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RESEARCH ARTICLE

Depiction of Routing Protocols in Mobile Adhoc Networks: Behaviour Analysis

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Abstract— An ad-hoc network is a multi-hop wireless network where all nodes cooperatively maintain network connectivity without a centralized infrastructure. If these nodes change their positions dynamically, it is called a mobile ad-hoc network (MANET). Since the network topology changes frequently, efficient Reactive routing protocols such as Dynamic Source Routing (DSR) and Location Aided Routing (LAR) are used. The idea described in this paper is based on a flexible network independent platform which can be easily deployed through the use of protocols. This paper proposed analysis of assertion routing protocols with broadcast flooding algorithm. It incorporates mechanisms for dynamic setup and discovery of nodes, Route Maintenance and route Discovery. The simulation results show the improvement of the network performance, in terms of overhead, and end to end delay for the routing protocols.

Key Terms: - MANET; LAR; DSR; Broadcast Flooding Algorithms; Comparison

I. INTRODUCTION

Mobile Ad-Hoc Network is an infrastructure less, self-organizing, self-configuring, self- maintaining network designed by a set of wireless mobile nodes, where all the mobile hosts take part in the process of forwarding packets. It has become one of the most prevalent areas of research in the recent years because of the challenges it pose to the related protocols. MANET is the new emerging technology which enables users to communicate without any physical infrastructure regardless of their geographical location, that's why it is sometimes referred to as an infrastructure less network. A MANET is a most promising and rapidly growing technology which is based on a self-organized and rapidly deployed network. Due to its great features, MANET attracts different real world application areas where the networks topology changes very quickly. These are highly applicable in Military Networks, Personal Area Networks, Home Networks, Wireless Sensor Networks, and Inter-Vehicle Communication. Each node in the network also acts as a router, forwarding data packets for other nodes. A central challenge in the design of Ad-Hoc networks is the development of dynamic routing protocols. A routing protocol is needed whenever a packet needs to be transmitted to a destination via number of nodes and numerous routing protocols have been proposed for Ad-Hoc networks. Several routing protocols have been planned to achieve a particular level of routing operation for MANET. Recent research in network layer protocols for MANETs has involved unicast, multicast and broadcast communications. Network wide broadcasting, simply referred to as "broadcasting", is the process in which one node sends a packet to all other nodes in the network. Broadcasting may be used to disseminate data to all other nodes in the network or may be used by MANET Network wide broadcasting, simply referred to as "broadcasting", is the process in which one node sends a packet to all other nodes in the network. Broadcasting may be used to disseminate data to all other nodes in the network or may be used by MANET.

II. ROUTING PROTOCOLS

There are different types of routing protocols are available, that is proactive, reactive and hybrid protocols. Reactive routing protocols for MANET are also called "on-demand" routing protocols. In a reactive routing protocol, routing paths are searched only when needed. A route discovery operation invokes a route-determination procedure. The discovery procedure terminates when either a route has been found or no route is available after examination for all route permutations. In a content delivery network, active routes may be disconnected due to node mobility [4]. Therefore, route maintenance is an important operation of reactive routing protocols. Compared to the proactive routing protocols for MANET, less control overhead is a distinct advantage of the reactive routing protocols. A mobile ad hoc network consists of wireless hosts that may move often. Movement of hosts results in a change in routes, requiring some mechanism for determining new routes.

2.1 Ad Hoc on-Demand Distance-Vector Routing Protocol (AODV)

The key feature of this protocol is that applying a distributed routing scheme. In contrast to the source routing applied by AODV depends on storing the next hops of a path as entries in the intermediate nodes, which is considered as an advantage [1]. However this may require additional resources form the intermediate nodes, which is the negative side of AODV. It is designed to be self-starting in an environment of mobile nodes, withstanding a variety of network behaviours such as node mobility, link failures and packet losses. The AODV protocol consists of two important mechanisms, Route Discovery and Route Maintenance [3][6].

