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Efficiency of Algorithms for Neighbouring Node Discovery in AdHoc Wireless Networks

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ABSTRACT

We describe a protocol for learning about neighbouring nodes in such an environment. The protocol is used for establishing and tearing down communication links with neighboring nodes as they move from one region of the network to another. In this paper, we design and analyze several algorithms for neighbor discovery in wireless networks. The work also aims at combine and finding a more efficient routing protocol for node discovery in adhoc network. This however as stated earlier is a challenging task as the nodes are mobile and maybe constantly moving. So it's tricky to find the best possible route from source to destination packet delivery.

Keywords:- Ad hoc networks, initialization, neighbour discovery, randomized algorithms, wireless networks.

I. INTRODUCTION

Neighbour discovery play a vital role in many algorithms in mobile wireless ad hoc networks (cf. [1], [8], [9]). For example, it can be used to route, cluster and broadcast in an efficient manner. Neighbourhood knowledge is assumed in many routing protocols used in wireless sensor networks. For example in [1] the authors assume that nodes know the location of one- and two-hop neighbours. This information is used to implement a coordinate based routing algorithm. In [8] nodes are assumed to maintain information about their one-hop neighbours in order to perform routing in multi-hop wireless networks. In [9] the authors assume that each node knows its own location and its neighbours' locations, in order to develop a locality-aware location service.Neighbour discovery algorithms can be classified into two categories, viz. randomized or deterministic. In randomized neighbour discovery, each node transmits at randomly chosen times and discovers all its neighbours by a given time with high probability. In deterministic neighbour discovery, on the other hand, each node transmits according to a predetermined transmission schedule that allows it to discover all its neighbours by a given time with probability one. In distributed settings, determinism often comes at the expense of increased running time (see, for example, [13] and [1]) and, in the particular case of neighbour discovery, typically requires unrealistic assumptions such as node synchronization and a priori knowledge of the number of neighbourstherefore, investigate randomized neighbour discovery algorithms in this paper. Neighbour discovery is nontrivial for several reasons.

1) Neighbour discovery needs to cope with collisions. Ideally, a neighbour discovery algorithm needs to minimize the probability of collisions and, therefore, the time to discover neighbours.
2) In many practical settings, nodes have no knowledge of thenumber of neighbours, which makes coping with collisions even harder.
3) When nodes do not have access to a global clock, they needto operate asynchronously and still be able to discover their neighbours efficiently.
4) In asynchronous systems, nodes can potentially start neighbour discovery at different times and, consequently, may miss each other's transmissions.
5) Furthermore, when the number of neighbours is unknown, nodes do not know when or how to terminate the neighbour discovery process.

In this paper, we present neighbour discovery algorithms thatcomprehensively address each of these practical challenges under the standard collision channel model. Unlike existing approaches that assume a priori knowledge of the number of neighbours or clock synchronization among nodes.

II. RELATED WORK

A protocol for secure neighbour discovery in the presence of compromised nodes is given in [3]. The protocol achieves secure discovery of the local neighbourhood by taking advantage of the sensor deployment phase. It is assumed that sensor nodes can be trusted for a short time after deployment. This period of time is used to ensure that neighbourhood information is not Compromised. The protocol also takes advantage of the fact that usually neighbouring nodes have a large number of common neighbours. Although the protocol tries to handle malicious nodes, it assumes that nodes remain static and do not change their location after they have been deployed. Our neighbour discovery protocol deals with mobile nodes which can move from region to region. Analysis of pro-active and reactive routing protocols of Adhoc mobile networks. The protocols that will be analyses are-

- Destination-sequenced distance vector (pro-active)
- Global state routing (pro-active)
- Dynamic source routing protocol (pro-active)
- Fish eye (pro-active)
- Adhoc on demand distance vector routing (Reactive routing)
- TORA (Temporary ordered routing algorithm) (Reactive routing)

