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Adaptive Routing Protocol For MANET

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Abstract-
MANETs are Dynamic ad hoc networks where network characteristics, such as network density and node mobility, change significantly over time and space. Mobile ad hoc networks are infrastructure-less networks consisting of wireless, possibly mobile nodes that are organized in peer-to-peer and autonomous fashion. The highly dynamic topology, limited bandwidth availability and energy constraints make the routing problem a challenging one. Sometimes, dynamic ad hoc networks resemble a dense ad hoc network. At other times, they resemble a delay tolerant network. Many real networks follow the paradigm of dynamic ad hoc networks. Previous research has proposed a variety of routing schemes for each specific network scenario. For instance, distributed routing tables are built for efficient multi-hop, single copy routing in static and dense networks. Mobility assisted, multi-copy routings are proposed in sparse networks where contemporary paths might not exist . In this paper we present a new routing scheme, Adaptive Routing in Dynamic ad hoc networks (AROD), which is a seamless integration of several existing schemes. Simulation results show that AROD is highly scalable and is adaptive to different network scenarios.

I.INTRODUCTION

Routing is a core problem in networks for sending data from one node to another. Wireless Ad Hoc networks are also called Mobile Ad Hoc multi-hop wireless networks is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration. MANET's can also be deployed to allow the communication devices to form a dynamic and temporary network among them. MANETs have several salient characteristics: 1) Dynamic topologies 2) Bandwidth-constrained, links 3) Energy constrained operation 4) limited physical security. Therefore the routing protocols for wired networks cannot be directly used for wireless networks. Many real networks follow the paradigm of dynamic ad hoc networks. Military networks, wildlife tracking sensor[5] networks, and vehicle networks[3] are some of these examples.

In mobile ad hoc networks (MANETs), two nodes can exchange data when they are located within one Another's communication range. A node can deliver data to another node directly or via intermediate nodes without relying on base stations. At certain times the mobile nodes might gather, enabling the instant communication between the nodes using direct or multi-hop delivery. At other times, nodes might spread and roam around a large geographical region, and it is appropriate to deliver messages in a store-and-forward, multicopy scheme to increase delivery probability and decrease delivery time Traditional ad hoc routing uses a single-copy, multihop delivery scheme under the assumption of the existence of contemporary source-destination paths and unlimited network capacity. Different existing routing protocols would work well for the different scenarios exhibited by a dynamic ad hoc network. However, it is inconvenient to require the users to switch between multiple routing protocols. Moreover, if different scenarios are exhibited by different parts of a network, the routing protocols used must be able to communicate and cooperate with each other, which is another difficult task. Thus, a routing protocol that is adaptive in an effort to maintain good performance and that also operates seamlessly in different network scenarios is desired.

II.LITERATURE REVIEW

The work on MANETs has been based on various assumptions regarding node density and mobility models. Conventional ad hoc network routing schemes such as DSR[6], AODV[5], and DSDV[4] are proposed in dense networks where contemporary source-destination paths exist. In delay tolerant networks[7], especially the extremely sparse networks where the average node degree is smaller than 1, messages can still be delivered if paths exist in the evolving graph of the network.

Existing routing schemes such as Epidemic, Prophet[8] , Spray and Wait[9], Spray and Focus[9] , MaxProp[3], and RAPID[2], use a store-carry-forward scheme. Previous proposed adaptive routing protocol includes CAR[1], where routing methods are selected depending on whether the recipient presents in the same connected component (cloud) in the network. If it does, the message is delivered by DSDV[4]. CAR is able to deliver messages synchronously (i.e., without storing them in buffers of intermediate nodes when there are no network partitions between sender and receiver) and asynchronously (i.e., by means of a store-and-forward mechanism when there are partitions). The delivery process depends on whether or not the recipient is present in the same connected region of the network (cloud) as the sender. If both are currently in the same connected portion of the network, the message is delivered using an underlying synchronous routing protocol to determine a forwarding path. If a message cannot be delivered synchronously, the best carriers for a message are those that have the highest chance of successful delivery, i.e., the highest delivery probabilities. The message is sent to the host with the highest one using the underlying synchronous protocol DSDV which is a table-driven routing scheme for ad hoc mobile networks based on the Bellman-Ford algorithm. Every mobile station maintains a routing table with all available destinations along with information like next hop, the number of hops to reach to the destination, sequence number of the destination originated by the destination node, etc. Otherwise, the message is sent to the node in the cloud which has the highest delivery probability. This protocol, however, uses pure single-copy forwarding and works well only for local mobility.

