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Angle based Routing Protocol for MANET

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Abstract: ***Mobile ad-hoc networks is collection of mobile nodes that will results a wireless network without any fixed infrastructure or any other centralized administration. In such network the node acts as a source as well as a router. Since the topology of a network will changes frequently and which is unpredictable. So considering the challenges of MANET like battery power, limited bandwidth, more traffic load and the unpredictable changes in topology of a network, In this paper, we propose the AB(Angle Based) Routing Protocol which is based on the direction of source to the destination and wise versa. This will calculates the direction of destination then concentrate to that particular direction. And hence this will results a best delivery of a data to the destination more accurately even an more traffic and unpredictable changes in network topologies.***

Keywords: MANET, Wireless ad-hoc networks, Routing, Link expiry

1. Introduction

A Mobile ad hoc Network is a group of mobile wireless nodes that can communicates with each other and form a network, while forwarding packets to each other in a multi-hop fashion. Since mobile devices are moves from one place to other asynchronously, and the traffic in a network is unpredictable in any particular time so these are the important objective, researchers and practitioners have recently started to consider the solutions for such problems of network protocols for the Ad hoc networking environment. Multicasting is the transmission of data packets to more than one node sharing one multicasting address. The senders and receivers form the multicast group. Actually, there could be more than one sender in a multicast group, so it is group-oriented computing. In wired networks, some well established routing protocols can provide efficient multicast, but when it comes to MANETs, these protocols may fail due to some unique characteristics of MANETs. When designing protocols for ad hoc network multicast, some key issues should be kept in Mind.

The proposed AB-protocol has the following key characteristics and innovations: 1) Ability to handle frequent network topology changes, 2) Dynamic discovery OF destination, 3) GPS-free nodes in the network, 4) Scalable to size and robust to mobility.5) minimizing the memory usage.

The nodes in the ad hoc networks are usually not aware of their geographical positions. As GPS is not used in our algorithm, we provide relative positions of the nodes with respect to the network topology. And the proposed algorithm is to only 2D and we can develop this algorithm to 3D also.

The rest of the paper is organized in the following way. In section 2 Background and Related Work in the field of MANET, in section 3 we present proposed protocol and related algorithm for building a local coordinate system at each node. In section 4 we describe simulation and results of our proposed protocol. In section 5 we describe the conclusion of AB Protocol.

2. Background and Related Work

Mobile ad-hoc networks (MANETs) are a form of wireless networks which do not require a base station for providing network connectivity. Each node acts as a host and a router at the same time. This means that each node participating in a MANET commits itself to forward data packets from a neighboring node to another until a final destination is reached. In other words, the survival of a MANET relies on the cooperation between its participating members. MANETs have many advantages like low cost, on the fly deployment, etc.

Many people have proposed many protocols so that they came with good resultant protocols for communication between the nodes in a network. So Routing protocols in Ad Hoc networks are categorized in three groups: Proactive (Table Driven), Reactive (On-Demand) and hybrid (both proactive and reactive) routing.

Proactive MANET Protocols (PMPs) constantly update network topology information and ensure that it is available to all nodes. PMPs reduce network latency (or system time delay) but increase data overhead by constantly updating routing information. It ensures routes to all destinations are up-to-date and ready for use when required.

Reactive MANET Protocols determine routing paths only when required. They are associated with lower protocol overheads but longer packet delays. Examples of reactive and proactive protocols include AODV (reactive protocol) and OLSR (proactive protocol).

Hybrid MANET Routing Protocols integrates suitable proactive and reactive MANET protocols. The resulting hybrid protocol achieves better performance than its components and is able to adjust dynamically to different network conditions. Hybrid routing protocols combine the advantages of both proactive and reactive protocols. Hybrid MANET routing protocols are lightweight, simple and designed to avoid excessive control overhead. These protocols are classified into node-centric and cluster-centric. A network is organized into clusters, or groups, in a cluster-centric network. The clustering optimizes the use of resources and reduces the size of routing tables. Cluster-centric protocols adopt different rules for inter cluster data traffic and intra cluster traffic. Node-centric protocols are simple protocols that incorporate sender and receiver information. They include fisheye routing protocols, zone routing protocols and a two-zone routing protocol.

3. Proposed Protocol Design and Algorithm

3.1 Assumptions and Design Goals

In the proposed AB-protocol, the following assumptions are made. Such assumptions are common when making in MANET these all are assumed in [1].

- The node IDs are unique throughout the entire network. This is a valid assumption in that we can simply use the physical Address (i.e., MAC address) of each node as its node ID, which guarantees a certain promise of uniqueness.
- The communications between inter-domain gateways are bidirectional.
- Domains are initially pre-assigned. Nodes in a domain normally running the same routing protocol.
- The position of each node known by itself and updates its position by itself.
- Source must know the relative ID of destination.
- The design of ABRP tries to meet the challenges in the inter-domain routing in MANETs. In the meantime, ABRP tries to reach the following properties:
- Scalability with network scale. Since the ad-hoc domain may have a large scale, ABRP should be scalable with respect to the node numbers.
- Robustness to mobility. Nodes in MANETs normally move frequently. The insensitivity to node motion is one of the goals of ABRP.
- GPS free system in order to minimize the usage of resources.
- Delivery of data to destination without any traffic load on a network by using yet another path to reach destination.