2.2 Dynamic Source Routing Protocol (DSR)

The key feature of this protocol is a pure on demand protocol; it does not employ any periodic exchange of packets. DSR does even employ beacon packets like some other on demand protocols. Consequently, DSR applies on demand schemes for both route discovery and route maintenance [7]. This makes the routing overhead traffic scales to the actual needed size automatically, which is considered as the main advantage of DSR. On the other hand, DSR employs source routing, so that each data packet contains the full path it should traverse to its destination. Source routing is some time considered as a disadvantage of DSR [5].

2.3 Location Aided Routing Protocol (LAR)

The most important feature of this protocol is limiting the area of flooding the route request packets in the network. It uses the location information to predict the current location of the destination nodes. LAR assumes the availability of a global positioning system infrastructure (GPS). According to the performance study in LAR schemes introduce less routing overhead than that introduced by the pure flooding scheme. However, it is considered as a two sided solution, as more recourses are required, namely, GPS [2].

There are two kind of working zones are propagated in Location aided routing Protocol. Fig 1. Represented the *Expected zone.* Consider a node S that needs to find a route to node D. Assume that node S knows that node D was at location L at time $t0$ and that the current time is $t1$. Then, the "*expected zone*" of node D, from the viewpoint of node S at time $t1$, is the region that node S expects to contain node D at time $t1$. Node S can determine the expected zone based on the knowledge that node D was at location L at time $t0$.

Request zone represented in Fig 2. Again, consider node S that needs to determine a route to node D. The proposed LAR algorithms use flooding with one modification. Node S defines (implicitly or explicitly) a *request zone* for the route request. A node forwards a route request *only if* it belongs to the request zone.

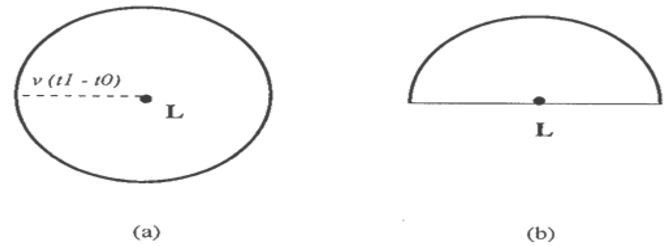

Fig 1. Expected Zone

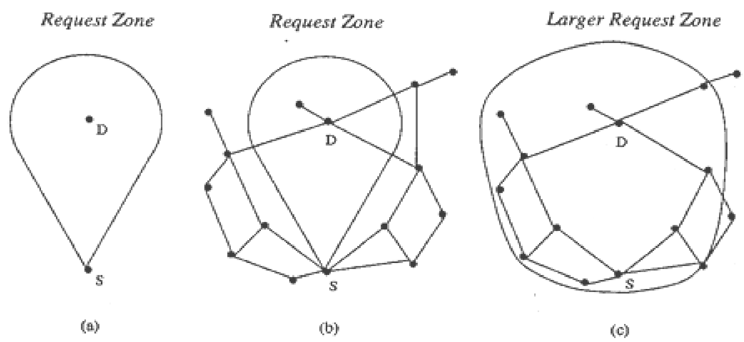

Fig 2. Request zone

III. BROADCAST FLOODING ALGORITHMS

Probabilistic algorithm is widely-used for flooding optimization during route discovery in this network. It aims at reducing number of retransmissions, in an attempt to alleviate the broadcast storm problem in MANETs. In this scheme of 64 bits, when receiving a LAR packet, a node retransmits the packet with a certain *pt* and with probability $(1-pt)$ it discards the packet [10]. A node is allowed to retransmit a given LAR packet only once, i.e., if a node receives a packet with expected zone, it checks to see if it has retransmitted it before, if so then it just discards it, otherwise it performs its probabilistic retransmission check. Nodes usually can identify the LAR packet through its sequence number. The source node *pt* is always set to 1, to enable the source node to initialize the LAR. While, *pt* for intermediate nodes (all nodes except the source) is determined using a static or dynamic approach [9].

