

# Mobile Ad-Hoc Network: MANET

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**Abstract** – In the recent years communication technology and service have advanced. Mobility has become very important, as people want to communicate anytime from and to anywhere. In the areas where there is little or no infrastructure is available or the existing wireless infrastructure is expensive and inconvenient to use, Mobile Ad-hoc Network, called MANETs, are becoming useful. They are going to become integral part of next generation mobile services. A MANET is collection of wireless nodes that can dynamically form a network to exchange information without using any pre-existing fixed network infrastructure. The special features of MANET bring this technology great opportunity together with service challenges. The military tactical and other security-sensitive operations are still the main application of ad hoc networks, although there is a trend to adopt ad hoc networks for commercial uses due to their unique properties.

**Keywords**-Mobile Ad Hoc Networks, Routing Protocol, AODV, DSDV, DSR

## INTRODUCTION

Manet is a branch of networking that deals with communication between two or more nodes without use of any external devices. MANET is a continuously self-configuring, infrastructure-less network of mobile devices connected wirelessly. It is one of the types of ad-hoc network. Here ad-hoc means whenever there is need, devices establish the connection. MANET is collection of nodes, which are free to move in the wireless network. The nodes are responsible for forwarding the data or packets from source to destination. Each node performs the role of both host and router. The nodes can consist of laptop, mobile phones and personal digital assistant (PDAS) see "Figure1".



Fig. 1 General Representation of MANET [12]

A "Mobile Ad-hoc Network" consists of mobile wireless nodes. The communication between these mobile nodes is carried out without any centralized control. Traditional routing protocols may not suffice for real time communications it depends upon the condition and our requirements. A mobile ad hoc network (MANET) is a group of mobile, wireless nodes which cooperatively and spontaneously form an IP-based network. This network is independent of any fixed infrastructure or centralized administration. A node communicates directly with nodes within its wireless communication range. Nodes that are part of the MANET, but beyond each other's wireless range communicate using a multi-hop route through other nodes in the network. These multi-hop routes changes with the network topology and are determined using a routing protocol such as DSDV, DSR, AODV, TORA, and ZRP etc. To support robust and efficient operation in mobile wireless networks by incorporating routing functionality into mobile nodes. Such networks are envisioned to have dynamic, sometimes rapidly-changing, random, multichip topologies which are likely composed of relatively bandwidth-constrained wireless links.

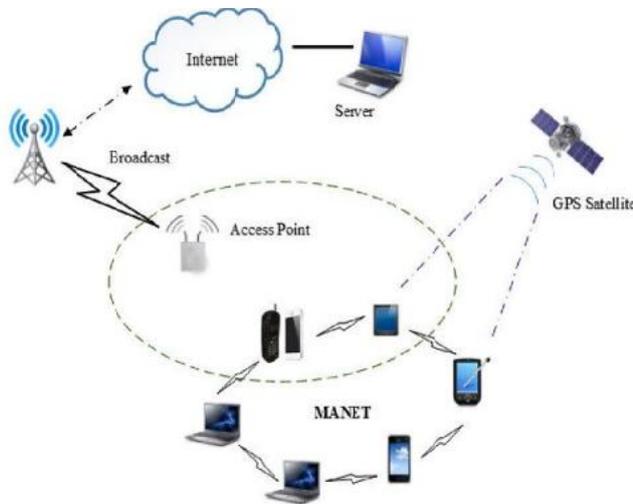


Fig. 2 Example of mobile ad-hoc network

### WHY AD HOC NETWORKS?

Setting up of fixed access points and backbone infrastructure is not always viable

- Infrastructure may not be present in a disaster area or war zone
- Infrastructure may not be practical for short-range radios; Bluetooth (range ~ 10m)

Ad hoc networks: – Do not need backbone infrastructure support

- Are easy to deploy
- Useful when infrastructure re is absent, destroyed or impractical.

### AD-HOC ROUTING PROTOCOLS

The main function of routing protocol is to find the path between the sender and the receiver. If nodes are in direct range of each other then they can directly connect and can communicate with each other, but if in case nodes are not in direct range then they need some intermediate nodes to transfer their data packet. Basically in MANET there are three types of routing protocols i.e. Proactive, Reactive and hybrid see in "Figure3".

