms of confidentiality.

D. Integrity

According to integrity security service, just authorized nodes can create, edit or delete packets. Integrity convinces that the information being transmitted is never corrupted.

E. Non-Repudiation

By using this service, neither source nor destination can repudiate their behavior or data. In other words, if a node receives a packet from node 2, and sends a reply, node 2 cannot repudiate the packet that it has been sent. This is accommodating when we need to differentiate if a node with some undesired function is undermined or not.

VI. CONCLUSION

The rapid developments in the field of ad hoc networking allows the nodes to form a self-creating, self-organizing and self-administering wireless network. Its intrinsic flexibility, lack of infrastructure, ease of deployment, auto configuration, low cost and potential applications makes it an essential part of future pervasive computing environments. In this research paper we discuss the features and advantages. After that we

discuss the most complex and challenging issue in MANET
i.e. Security with their goals.

VII. REFERENCES

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