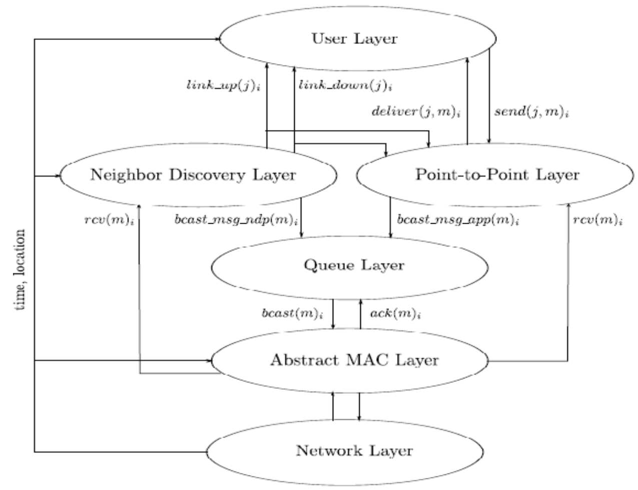

Fig 1: The MANET system.

All Simulations will be done on network simulator (NS2). Each protocol will be analysed for their efficiency in neighbouring node discovery. It is assumed that messages are received from the application layer at a rate such that the queues do not overflow. Both the neighbour discovery layer and the user layer should be such that the number of messages they send does not overflow the queue. The whole description of MANET system are shown in figure.

III. THE NEIGHBOUR DISCOVERY PROTOCOL

Our neighbour discovery protocol deals with mobile nodes which can move from region to region. Analysis of pro-active and reactive routing protocols of Adhoc mobile networks. The protocols that will be analysed are-

a. Destination-sequenced distance vector (pro-active) -:

Among the proactive routing protocols of MANET Destination Sequenced Distance Vector routing protocol is one. DSDV is somewhat same as the conventional Routing Information Protocol (RIP) and has the only difference of having additional attribute in the routing table that is the sequence number. At each node of the network the routing information which is used while routing is stored using a table known as routing table. Routing table has the attributes; all the available destinations, the sequence number assigned by the destination node and the number of hops that is needed to reach the destination node and with the help of this table, communication between nodes in the network take place.

Consistency among the routing table in the nodes is maintained by broadcasting regularly the routing information stored in the routing table to every neighbour. The broadcasted routing information contains the fields; the nodes' new sequence number, the IP address of the destination, the new sequence number assigned by the destination and the number of hops required to reach that destination. And the latest destination sequence number is used for making decisions to forward the information again or not. This latest sequence number is also updated to all the nodes which are passed by the information while transmitting within the network. Full dump is one of the ways of broadcasting routing information and incremental dump is another way of broadcasting in the DSDV protocol. When mobile nodes move from one place to another then it causes broken links within the network. The node updates its routing information in its routing table entry for the corresponding destination describe in the incoming data with the incoming routing information if:

1. Sequence number of the incoming routing information > Sequence number of the routing table entry.

2. Sequence number of the incoming routing information = Sequence number of the routing table entry AND value of metric that is the number of hop of the incoming routing information < Value of metric in the corresponding routing table entry.

b. Adhoc on demand distance vector routing (Reactive routing)-:

In AODV, the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sends a message backwards through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time.

c. Global state routing (pro-active) -:

Global State Routing (GSR) [13] is similar to DSDV, It takes the idea of link state routing but improves it by avoiding flooding of routing messages. In this algorithm, each node maintains a Neighbour list, a Topology table, a Next Hop table and a Distance table. Neighbour list of a node contains the list of its neighbours. For each destination node, the Topology table contains the link state information as reported by the destination and the timestamp of the information. For each destination, the Next Hop table contains the next hop to which the packets for this destination must be forwarded. The Distance table contains the shortest distance to each destination node.

d. TORA(Temporary ordered routing algorithm) (Reactive routing) -:

The Temporally-Ordered Routing Algorithm (TORA) [9] is an adaptive routing protocol for multihop networks that possesses the following attributes:

- Distributed execution,
- Loop-free routing,
- Multipath routing,
- Reactive or proactive route establishment and maintenance, and
- Minimization of communication overhead via localization of algorithmic reaction to topological changes.