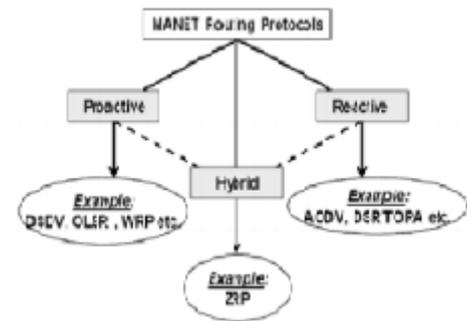


Fig. 3 Types of Routing Protocol with examples

#### A. Proactive Routing Protocols

They are also called as table driven routing protocols. In this every node maintain routing table which contains the full information of all the nodes present in the network. The routing tables are updated periodically after a small time interval. Proactive protocols are not suitable for large networks as they need to maintain full information of all the nodes present in the network. This causes more overhead in the routing table leading to consumption of more bandwidth. Example: DSDV.

#### B. Reactive Routing Protocol

The reactive protocols are also known as source-initiated on-demand routing protocols. They do not have any procedure for creating & updating routing tables with routing information at regular intervals. They finding the suitable route to the destination and establishing the connection in order to transmit and receive the packet.

Example: DSR.

#### C. Hybrid Routing Protocol

It is combination of both reactive and proactive routing protocols. Proactive protocols have large overhead and less latency while reactive protocols have less overhead and more latency. So a Hybrid protocol is invented to overcome the shortcomings of both proactive and reactive routing protocols. Hybrid protocol is suitable for large networks. In this, large network is divided into set of zones where routing inside the zone is performed by using reactive approach and outside the zone routing is done using reactive approach. Example: ZRP.

### ADVANTAGES OF MANET

- 1 Minimum cost estimation.
- 2 Enhanced flexibility.
- 3 These networks can be set up at any place and time.
- 4 MANET gives access to information and facilities regardless to geographic location.

**DISADVANTAGES OF MANET**

- 1 These networks have lower capacity and shorter transmission range than fixed infrastructure networks.
- 2 Volatile network topology makes it hard to detect the malicious nodes.
- 3 Limited resources and physical security.
- 4 Dynamic network topology makes it difficult to identify malicious attack.

**APPLICATIONS OF MANET**

- 1 Military field: Ad-Hoc networking can permit army to exploit benefit of conventional network expertise for preserving any info network among vehicles, armed forces, and headquarters of information.
- 2 Cooperative work: To facilitate the commercial settings, necessity for concerted computing is very significant external to office atmosphere and surroundings as compared to inner environment. People want getting outside meetings for exchanging the information plus cooperating with each other regarding any assigned task.
- 3 Emergency Services: Ad-hoc network could be used for rescuing and emergency processes for adversity assistance struggles, for instance, in flood, fire or earthquake.
- 4 Educational sector: Set up virtual classes & conference rooms.
- 5 Location Aware Services: Automatic Call forwarding, advertise location specific services, Location– dependent travel guide.

**CHALLENGES OF NETWORK**

- i. Security The ad hoc nature of MANETs brings various new security challenges to the network design. The wireless medium is a vulnerable attack to eavesdropping and the ad hoc network functionality is established through node cooperation of the mobile ad hoc networks are intrinsically exposed to various security attacks.
- ii. Quality of Service  
The dynamic changes in topology in ad hoc network, providing the QOS. Because of rapid development in mobile technology and real time applications like multimedia, voice providing Quos in ad hoc network is necessary to maintain best-effort-offservice.
- iii. Routing Overhead

The wireless ad hoc networks nodes often change their location within network. There are some stale routes are generated in the routing table which leads to the unnecessary routing overhead.

## iv. Inter-networking

The communication in ad hoc networks the inter-networking between MANET and fixed networks mainly IP based. The coexistence of routing protocols in such a mobile device is a challenge for the harmonious mobility management.

## v. Power Consumption

For most of the light-weight mobile terminals, the communication-related functions should be optimized for low power consumption. Conservation of power and power-aware routing must be taken into consideration.

## vi. Location-aided Routing Location-aided routing

It uses positioning information to define associated regions so that the routing is spatially oriented and limited. This is analogous to associatively-oriented and restricted broadcast in ABR.

