A Survey: Performance and Impact of Mobility in MANET

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Abstract

Ad-hoc networks have lots of challenges than traditional networks. It has challenges like infrastructure less and self-organizing networks. They don't have any fixed infrastructure. In MANETS, there will be no centralized authority to manage the network. Nodes have to rely on other nodes to keep the network connected. In MANET, routing is a critical task due to the highly dynamic environment. Later on, many routing protocols have been proposed for mobile ad hoc networks and prominent among them are DSR, AODV, TORA and NCPR. This research paper provides an overview of these protocols by presenting their limitations, benefits, functionality and characteristics and then makes their comparative analysis to analyze their performance.

Keywords: - *A AODV, DSR, mobile ad hoc networks (MANETs), topology control algorithm, topology control*

INTRODUCTION

The wireless network can be classified into two types: Infrastructure or Infrastructure less. In Infrastructure wireless networks, the mobile node can move while communicating, the base stations are fixed, and as the node goes out of the range of a base station, it gets into the range of another base station. The fig. 1, given below, depicts the Infrastructure wireless network. In an Infrastructure less or Ad Hoc wireless network, the mobile node can move while communicating, there are no fixed base stations and all the nodes in the network act as routers. The mobile nodes in the Ad Hoc network dynamically establish routing among themselves to form their own network 'on the fly'. This type of network can be shown as in fig. 1.

In a wired network, security protocols will be implemented in the router node. But implementing security in MANET is a challenging task. Because here node itself will be acting as a router node. So identifying a neighbour node as a legitimate or malicious node is difficult in MANET shown in Figure 1. Communication in the network depends upon the trust of each other. Communication can work appropriately if each node co-operates for data transmission. As MANET has no fixed infrastructure, they have more security threats when compared to the infrastructure-based

wireless networks. Each communication layer has lots of attacks in MANET due to its dynamic Fig 1. MANET nature, lack of centralized monitoring, and limited resources like bandwidth and battery power.

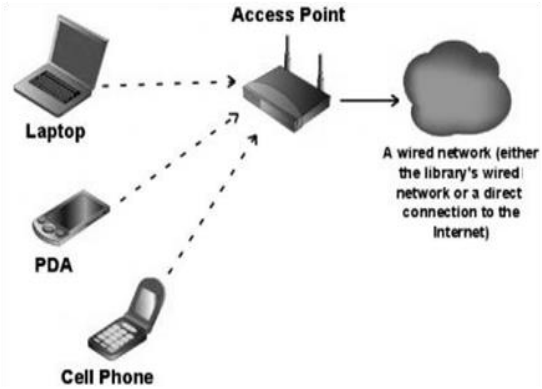

Figure 1 Infrastructure Wireless

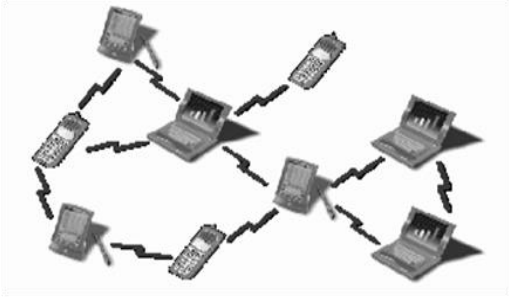

Figure 2 Infrastructure Less Wireless Network [2]

LITERATURE REVIEW

I. TOPOLOGY CONTROL IN MANETS

The network topology in a MANET is changing dynamically due to user mobility, traffic, node batteries, etc. Meanwhile, the topology in a MANET is controllable by adjusting some parameters such as the transmission power, channel assignment, etc. In general, topology control is such a scheme to determine where to deploy the links and how the links work in wireless networks to form a good network topology, which will optimize the energy consumption, the capacity of the network, or end-to-end routing performance. Topology control is originally developed for wireless sensor networks (WSNs), MANETs, and wireless mesh networks to reduce energy consumption and interference. It usually results in a simpler network topology with a small node degree and a short transmission radius. It will have high-quality links and less contention in the medium access control (MAC) layer. Spatial/spectrum reuse will become possible due to the smaller radio coverage.

Power control and channel control issues are coupled with topology control in MANETs while they are treated separately traditionally.

Although a mobile node can sense the available channel, it lacks the scope to make network-wide decisions. It, therefore, makes more sense to conduct power control and channel control via the topological viewpoint. Topology control aims to set up interference-free connections to minimize the maximum transmission power and the number of required channels. It is also desirable to construct a reliable network topology since it will benefit the network performance.

MOBILE AD HOC NETWORKS WITH COOPERATIVE COMMUNICATIONS

Cooperative communication typically refers to a system where users share and coordinate their resources to enhance the information transmission quality. It is a generalization of the relay communication, in which multiple sources also serve as relays for each other.

There are a source, a destination, and several relay nodes in a simple cooperative wireless network model with two hops. The basic idea of cooperative relaying is that some nodes, which overheard the information transmitted from the source node, relay it to the destination node instead of treating it as interference. Cooperative

diversity is achieved since the destination node receives multiple independently faded copies of the transmitted information from the source node and relay nodes.