III.PROPOSED FRAMEWORK

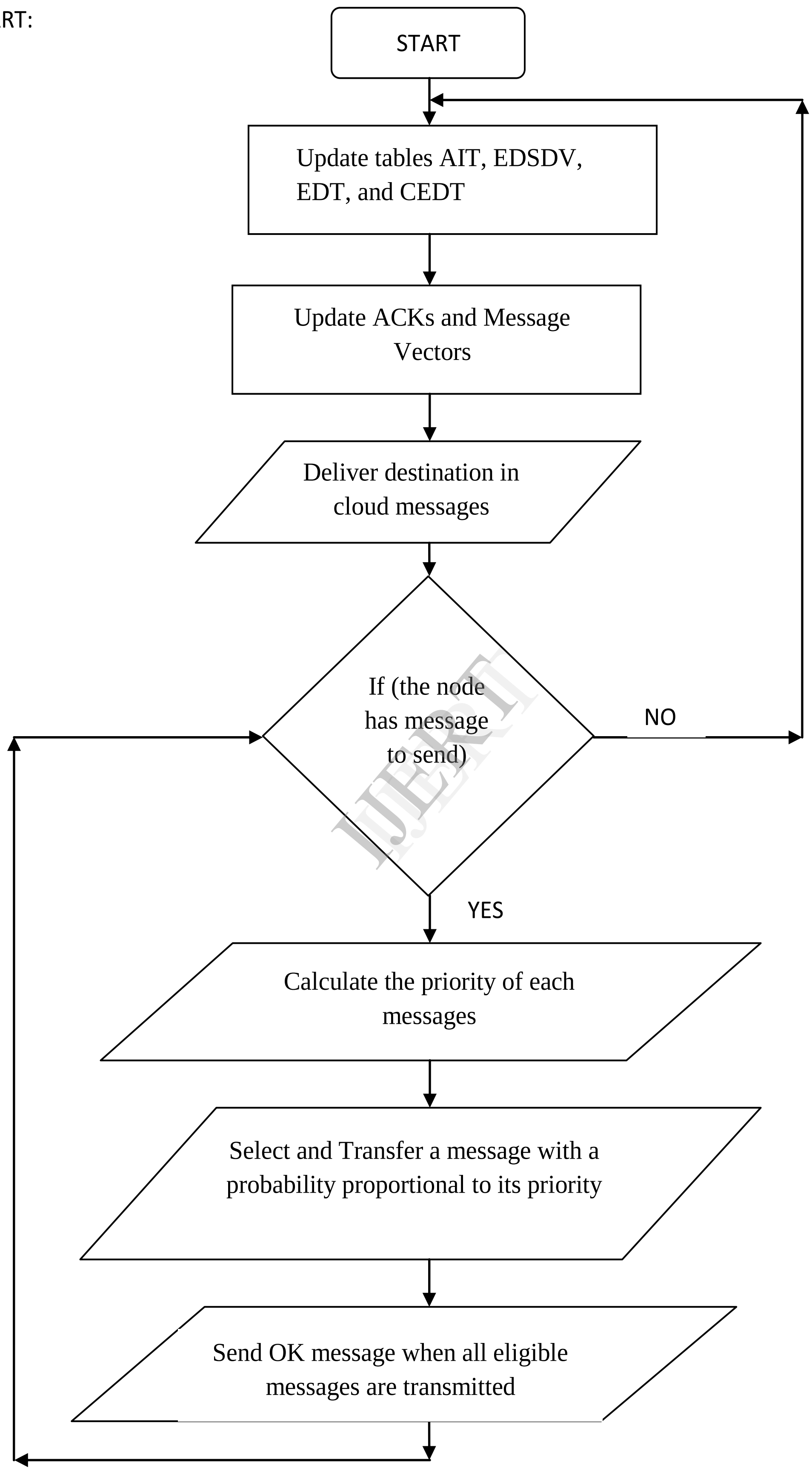
The principle of Adaptive Routing protocol in Dynamic ad hoc networks (AROD) is exemplified as follows. In a network that has an adequate communication capacity (i.e., the total transfer opportunities in the network) and a clear gradient of decreasing estimated delivery latency or increasing delivery probability to each destination, such as a dense network with a local mobility pattern, it is suffice to use a single-copy and multi-hop delivery. However, in a sparse mobile network with random mobility and limited transfer opportunities, mobility-assisted and multi-copy delivery is used to shorten the delivery time and increase the delivery ratio. AROD adaptively trades off delivery latency/probability to bandwidth consumption. It is a seamless integration of the different routing schemes used for different network scenarios.

Two nodes transfer data messages to each other when they are within one another's communication range. During a transfer, the sender replicates messages while retaining a copy. Messages may not be fragmented. We assume unlimited storage capacity, and that a node never deletes messages until it receives an acknowledgement or timeout. AROD's adaptation to the correct forwarding strategy is embodied by the formulation of message priority which is maintained by four tables: the EDSDV table, the Average Inter-meeting Time (AIT) table, the Estimated Delivery Time (EDT) table, and the Collective Estimated Delivery Time (CEDT) table. Each of these tables is of size O(N) (a moderate transmission and memory requirement), where N is the network size. Each message is given a Time-To-Live (TTL) which specifies a timeout of the message after which a message is no longer meaningful and can thusly be dropped. Two nodes are in the same cloud if there is a contemporary multi-hop contemporary path.