3.1 Flooding with Self Pruning (FSP)

FSP is a receiver-based scheme which uses 1-hop information. A sender forwards a flooding message by attaching all of its 1-hop neighbors to the message. A receiver compares its own 1-hop neighbors with the node list in the message; it will not forward the message if all its 1-hop neighbors are already included in the list, otherwise it forwards the message as a sender. The effect of self-pruning is shown most significantly in the perimeter of the network. The nodes in the center are more likely to have no overlapping neighbor nodes. Self-pruning requires extra transmission overhead of exchanging neighborhood information. To reduce the overhead, each node can store the received adjacent node list in their cache [8].

3.2 Broadcast Flooding Algorithm

Step1: One node initiates a request for estimating of the network diameter, using LAR to reach all the nodes in the network and estimate the network diameter as seen from its current position. At the end of this algorithm, every node has received an initial estimate N10. Each node can use 2Nl0 as its estimate, since that is the maximum number of hops between any two nodes the initial sender can communicate.

Step2: Over time, other nodes perform step 1 and compute a new value Nli, using conventional random waits and perhaps a throttling mechanism to keep the average rate of requests as appropriate for the network.

Step3: Each node remembers the maximum network diameter it has seen, Nlmax = maxi Nli and uses broadcast transmissions.

Step4: if desired, each new value could be compared with the remembered value only after multiplying the older value by an aging factor (Result Id, Coverage) ←Max $_{id}$ (m). This makes older values decay over time and makes it more likely the network will converge on a value that is reasonable under current circumstances.

3.3 Features of LAR

LAR reacts relatively quickly to the topological changes in a network and updates only hosts that may be affected by the change. However, LAR tends to cause heavy overhead due to the flood search triggered by link failures.

Main advantages are: algorithm is nor computationally or memory complex, Data transfer does not generate additional traffic, Scalable, suitable for mobile networks, Supports multicasting, tries to minimize the number of required broadcasts. Every node has multi neighbor connections in the underlying network. Some node ID in the correspondent network and Neighbor nodes are shown in the Table I.

Table I Neighbor Details

NODE ID	NEIGHBOR NODE
0	1,4,16,18,23
1	0,2,18,23
2	1,31
3	31
4	0,5,16,23
5	4,6,10,23,24,25
6	5,7,24,25,32

IV. EXPERIMENTAL SETUP

The basic scenario and working Deployment parameters are represented in the Table II. The first set of performance tests included varying network size at a nearly constant network density followed by the performance was evaluated against a varying network density with a fixed-size area. The last set of tests includes the study of all schemes with varying packet sending rates.

Table II. Basic Scenario

PARAMETERS	VALUES
Simulator	NS2 simulator
Protocols	DSR, LAR
The number of nodes	100 nodes
Traffic Type	CBR
Simulation network Space	1500mx1500m
Node placement	Randomly deployment
MAC Protocol	IEEE 802.15.4
User mobility	Random way point
User Speed	5m/s, 30m/s & 120m/s
Simulation Speed	18sec

V. PERFORMANCE METRICS

Different quantitative metrics to compare the performance are represented the protocol characteristics and behaviors.

5.1 Throughput: Ratio of the packets delivered to the total number of packets sent.

Throughput= (number of delivered packet *packet size) / total duration of simulation.

*5.2 Packet Delivery Ratio***:** Packet Delivery Ratio in this simulation is defined as the ratio between the number of packets sent by constant bit sources (CBR) and numbers of packets received by CBR sink at destination.

Packet Delivery Ratio = Σ CBR Packets received / Σ CBR
Packets sent it describes the percentage of packets, which reach the destination.

*5.3 Average End-to-End Delay***:** Time taken for the packets to reach the destination. It is defined as the time taken for a data packet to be transmitted across an MANET from source to destination.
D = Pr –Ps
Where Pr is packet receive Time and Ps is sent Time.

*5.4 Simulation Time***:** The time for which simulations will be run i.e. time between the starting of simulation and when the simulation ends.

