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Efficient Data Transmit in MANET Using Proactive Source Routing

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ABSTRACT : Opportunistic data forwarding draws more and more attention in the research community of wireless network. However, as far as we know, all existing opportunistic data forwarding only use the nodes which are included in the forwarder list in the entire forwarding progress. In fact, even if a node is not a *listed forwarder* in the forwarder list, but it is on the direction from source node to destination node, and when it successfully overhears some packets by opportunity, the node actually can be utilized in the opportunistic data forwarding progress. In this paper, we propose the proactive source routing protocol for opportunistic data forwarding in mobile ad-hoc networks. In general, three contributions we have in this paper, 1) we allow each and every intermediate node to update path to a destination in the packet header. 2) we open more node to participate in the opportunistic data forwarding even though the nodes are not included in the forwarder list, 3) we propose the procedure to select the *best* local relay node, namely the helper-node, from many candidates but require no inner communication between them. Here, the source node sends the data packet with variable batch sizes which may improve the packet delivery ratio in MANET.

KEYWORDS:MANET, routing, adhoc network, proactive routing.

1. INTRODUCTION

An *ad hoc* network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration. In such an environment, it may be necessary for one mobile host to enlist the aid of other hosts in forwarding a packet to its destination, due to the limited range of each mobile host's wireless transmissions. Mobile ad hoc networks (MANET) do not rely on any fixed infrastructure but communicate in a self-organized way.

The need for adhoc network is that, setting up of fixed access points and backbone infrastructure is not always viable -Infrastructure may not be present in a disaster area or war zone-Infrastructure may not be practical for short-range radios; Bluetooth (range ~ 10m) Ad hoc networks do not need backbone infrastructure support-Are easy to deploy -Useful when infrastructure is absent, destroyed or impractical Mobile Ad-hoc Networks (MANETs) are wireless networks consisting entirely of mobile nodes that communicate on-the-move without base stations. Nodes in these networks will both generate user and application traffic and carry out network control and routing protocols. Rapidly changing connectivity, network partitions, higher error rates, collision interference, and bandwidth and power constraints together pose new problems in network control—particularly in the design of higher level protocols such as routing and in implementing applications with Quality of Service requirements.

CHARACTERISTICS

Dynamic topologies: nodes can move freely, network topology may change rapidly, restructuring, but also may also have symmetric and asymmetric links.

- Bandwidth-constrained, variable capacity links Compared with the wired network environment, the capacity of the wireless link itself is relatively small, but also susceptible to external noise, interference, and signal attenuation effects.

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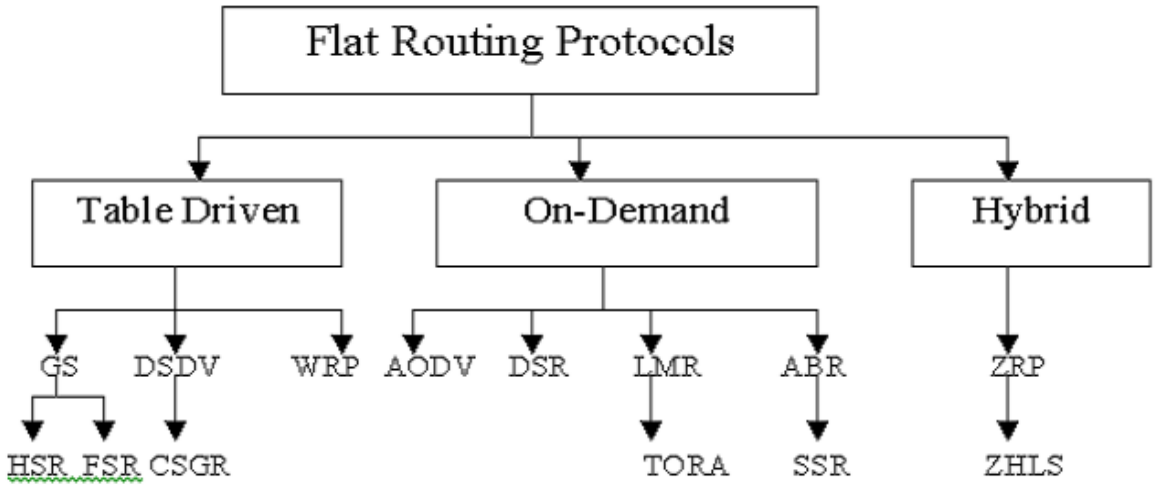
- Energy-constrained operation A laptop or handheld computers are often used batteries to provide power, how to save electricity in the context of depletion of system design is also necessary to consider the point.