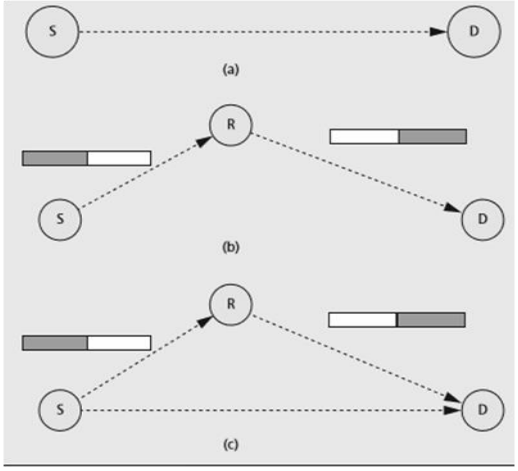

Figure 3 Topology Control with Cooperative Communication in Manet [3]

Most existing cooperative communications works focus on physical layer issues, such as decreasing outage probability and increasing outage capacity, which is only link-wide metrics.

ROUTING PROTOCOLS

A routing protocol is needed whenever a packet needs to be transmitted to a destination via several nodes. Numerous routing protocols have been proposed for such ad hoc networks. These protocols find a route for packet delivery and deliver the packet to the correct destination. The studies on various aspects of routing protocols have been an active area of research for many years. Many protocols have been suggested, keeping applications.

Table Driven or Proactive Protocols: In Table Driven routing protocols, each node maintains one or more tables containing routing information to every other node in the network. All nodes keep on updating these tables to maintain the latest view of the network. Some of the existing table-driven or proactive protocols are: DSDV [6], [19], DBF [7], GSR [24], WRP [23] and ZRP [28], [13].

On-Demand or Reactive Protocols: In these protocols, routes are created as and when required. When transmission occurs from source to destination, it invokes the route discovery procedure. The route remains valid till the destination is achieved or until the route is no longer needed. Some of the existing on-demand routing protocols are: DSR [8], [9], AODV [4], [5] and TORA [26], [27].

The emphasis in this research paper is concentrated on the survey and comparison of various On-Demand/Reactive Protocols such as DSR, AODV and TORA as these are best suited for Ad Hoc Network.

PERFORMANCE METRICS

Several qualitative and quantitative metrics can be used to compare different reactive routing protocols. Most of the already available routing protocols ensure qualitative metrics. The following quantitative metrics have been considered to make the comparative study of these routing protocols through simulation.

1. **Routing overhead:** This metric describes how many routing packets for route discovery and maintenance must be sent to propagate the data packets.
2. **Average Delay:** It represents the average end-to-end delay and indicates how long it took for a packet to travel from the source to the application layer of the destination.
3. Throughput: This metric represents the total number of bits forwarded to higher layers per second. In other words, it is defined as the total amount of data a receiver receives from

the sender divided by the time taken by the receiver to obtain the last packet. It is measured in bps.

4. **Media Access Delay:** A node's time to access media for starting the packet transmission is called a media access delay. For each packet, the delay is recorded when it is sent to the physical layer for the first time.
5. **Packet Delivery Ratio:** The ratio between the amount of incoming data packets and received data packets.
6. **Path Optimality:** It can be defined as the difference between the path taken and the best possible path for a packet to reach its destination.

LITERATURE REVIEW

The literature review provides us with information about the current work done in this particular field. In our case, the literature review highlighted the main problem and drawbacks. Some of the issues are energy efficiency, looping problem, scalability, quality of services. This comprised our primary research. Our next aim is to implement and solve the issues that were highlighted.

Table 1- Comparison OF AODV, DSR

Features	AODV	DSR
Routing Overhead	High	Less than AODV
Mechanism	Combination of DSR and DSDV	Source Routing
Higher mobility performance	Medium	Low
Latency time	High	Low
End to End Delay	High	Average

CONCLUSION

MANETs is an emerging technological field and hence is an active area of research. Because of ease of deployment and defined infrastructure-less features, these networks find applications in various scenarios ranging from emergency operations and disaster relief to military service and task forces. Providing security in such systems is critical. Several challenges like the Invisible Node Attack remain in the area of routing security of MANETs.

There is a growing requirement of Topology Control which satisfies quality of service (QoS) like bandwidth, packet loss rate, delay, packet jitter, hop count, path reliability and power consumption. The topology control scheme can substantially improve the network capacity in MANETs.

FUTURE ENHANCEMENT

There are a lot of researches done in MANET for so many years. More research is needed on the secure routing protocol, key management, trust-based systems, integrated approaches to routing security, data security in different levels and cooperation enforcement. Finally, building a trust-based system and integrating it into the intrusion detection system can be considered future research.

The focus of the study is on these issues in our future research work, and effort will be undertaken to propose a solution for routing in Ad Hoc networks by tackling these core issues of security and power-aware/energy-efficient routing.

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