VI. SIMULATION RESULTS AND ANALYSIS

The simulation graphs represented the results of evaluated measurements of the proposed scenarios. The results show the different characteristic measurements of different data byte variations of the networks.

6.1 Result Analysis in Throughput: The amount of data that received through the MANET per unit time, i.e. data bytes delivered to their destinations. Fig 3. Represented the throughput performance and delay ratio of LAR.

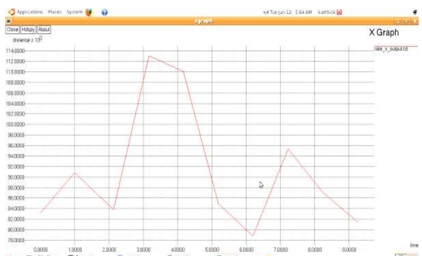

Fig 3. Throughput delay

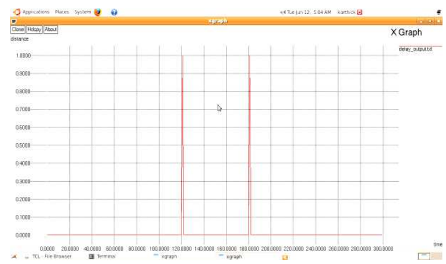

Fig 4. Packet drops

Fig 5. End to end delay

6.2 Result Analysis in Bandwidth Delay: End-to-end delay indicates how long it took for a packet to travel from the Virtual server source to the application layer of the destination. Fig 5. Represents the average data delay an application or a user experiences when transmitting data.

6.3 Packet Delivery Ratio: The packets are transmitting while routing in networks. Fig 4. Exposed the packets drops and delivery ratio of the simulation.

Figure 6 and 7 represented the different characteristic measurements of different data byte variations of small, medium and large scale networks in LAR protocol.

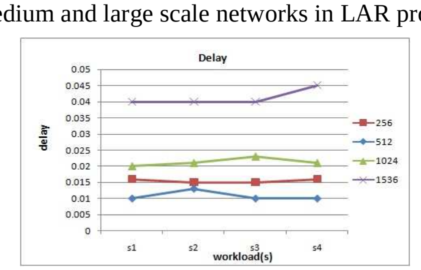

Fig 6. Delay

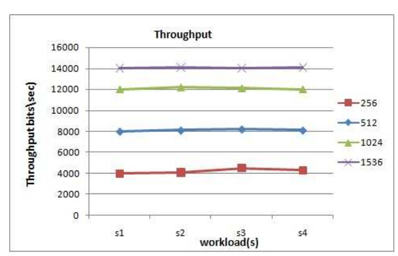

Fig 7. Throughput

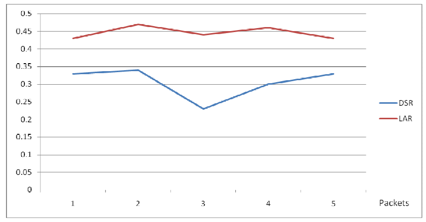

Fig 8. Packet delivery ratio

Packet delivery ratio of LAR and DSR protocols are shown in the Fig 8. Location Aided Protocol has performed better than DSR. The above simulations and graphs give the results of the metrics and performance ratio of the protocols. The result and comparative analysis represented in Table III.

Table III. Performance Metrics

S.NO	SIMULATIONS	DSR	LAR
1	Packet Delivery Ratio	0.330	0.433
2	End To End Delay	0.918	0.473
3	Speed(Time)	0.24 ns	0.01 ns

VII. CONCLUSION

This paper describes how location information protocol may be used to reduce the routing overhead in ad hoc networks used to evaluate two protocols Location Aided Routing and Dynamic Source Routing. These protocols limit the search for a route to the so-called request zone, determined based on the expected location of the destination node at the time of route discovery. Two protocols has tested in simulation were measured using the NS-2 simulator. The evaluation metrics used in this study were overhead, end to end delay and packet delivery ratio. This proposal gives very high throughput and small delay in quality of service in LAR protocol.

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