**RELATED WORK**

Rajesh M and Gnanasekar[3] proposed about network congestion is collected and distributed by Wireless Agent (WA). A wireless agent starts from every node and moves to an adjacent node at every time see in "Figure 4". A node visited next is selected at the equivalent probability. The WA brings its own history of movement and updates the routing table of the node it visits. In this technique, the node is classified in one of the four categories depending on whether the traffic belongs to background, best effort, video or voice AC, respectively. Then WA estimates the queue length of the various traffic classes and the channel contention of each path. Then this total congestion metric is applied to the routing protocol to select the minimum congested route in the network. A wireless agent based congestion control AODV routing protocol reduces the end-to-end delay and the number of route discovery requests balances the traffic load. With the help of this technique, he attains high delivery ratio.

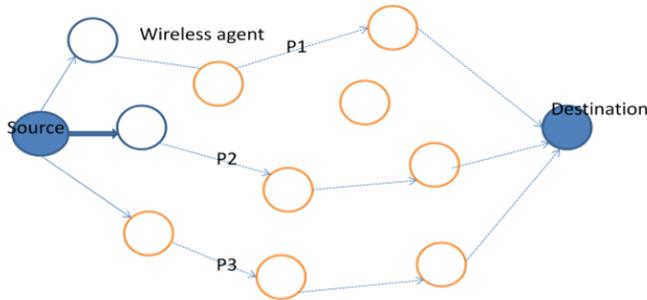


Fig. 4 Agent based congestion routing

Bandana Bhatia [8] proposed congestion control protocols based on AODV in MANETs. Improved Ad-hoc on-demand Distance Vector Routing Protocol (AODV-I) and Early Detection Congestion and Control Routing Protocol (EDAODV). EDAODV is a unicast routing protocols. In this protocol, the previous (predecessor) and the next (successor) node on the primary path find alternate path bi-directionally "Figure 5". An Improved Ad-hoc on-demand Distance Vector Routing Protocol (AODV-I) is based on congestion aware and route repair mechanism. It deals with the congestion processing to the RREQ message thereby avoiding the selection of the busy nodes automatically during the establishment of new route. The main goal of the proposed method is to determine all available node disjoint routes from source to destination with minimum routing control overhead.

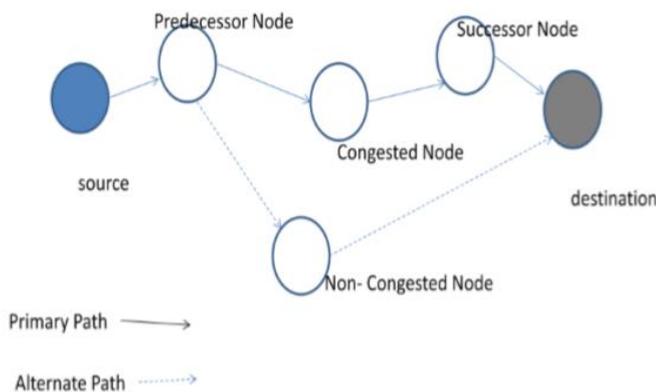


Fig. 5 Finding alternate path to reduce congestion

**PROBLEMS OF MANET**

- Hosts may misbehave or try to compromise security at all layers of the protocol stack
- Transport layer: securing end-to-end communication
  - Need to know keys to be used for secure communication

- May want to anonymize the communication
- Network layer: misbehaving hosts may create many hazards
  - May disrupt route discovery and maintenance: Force use of poor routes (e.g., long routes)
  - Delay, drop, corrupt, misroute packets
  - May degrade performance by making good routes look bad
- MAC layer: misbehaving nodes may not cooperate
  - Disobey protocol specifications for selfish gains
  - Denial-of-service attacks
- Dynamic topology
  - Nodes mobility
  - Interference in wireless communications

**CONCLUSION**

There has been vast development in the field of wireless communication and MANET. In this review paper various routing protocol techniques to control the congestion in MANETS have been evaluated. The routing protocol "AODV" provides the better results in terms of packet delivery ratio, throughput and low delay as compared to other routing protocols such as DSR, IRED of Computer Science and Mobile Computing, Vol 2, Issue., EOAODV to control the congestion and packet loss.

In this paper, we basically focused on three different approaches of MANETS routing protocols and their examples: Reactive (AODV, DSR), Proactive (OLSR, DSDV), Hybrid (ZRP) routing protocols. We have review the various papers related to this work and conclude that it is critical issue to select an efficient and reliable path establishment between sources to destination.

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