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A Literature Review on Routing Protocols of Mobile Adhoc Network with Group Mobility Model

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Abstract**—**A mobile ad hoc network (MANET) is a collection of wireless mobile nodes forming a dynamic network Topology without the aid of any existing network infrastructure or centralized administration. Each node participating in the network acts as a host and as a router, means they have to forward packets and identify route as well. Random waypoint is the most common mobility model in most of the simulation based studies of various MANET routing protocols. The Reference Point Group Mobility Model (RPGM) has been generated by Impact of Mobility Patterns on Routing in Ad-hoc Network (IMPORTANT). In most of the papers the groups are considered equal number of nodes means each group contains similar number of members. There are various areas where unequal number of members is required in the group. In near future we try to develop an improved Reference Point Group Mobility Model (iRPGM), which can be capable to perform such task. The present communication is an attempt to perform literature review and to identify fundamental basics to be used in development of such model.

Keywords:**—** MANET, IMPORTANT, RPGM, iRPGM.

1. INTRODUCTION

A Mobile Ad hoc Networks (MANET) represents a system of wireless mobile nodes that move arbitrarily and dynamically self-organize in to autonomous and temporary network topologies, allowing people and devices to seamlessly communicate without any pre-existing communication architecture. Such infrastructure less networks are usually needed in battlefields, disaster areas, and meetings, because of their capability of handling node failures and fast topology changes. The most important characteristics are dynamic topology, where nodes can change position quite frequently, so we require such routing protocol that quickly adapts to topology changes. Normal routing protocol, which works well in fixed networks does not show same performance in Mobile ad-hoc Networks. In MANET routing protocols should be more dynamic so that they quickly respond to topological changes [1]. A number of protocols have been developed to accomplish this task. Routing paths in MANET potentially contain multiple hops, and each node has the responsibility to act as router [2]. Routing in MANET has been a challenging task because of high degree of node mobility.

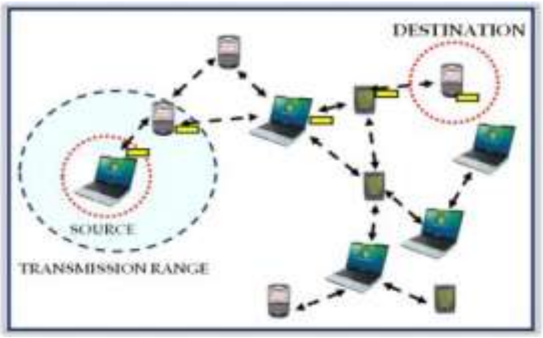

Figure 1: A Typical MANET Network

MANET routing protocol must have the following characteristics:

- Keep the routing table up-to-date and reasonably small,
- Select the best route for given destination and
- Converge within an exchange of a small amount of messages[3].

This paper is organized in five sections. Section 2 gives brief description of routing protocols and facts obtained after literature review are discuss in section 3. Section 4 describes Reference Point Group Mobility (RPGM) Model. Section 5 describes conclusion and future scope.

2. DESCRIPTION OF MANET ROUTING PROTOCOLS

Classification of routing protocols in MANET can be done in many ways, but most of these are done depending on routing strategy and network structure. The classification of routing protocols is shown in the following Figure:

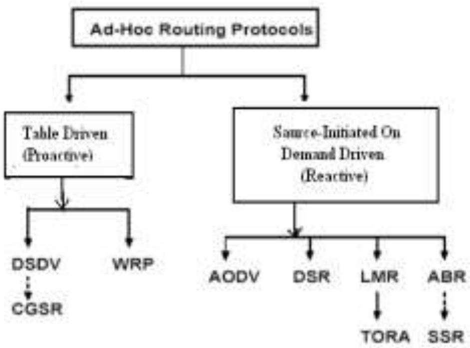

Figure 2: Classification of MANET Routing Protocol

2.1. Proactive Routing Protocols

Proactive protocols [4] are also called table driven protocols and will actively determine the layout of the network. Through a regular exchange of network topology packets between the nodes of the network, at every single node an absolute picture of the network is maintained. There is hence minimal delay in determining the route to be taken. Some of the proactive routing protocols are:

- Optimized Link State Routing (OLSR)
- Fish-eye State Routing (FSR)
- Destination-Sequenced Distance Vector (DSDV)
- Cluster-head Gateway Switch Routing Protocol (CGSR)

2.2. Reactive Routing Protocols

Reactive protocols [4] start to set up routes on-demand. The routing protocol will try to establish such a route, whenever any node wants to initiate communication with another node to which it has no route. This kind of protocols is usually based on flooding the network with Route Request (RREQ) and Route reply (RERP) messages. By the help of Route request message the route is discovered from source to target node; and as the target node gets a RREQ message it send RERP message for the confirmation that the route has been established. This kind of protocol is usually very effective on single-rate networks. It usually minimizes the number of hops of the selected path. Some of the reactive routing protocols are:

- Ad hoc On Demand Distance Vector (AODV)
- Dynamic Source routing protocol (DSR)
- Temporally ordered routing algorithm (TORA)
- Associativity Based routing (ABR)
- Signal Stability-Based Adaptive Routing (SSA)

3. LITERATURE REVIEW

Ken Blakely, Bruce Lowekamp [5] presents a study of real-world group movement scenarios for mobile ad hoc networks. The collected data and experiments dictate two conclusions. Groups in real-world MANET scenarios exhibit internal structure. A mobility model that captures structure inherent in groups produces different results than those that do not capture structure. These conclusions suggest that simulations of mobile ad hoc nodes should be designed with consideration for possible structure inherent in the environment being simulated. To effectively model the structure inherent in groups and to simulate its affects on routing performance we introduce the Structured Group Mobility Model (SGMM), which allows a parameterized description of group structure dependencies for generating movement traces. The group movements can be specified using only waypoints for the reference point.

Jiun-Long Huang and Ming-Syan Chen [6] identified the problem of replica allocation in a MANET with group mobility. They analyzed the employ group mobility model and derived several theoretical results. In light of these results, they proposed a replica allocation scheme to allocate replicas by considering group mobility. To evaluate the performance of the proposed schemes, several experiments were conducted.

Tracy Camp, Jeff Boleng and Vanessa Davies [7] in their paper describe several mobility models that represent mobile nodes whose movements are independent of each other (i.e., entity mobility models) and several mobility models that represent mobile nodes whose movements are dependent on each other. The goal of this paper is to present a number of mobility models in order to offer researchers more informed choices when they are deciding upon a mobility model to use in their performance evaluations. They present simulation results that illustrate the importance of choosing a mobility model in the simulation of an ad hoc network protocol. Specifically, they illustrate how the performance results of an ad hoc network protocol drastically change as a result of changing the mobility model simulated.

Bindra, Maakar and Sangal [8] measure the performance of AODV and DSR with CBR and TCP in Group mobility model. In CBR traffic sources AODV perform better, but in case of TCP traffic, DSR perform better in stressful situation (high load or high mobility). DSR routing load is always less than AODV in all type of traffic. Average end to end delay of AODV is less than DSR in both type of traffic. Over all the performance of AODV is better than DSR in CBR traffic and real time delivery of data. But DSR perform better in TCP traffic under restriction of bandwidth condition. In this paper, two routing protocol are used and their performance have been analyzed under Group mobility model with respect to four performance metrics. This paper can be enhanced by analyzing the other MANET routing protocols under different mobility model and different type of traffic sources with respect to other performance metrics.

Agrawal and Patel [9] in their paper compare the performance of AODV and DSDV with CBR and TCP traffic with the increasing number of groups. At TCP traffic, AODV perform well over the DSDV in terms of Average Throughput. The Average End to End delay with CBR traffic, DSDV perform well over the AODV. In TCP traffic, Average End to End delay of AODV is less than DSDV with all the groups. In Both the traffic types, Average End to End Delay is increased with increment in group. The Average End to End Delay with CBR traffic is much less than the TCP Traffic.

4. REFERENCE POINT GROUP MOBILITY MODEL (RPGM) MODEL

Group mobility can be used in military battlefield communication, where the commander and soldiers form a logical group. Here, each group has a logical center (group leader or commander) that determines the group's motion behavior. Each member of the group (soldier) is uniformly distributed in neighborhood of group leader (commander). Subsequently, at every instant, each node has a speed and direction that is derived by randomly deviating from that of the group leader [8]. Each node derivates from its velocity randomly from that of leader. The movement in group mobility can be defined as follows:

$$|V_{member}(t)| = |V_{leader}(t)| + random() * SDR * max\_speed \quad \ldots\ldots(1)$$

$$|\Theta_{member}(t)| = |\Theta_{leader}(t)| + random() * SDR * max\_angle. \quad \ldots\ldots(2)$$

Where 0 <= SDR (Standard Deviation Ratio) and ADR (Angle Deviation Ratio) <= 1.

SDR and ADR are used to control the deviation of the velocity of group members from that of the leader. Since the group leader mainly decides the mobility of group members, group mobility pattern is expected to have high spatial dependence for small values of SDR and ADR.

5. CONCLUSION AND FUTURE SCOPE

From the above study, we observe that the Reference Point Group Mobility Model used in the papers can consider equal number of members in each group.

Another important aspect of group mobility is mobility of nodes inside the group with reference to their leader. In most of the real life examples of group mobility in MANET, such as military operation, tracking and disaster relief operations, different groups are formed. Some times the number of members is unequal according to the requirement of the task.

These facts are motivated us to design a new improved Reference Point Group Mobility Model (iRPGM), which can generate different groups with required number of members.

In future we will try to design and develop iRPGM model to evaluate and measure performance of various routing protocols under several numbers of groups with equal and unequal number of members.

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