3.2 Proposed algorithm

Algorithm-1

In our proposed protocol, when a node has a packet to send to some destination and the node initiates Destination Discovery to find a route; this node is known as the initiator of the Destination Discovery, and the destination of the packet is known as the Discovery's target. The initiator transmits a Destination Request (DREQ) packet as a local broadcast, specifying the target, unique identifier from the initiator and its position. Each node receiving the Route Request, it does the following:

IF
The node is never received DREQ before
ELSE IF
The destination in its Neighbors table (NT) Sends the DREQ to the destination
ELSE IF
The destination does not in the NT Rebroadcast DREQ by calculating the region of destination by using angle of destination (xd, yd,theead).
ELSE IF
Discards the DREQ
ELSE IF
The node is destination Stops forwarding the DREQ and replies SREP back to the source by calculating the region of source by using angle of source (xs, ys, thetas). And the SREP is now consists both source and destination i.e. (xs, ys) and (xd, yd).
ELSE IF

Usually link failure (Link expiry) occurs due to node mobility. A node on detecting link failure is no need of sending any route error message to the destination instead the intermediate node only acts as a source and forwards the packet to destination. These all can be viewed by following figure.

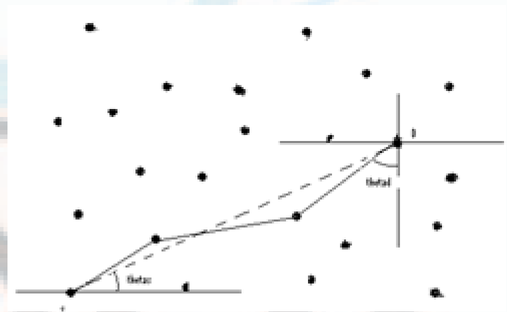

Figure 1: Angle and direction between source and destination

3.3 Simulation and Results

In order to examine the performance of AB Protocol we are using C language because of the flexibility of this language. And for our simulation, mobile ad hoc network consisting of

100 nodes placed randomly using uniform distribution in an area of 1000 x 600 m2 is considered.

The nodes in the network have the transmission range of 300m and a channel capacity of 2 Mbps. The data traffic consists of 30 CBR sources sending four 512 bits packet per second. The mobility model used is Random Waypoint. In this, each node is randomly placed in the simulated area and remains stationary for a specified pause time. It then randomly chooses a destination and moves there at a velocity chosen uniformly between a minimum velocity vmin and a maximum velocity vmax. Each node independently repeats this movement pattern through the simulation. The experimental setup defines vmin as 0 m/s and v max as 20 m/s and varies the pause time as the independent variable.

The performance of the proposed routing algorithm is gauged in terms of packet delivery ratio, average end-to-end delay and normalized routing overhead. The results presented here are the average of 10 runs obtained for the same simulation configuration of 30 active sources. The results obtained after simulation are compared with the well known reactive protocol AODV. Fig. 2 shows the packet delivery ratio compared with AODV.

The packet delivery ratio is higher for the proposed protocol AB Protocol as compared to AODV. At high mobility, the AODV has to reinitiate a route discovery process again. This leads to lower packet delivery ratio. The NPRP proactively maintains the path to the destination, which leads to better performance. At lower mobility, the performance is comparable as expected.

The quality of service of the network is defined by the end-to-end delay. The average delay decreases at low mobility for both the protocols. The average delay is higher for AODV at high mobility as route failure occurs very frequently. The ABProtocol maintains connectivity at all times leading to better performance. Fig. 3 gives the comparison for the average end-to-end delay for AODV and ABProtocol. It is noticed that a significant reduction in routing overhead for ABProtocol over AODV.

The routing overhead is shown in Fig. 4 gives the number of control packets per data packet to perform routing. It is noticed that a significant reduction in routing overhead for ABProtocol over AODV. The performance of AODV is relatively stable at lower mobility leading to a decrease in routing overhead.

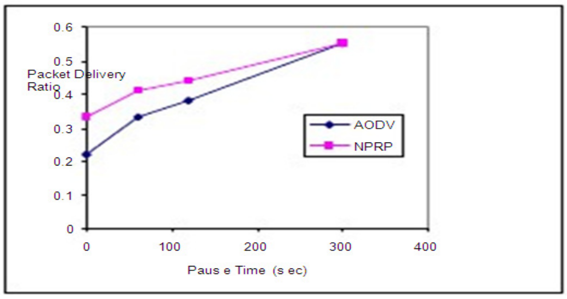

Figure 2: Packet delivery ratio vs. Pause time

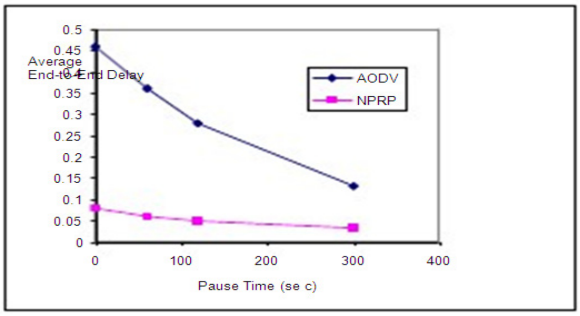

Figure 3: Average end-to-end delay vs. Pause time

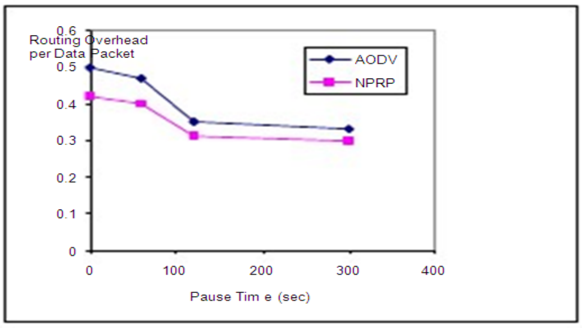

Figure 4: Routing overhead per data packet vs. Pause time

4. Conclusion

Our protocol has both the advantages of proactive and reactive. And which is not table which is source initiated. And if any changes in network topology it can adjust with that topology of a network, it also ensures accurate delivery of packets to a corresponding destination.

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