TORA is distributed, in that routers need only maintain informationabout adjacent routers (i.e., one-hop knowledge). Like a distance vector routing approach, TORA maintains state on a per-destination basis. However, TORA does not continuously execute a shortest-pathcomputation and thus the metric used to establish the routingstructure does not represent a distance. The destination-orientednature of the routing structure in TORA supports mix of reactiveand proactive routing on a per-destination basis. During reactiveoperation, sources initiate the establishment of routes to a given destination on-demand. This mode of operation may be advantageous in dynamic networks with relatively sparse traffic patterns, since itmay not be necessary (nor desirable) to maintain routes between everysource/destination pair at all times. At the same time, selecteddestinations can initiate proactive operation, resembling traditionaltable-driven routing approaches. This allows routes to be proactively maintained to destinations for which routing is consistently orfrequently required (e.g., servers or gateways to hardwired infrastructure).

IV. PROPOSED IMPLEMENTATION OF NEIGHBOUR NODE COVERAGE USING ROTING PROTOCOL IN MANET

Neighbour coverage Probabilistic Routing method which is used to reducethe routing overhead in order to improve energy level of nodes

a. Neighbour coverage knowledge-: When the routing starts, Source node starts to send the Route request packets to other nodes. So we namedthese packets as RREQ packets and when these packets reach the destination node, Destination node starts to send Route reply packets to Source to form the path for network. So we named these packets as RREP packets [9].

b. Algorithm Description-: The node which has a larger rebroadcast delay maylisten toRREQ packets from the nodes which have lower one.For example, if node ni receives a duplicate RREQpacket from its neighbor nj, it knows that how manyits neighbors have been covered by the RREQ packetfrom nj [1]. Thus, node ni could further adjust its UCNset according to the neighbour list in the RREQ packet from nj. Then, the U(ni) can be adjusted as follows [9]:

RREQv: RREQ packet received from node v.
Rv:id: the unique identifier (id) of RREQv.
N(u): Neighbour set of node u.
U(u, x): Uncovered neighbours set of node u for RREQ, whose id is x.
Timer (u, x): Timer of node u for RREQ packet whose id is x.
{Note that, in the actual implementation of NCPR protocol,every different RREQ needs a UCN set and a Timer.}
The Whole process is explained by flowchart given below-
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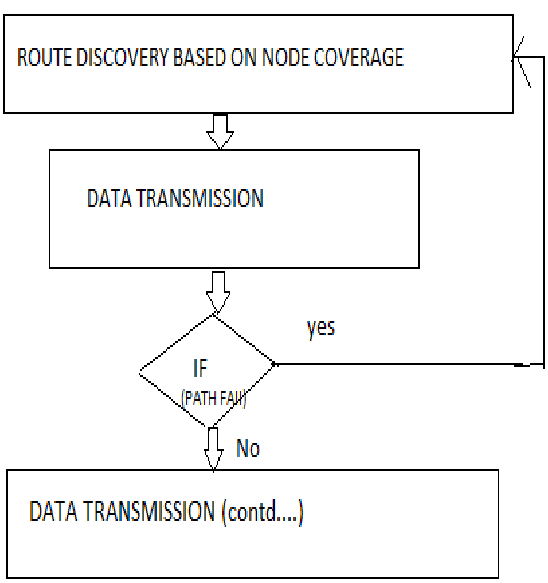
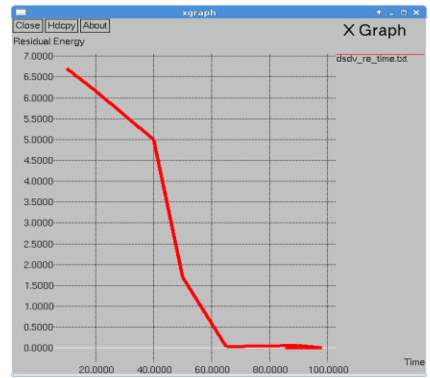
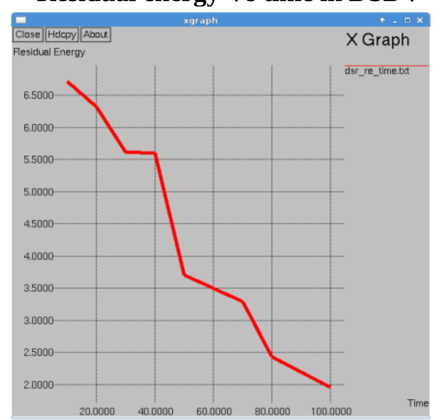


