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Hop by Hop Routing in MANETS with Power Management and Better Stability

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Abstract: ***Routing in ad hoc network is a great problematic, since a good routing protocol must ensure fast and efficient packet forwarding, which isn't evident in ad hoc networks. In literature there exists lot of routing protocols however they don't include all the aspects of ad hoc networks as mobility, device and medium constraints which make these protocols not efficient for some configuration and categories of ad hoc networks. Thus in this paper we propose an improvement of Dynamic Source Routing Protocol DSR in order to include some of the aspects of ad hoc networks as mobility and energy by proposing a new metric to evaluate route based on intermediate nodes weight computed by combining the stability and the battery power of nodes to choose the most stable and powered nodes for packet forwarding.***

Keywords: WSN, DSR, MANET, ROUTING

1. Introduction

Mobile ad hoc networks (MANET) are a collection of wireless mobile nodes forming a temporary network, using as transmission medium radio waves. The used specter for wireless transmissions is the specter situated around the 2.4 and around the 5 GHz. The transmission range and the emission power are regulated by laws in each country, ranging from 10 m for Personal Area Networks to 100-200 m for Local Area Networks.

Regarding its costless, facility of use and deployment, MANET gets day after day new applications ranging from military applications for connecting soldiers in battlefields and civil or commercial application such as Public and Personal Area Networks, other applications are recently under development will also benefit from MANETs advantages such as telemedicine, weather report and disaster environment such as in seism. All these examples of use predict for some envisioned MANETs to increase in size to reach the threshold of thousands of nodes per system (commercial or military). However in ad hoc network there is no concept of centralized administration, to manage some tasks as security, routing and others, therefore mobile nodes must collaborate among themselves to accomplish these services. However due to dynamic topology; the energy and the bandwidth constraints due to the nature of devices and the transmission medium; these tasks are not easily carried out. Thus any developed protocol for ad hoc networks must take into consideration all the aspects of ad hoc networks as mobility, energy and bandwidth constraints to develop an efficient and effective routing or security protocol.

2. Previous Work

Ad hoc networks are presently enjoying unprecedented research interest, and are expected to provide opportunities for utilization of network applications in new scenarios in which today's Internet-based communication paradigms are no longer applicable. In particular, we expect that ad hoc networks will be formed in situations where no infrastructure is available, and for which no predetermined subnet structure is known. Ad hoc networks are typically considered to be composed of mobile wireless devices, with the result that the interconnection pathways between the devices can change rapidly. This characteristic often causes ad hoc networks to be viewed as quite different as traditional networks; however, our experience shows that instead there is a strong commonality which, as we learn to understand it better, will illuminate not only the nature of ad hoc networks but also some fundamental aspects of networking. Most of the research related to establishing communication pathways in ad hoc network models the individual nodes as capable of exchanging information that usefully represents the current topology of the node interconnects, or links. If all nodes are mutually within range of each other, then the network topology and routing mechanism is fairly simple. If not, then it is likely to be necessary for some nodes to relay data from a data source, in order to accomplish delivery towards its destination. Determining which nodes should relay data for particular destinations (and sources) is the subject matter of interest in this paper. The protocols in use for such information exchange are best understood to be routing protocols, since they perform on a small scale the same function as Internet routers do within the backbone of the Internet. In both cases, packets have to be relayed (forwarded) towards the destination, after information has been acquired and exchanged so that a useful route can be determined. A majority of traditional routing protocols are able to be classified as either link-state protocols or distance-vector protocols. In either case, the routing protocols typically specify that each node makes periodic advertisements to supply current routing information to its neighbors. The neighbor is then able to calculate routes to network nodes based on the received information. The node can also incorporate the information it has received into its own advertisements, as necessary according to the protocol. In the case of link-state protocols, the advertisements can

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contain information about every known link between other routing agents in the network. Distance-vector protocols, on the other hand, supply next-hop information about all destinations in the network. For Internet routing protocols, in order to reduce the size of the advertisements, routing information is aggregated according to a well-defined subnet structure.

