A Novel Approach to Mobile Ad-hoc Network: Routing Protocols, Characteristics and Features

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Abstract - *Mobile Ad-Hoc Networks (MANETs) represents a group of wireless networks which can be formed randomly and dynamically without the requirement of infrastructure. Such networks are capable to acclimate and reconfigure among themselves according to varying network topologies and node mobility. These following characteristics are mainly striking to the military user owing to the inherent randomness of the strategic situation. MANET technology has its origin in defense, which have been developed from the military research efforts. In this paper, we will discuss more in detail about the application, significant features and different types of protocols in MANET*

Key Words: **MANET, Proactive, reactive and hybrid routing protocols**

1. INTRODUCTION:

MANET denotes to a multi-hop packet based wireless network that includes a set of nodes which can communicate and move at same time, without the need of any fixed wired infrastructure [1]. In general, MANET are adaptive and self-organizing networks that are formed without the necessity of any centralized administration. In other words, MANET can also be defined as a type of ad hoc network which varies with locations and configure itself **(Fig.1.).** Subsequently, MANETS are mobile in nature, they use wireless connections to connect with different networks. The wireless connection can be either a standard Wi-Fi connection, or another medium, such as a satellite or cellular transmission.
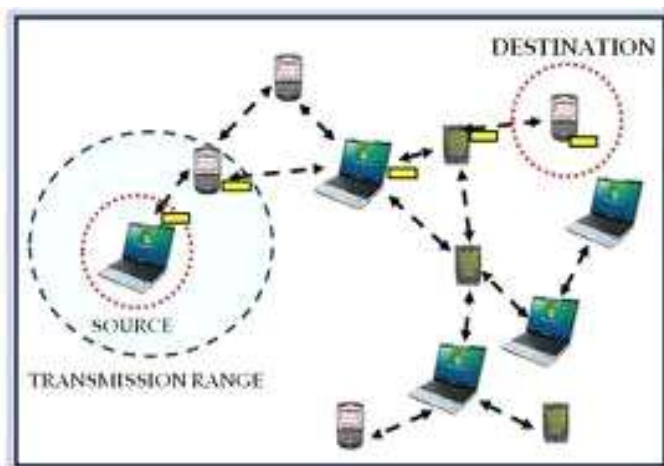

Figure.1. Structure of MANET [1]

2. Routing in MANET:

Routing is defined as transmitting of packets or data from source node to destination node. As ad-hoc network continuously changes their topology every now and then and so making packet routing difficult at that instant [9]. Routing protocol controls the stream of information in systems and moreover chooses the well-organized way to attain the goal **(Fig.2).** Routing protocols can be classified on several bases such as on the basis of communication strategy used for transmitting of information from source to destination i.e. unicast, broadcast and multicast routing, on the topology of network for routing i.e. proactive and reactive routing protocols [4]. In general, the routing protocols defines a set of rules that governs the approach of data packets transfer from sender to receiver in a network [5].
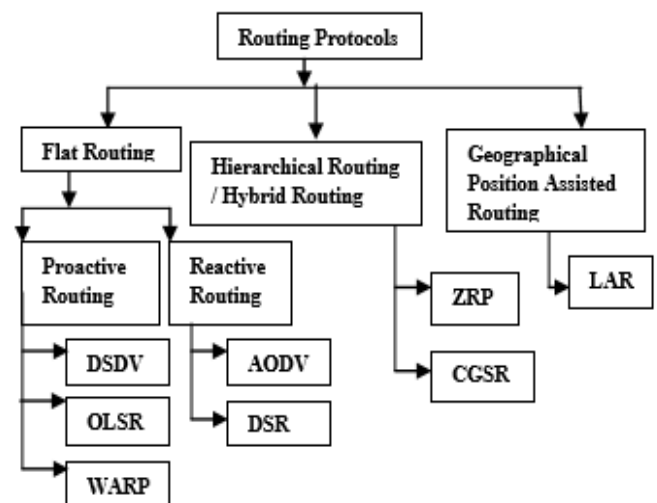