In a connected network, AROD uses multi-hop delivery, where a message will only be forwarded to the node that is closest to the destination in terms of hop-count. Since, in a connected network, the source and the destination are in the same cloud, the message will be forwarded in a multi-hop manner according to the EDSDV table. In each forwarding, the ticket of the message is completely transferred to the receiver, and thus the sender will not send the same message a second time. Consequently, a single copy of the message will be forwarded to the destination along the shortest path.

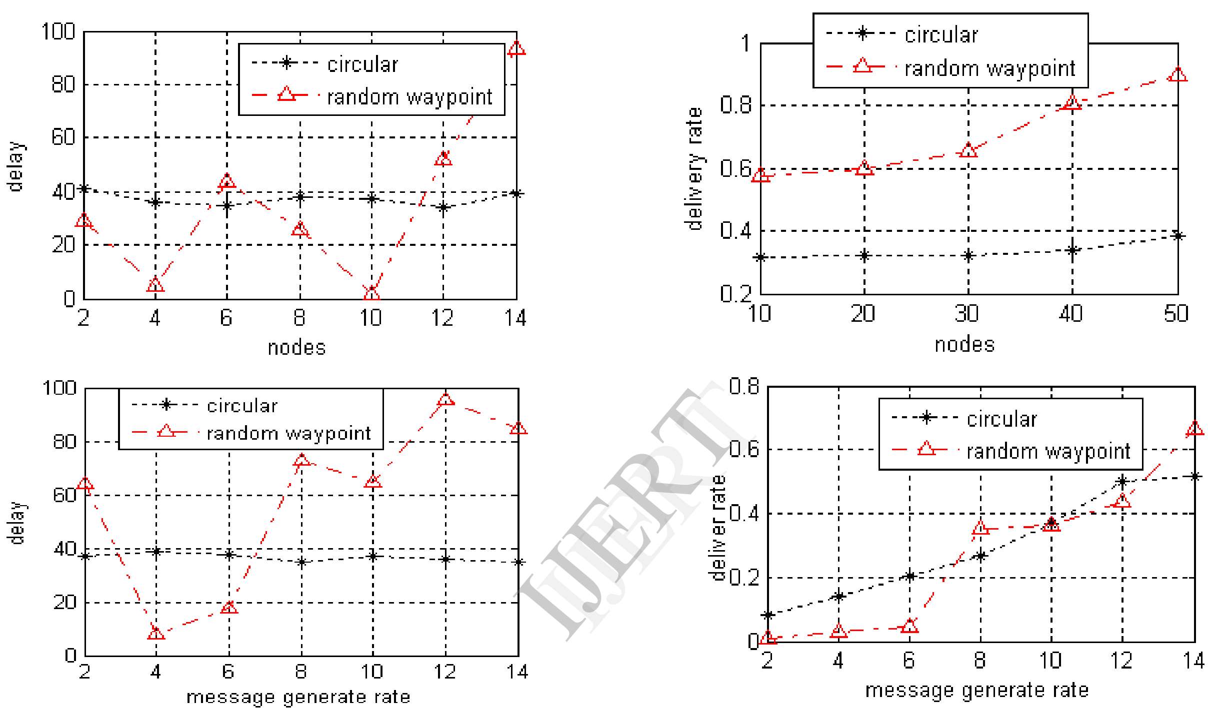
In a sparse mobile network with random mobility, AROD resembles spray and wait and performs binary spray. In random mobility, nodes have similar EDTs to any destination. A message will be forwarded in a multi-copy manner, where its ticket will be split among the copies from the sender and the receivers. After a certain number n of forwardings, the ticket of each copy will become approximately (1/2)n. As n becomes larger, the ticket, and consequently, the priority of the message, decreases exponentially.

FLOWCHART:


START
Update tables AIT, EDSDV, EDT, and CEDT
Update ACKs and Message Vectors
Deliver destination in cloud messages
If (the node has message to send)
NO
YES
Calculate the priority of each messages
Select and Transfer a message with a probability proportional to its priority
Send OK message when all eligible messages are transmitted

IV.SIMULATION

The following metrics are used in the simulation: (1) Convergence speed, (2) Delivery ratio, and (3) Delivery latency (delay). Two mobility models are used in our simulation: (1)the Random Waypoint (RWP) model, which is a representative of the random mobility, and (2) the Circular Trajectory (CT) model which is a representative of the local mobility. In the Circular Trajectory model, each node has a fixed circular trajectory that it travels at a constant speed.



This result shows that AROD performs better in denser networks due to the adaptation of the multi-hop delivery, which saves bandwidth compared to the multi-copy delivery. Also, AROD performs better in RWP, which shows that increased mobility improves delivery rate. These figures show that AROD adaptively utilizes the bandwidth. Compared to spray-and-wait, it adaptively generates more (less) copies for the messages when message generating rate is lower (higher).

I.CONCLUSION

In this paper we studied a routing protocol AROD which is seamless a seamless integration of existing routing schemes. AROD, which is the first routing scheme that is adaptive to network density as well as to mobility patterns, Simulation and discussion show that it has the desired performance with respect to delivery rate and delay. AROD is simple to implement and does not require configuration. AROD adaptively trades off delivery latency/probability to bandwidth consumption.

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