Routes to all hosts on a particular subnet are represented by a single route entry to a routing prefix, and the addresses of all the hosts on the subnet are then required to use the routing prefix as the initial bits of their network-layer address. Subnets with longer prefixes (i.e., more specific addressing) are themselves typically aggregated into larger subnets with shorter prefixes. At the center (core) of the Internet, there is finally a requirement to advertise all of the routing prefixes with no further aggregation possible. The current number of these unaggregated (in fact, unaggregatable) prefixes is over 100,000; this is a matter of some concern to router vendors as they strive to keep up with the growth of the Internet. The routers in the Internet (core and otherwise) are often considered to be the infrastructure of the Internet.

3. Proposed System

Our proposed research works in two directions. The first is to reduce power consumption and the second is to balance power consumption. Reducing power consumption intends to prolong the lifetime of each node, and thus to extend the lifetime of the entire ad hoc network. Balancing power consumption is conjectured to postpone network partitioning by avoiding the death of some critical nodes caused by excessive power consumption.

It is observed that we can reduce power consumption if unnecessary traffic can be eliminated or reduced. For example, link quality prediction based on signal strength or residual power can avoid invalid transmission attempts in a predicting manner. It is based on the fact that much energy can be saved if localized route recovery is deployed rather than global flooding during the process of route recovery. We now illustrate the algorithm. Most existing ad hoc network routing protocols use a recovery scheme to repair a broken link rather than going through the entire procedure to try to discover a new route. One advantage of this is that it limits the range of flooding of a request message, and thus, reduces the amount of power consumed while repairing a link. For instance, Ad hoc On- Demand Distance Vector Routing (AODV) may use Expanding Ring Search (ERS) or Query Localization (QL) for link recovery.

The second step is to repair the broken link. Please note that the ability of directional transmission is not assumed at each node in an ad hoc network. Obviously the assumption of such ability would make our algorithm simpler.

Step 1: Forming the candidate nodes cluster the candidate nodes cluster refers to the nodes to be traversed by RREQ from the node detecting link failure. The candidate nodes cluster can be formed by overhearing the route reply (RREP) messages from the destination.

Step 2: Repairing a broken link now, suppose a link failure (between node A and node B occurs. Node A will discover the link failure and try to repair the broken link. It broadcasts RREQ message to its neighbor nodes. The neighbor nodes will receive the RREQ as long as the following conditions are satisfied. The conditions are that the candidate flag of the neighbors should be set and the number of hops of the node receiving RREQ should be no less than the number of hops of the node sending RREQ.

In an ad hoc network, ideally all nodes would equally participate in the relay activity, forwarding packets for other nodes and having their packets forwarded by other nodes in return. Practically, however, this is not the case. One reason is that traffic patterns are not evenly distributed across the network, and as a result, the power levels available at different nodes are diverse. Even if we consider that the power level is the same among all nodes initially, depending on the communication session and the topology, eventually the power level at some critical nodes or frequently used nodes would be quite different from other nodes.