Figure.2. Classification of routing protocol [4]

2.1. Proactive routing protocol (Table-Driven protocol):

The proactive protocol are also termed as table-driven protocols in which fresh lists of routes and their destination are sustained by periodic distribution of routing tables over the complete network and this group of protocol always attempts to maintain reliable and updated routing information at each and every node. Generally, the packets are transferred over the predefined route stated in the routing table. The proactive protocols uses the link-state routing algorithms that frequently flood the link information about its adjacent and neighbors. The significant drawback of this protocol is that every nodes that are present in the

network constantly maintain an updated table. The Proactive protocols consists of lower latency when compared to reactive protocols. Some of the example protocols are: Optimized Link State Routing,

Dynamic source Distance Vector Routing [10] and etc.,

2.2. Reactive routing protocol (Source-Initiated On-Demand Driven):

The reactive routing protocols is also called as On Demand Routing Protocols in which the routes are not predefined for routing purpose. This protocol establishes a route to a destination on demand basis. The route discovery mechanism is completely based on the flooding algorithm which functions on the method that a node will broadcasts the data packet to all of its neighbor nodes and whereas the intermediate nodes will forward that data packet to their neighbor nodes [6]. The reactive protocols consist of smaller routing overheads and higher latency when compared to proactive protocols. Some of the example protocols are: Dynamic Source Routing (DSR), An Ad Hoc On-Demand Distance Vector (AODV)

2.3. Hybrid routing protocol:

These protocols are designed by the combination of both proactive and reactive protocols and taking the advantages of these two protocols and hence combine the advantages of both. The example protocols are: Zone Routing Protocol [8].

3. Characteristics of MANET's:

- Each and every node that are present in the MANET act as both router and host due to its autonomous behavior [9].

- Multi-hop radio relaying- When a sender node and receiver node wants to forward a message which is in out of the radio range, for such instance MANETs are accomplished with multi-hop routing.

- Distributed nature of operation for the need of security [7], host and routing configuration. A centralized firewall is absent here.

- At any time, the mobile nodes may or leave or join the network, creating the network topology dynamic in nature.

- Mobile nodes are categorized with less power, memory, and light weight features.

- The stability, reliability, efficiency, and capacity of wireless links are often considered to be inferior when compared to wired links. This illustrates the fluctuating bandwidth of wireless links.

- The mobile and thoughtless behavior which requires less human involvement to configure the network.

- All the mobile nodes that have identical features with similar abilities and responsibilities therefore forms a totally symmetric atmosphere [3].

- Nodal connectivity is intermittent.

- Large level of user mobility and High user density.

4. Advantages of MANET's:

1. Mobility nature

2. Wireless communication

3. Do not need particular or specific infrastructure

4. Light and Small equipment/device

5. Limitations of MANET:

1. Delay in nature

2. Throughput drops with a greater or increased number of hops

3. Throughput drops with increase in mobility of nodes

6. Features

The rapid development of MANETs has inspired many wireless applications which can be used in a wide number of regions like emergency services, military, education, commerce and entertainment [2]. The main significant feature of MANETs are and independent infrastructures and self-organizing, that make them very ideal choice for uses like communication and information sharing. Owing to openness, decentralization characteristic and features of MANETs, it generally required to make the membership of the mobile nodes in the network.

7. Conclusions

The development in the area of mobile computing has led to a new different way for mobile communication, in which the mobile devices form a self-organizing, self- administering, and self-creating wireless network, termed as mobile ad-hoc network. These are typically highly susceptible to physical security threats when compared to the hardwired or fixed networks.

This paper throws a light on unique characteristics and features of MANETS have helped the researchers to the maximum. Its ease of deployment, flexibility, auto-configuration, lack of infrastructure, low cost and potential applications makes it more essential part of future persistent computing surroundings. Even though the extensive

deployment of ad- hoc networks is still year away, the research in this field will remain very dynamic and creative.

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