Fig 2: Method for Route Discovery

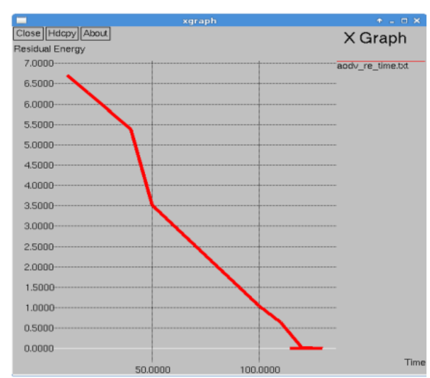
VI) EXPERIMENTAL RESULTS



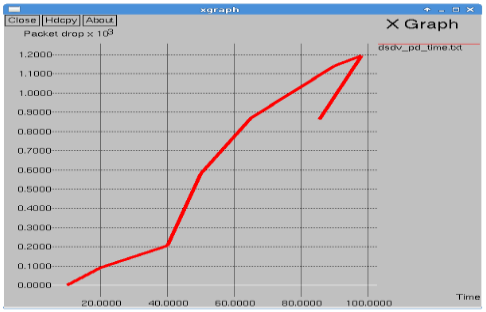
Residual energy Vs time in DSDV



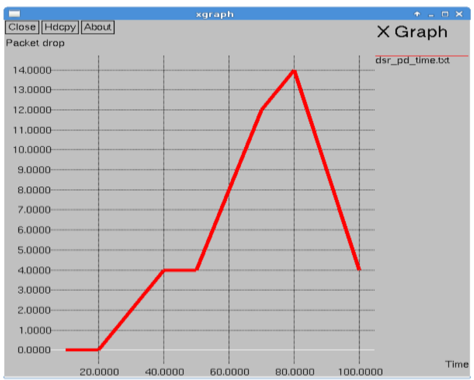
Residual energy Vs time in DSR



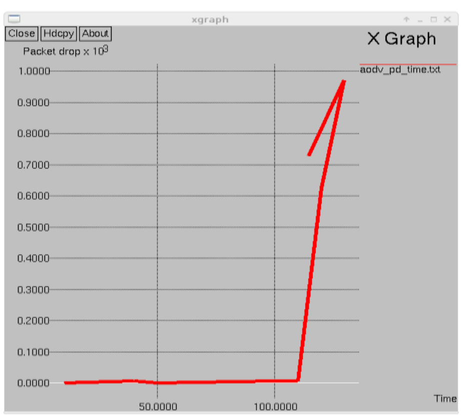
Residual energy Vs time in AODV



Dropped Packet Vs Time in DSDV



Dropped Packet Vs Time in DSR



Dropped Packet Vs Time in AODV

V. CONCLUSION

Routing in MANET's is an interesting research area that has been growing in recent years. The main difficulty in MANET is faced because of the continuous change in the environment. With this changing environment a routing protocol is used to decide the best suitable route for sending data to the sink from a source node. One of the major concerns is to send this data on a route which consumes less power, because the power is a limited resource in mobile ad hoc networks. So to make our communication energy efficient, we have to choose a routing protocol which considers energy as an important parameter. In this work, the performance of three protocols are studied against various parameters such as, residue energy, packet drop . The three protocols Destination-Sequenced Distance-Vector (DSDV), Dynamic Source Routing (DSR) and Ad-Hoc On-Demand Distance Vector (AODV) have been compared using simulation. We conclude that initially in DSR the energy consumption is high as compare to DSDV or AODV. And if the MANET has to be set for small amount of time then DSDV and AODV should be preferred due to low initial packet loss and DSR should not be preferred to setup a MANET for small amount of time because initially there is a high packet loss.

It would be interesting to note the behavior of these protocols when the number of packets sends/ receive and the numbers of nodes in the network are increased. And also interesting to note the behaviour of these protocols on a real life test.

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