4. Results

The concept of this paper is implemented and different results are shown below

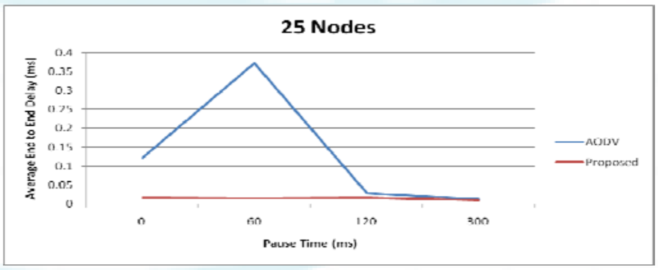

Figure 1: Average End to End Delay Vs. Pause Time with 25 Nodes

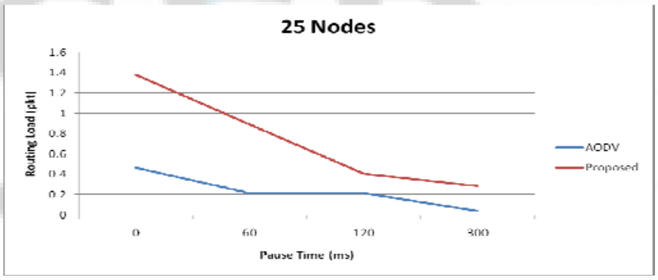

Figure 2: Routing Load Vs. Pause Time with 25 Nodes

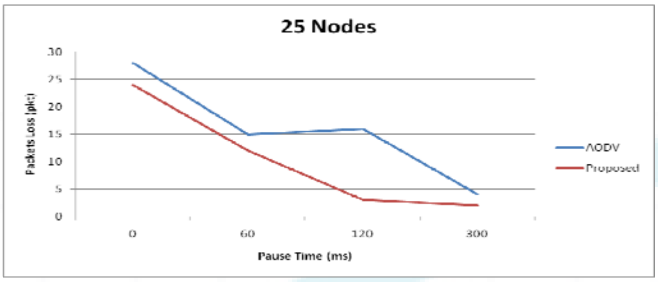

Figure 3: Packet Loss Vs. Pause Time with 25 Nodes

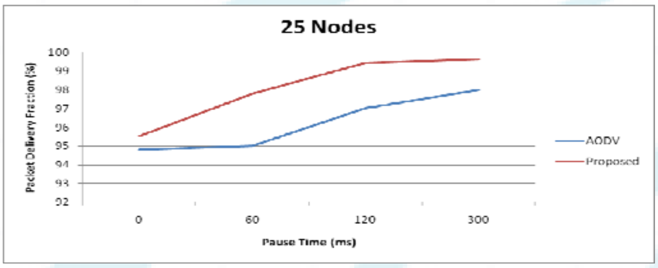

Figure 4: Packet Delivery Fraction Vs. Pause Time with 25 Nodes

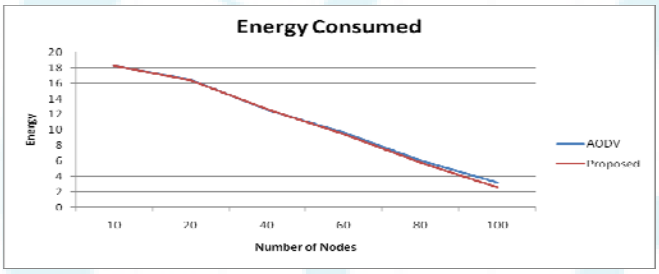

Figure 5: Energy Consumed Vs. Number of Nodes

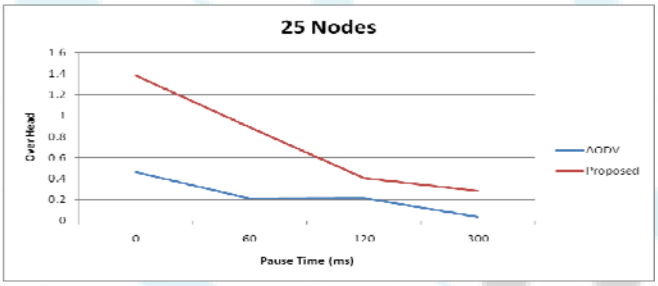

Figure 6: Overhead Vs. Pause Time with 25 Nodes

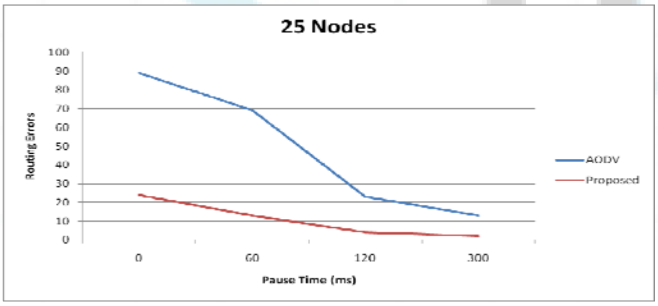

Figure 7: Routing Errors Vs. Pause Time with 25 Nodes

5. Performance Analysis

The proposed paper is implemented in NS 2.34 on a Pentium-III PC with 20 GB hard-disk and 256 MB RAM with apache web server. The propose paper's concepts shows efficient results and has been efficiently tested on different number of nodes and topology.

6. Conclusion

In this project we have presented an improvement of dynamic source routing protocol by proposing a new metric to evaluate routes. This metric is based on nodes weight computed by combining two parameters which are the power of node and its stability assumed to be the most important parameters in choosing routes. Then using these weight we can choose the best route which may be the long one however it's the best regarding our two proposed arguments; whenever two routes have near values of weights we choose the one with the minimum of hops.

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