- Limited physical security Network Security With the network deeply embedded in our daily lives and the benefits have become increasingly important in the wireless network to provide security support is also an important issue

ROUTING IN MOBILE ADHOC NETWORK

A Mobile ad hoc network (MANET) is an autonomous collection of mobile users (nodes) that communicate over bandwidth constrained wireless links. Due to nodal mobility, the network topology may change rapidly and unpredictably over time. The network is decentralized, where network organization and message delivery must be executed by the nodes themselves. Message routing is a problem in a decentralized environment where the topology fluctuates While the shortest path from a source to a destination based on a given cost function in a static network is usually the optimal route, this concept is difficult to extended in MANETs.

ROUTING PROTOCOLS



II. PREVIOUS RESEARCH

Zehua Wang, *Yuanzhu Chen, Cheng Le proposed* CORMAN as a network layer solution to the opportunistic data transfer in mobile ad hoc networks. Its node coordination mechanism is largely in line with that of ExOR and it is an extension to ExOR in order to accommodate node mobility. To support CORMAN, they used Proactive Source Routing (PSR) , which provides each node with the complete routing information to all other node in the network. Here, when a data packet is broadcast by an upstream node and has happened to be received by a downstream node further along the route, it continues its way from there and thus will arrive at the destination node sooner. This is achieved through cooperative data communication at the link and network layers. This work is a powerful extension to the pioneering work of ExOR

S.Biswas and R.Morris proposed ExOR to support opportunistic data forwarding.It an integrated routing and MAC protocol that increases the throughput of large unicast transmission in multi-hop wireless network. It ensures that only the “best” receiver of each packet forwards it. It forwards the data packets in batches. A source node has a packet that it wishes to deliver to a distant destination. Between the source and destination are other wireless nodes willing to participate in ExOR. The source broadcasts the packet. Some sub-set of the nodes receive the packet. The nodes run a protocol to discover and agree on which nodes are in that sub-set. The node in the sub-set that is closest to the destination broadcasts the packet. Again, the nodes that receive this second transmission agree on the closest receiver, which broadcasts the packet. This process continues until the destination has received the packet[11]

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Z. Wang, Y. Chen, and C. Li proposed A New Loop-Free Proactive Source Routing Scheme for Opportunistic Data Forwarding in Wireless Networks. It provides every node with Breadth-first spanning tree(BFST) rooted at itself. Nodes periodically broadcast the tree structure to its best knowledge. Based, a node can update its knowledge about network topology by constructing a deeper BFST. When a neighbor node deemed lost, a procedure is triggered to remove its relevant information from the detecting node. The operation involved in PSR are

(i)Route Update:- Which is iterative and distributed among all nodes in the network. In each subsequent iteration, nodes exchange their spanning tree with their neighbors.

(ii) Neighborhood trimming:- When a neighbour is deemed lost, its contribution to the network connectivity should be removed, called "neighbourhood trimming".

(iii) Streamlined differential update:- The basic idea behind this is to send the full update messages less frequently than shorter messages containing the difference between the current and previous states of node's routing module.[12]

Z. Wang, Y. Chen and C. Li proposed opportunistic data transfer in multihop wireless networks. It uses coordinate protocol which make all receiver to know that which is the forwarder with least overhead In multi-hop wireless network, some nodes are not within a direct transmission range of each other and rely on other nodes to forward data. It was originally put forward for battlefield communication and disaster relief. It is obvious that solutions adopted from Internet may not work properly in multi-hop wireless networks because the broadcast nature of wireless communication is not considered. In traditional protocols for multi-hop wireless networks, a unicast transmission can be picked up by multiple nodes, but only one of them is the intended receiver (destination node or relay). If this node has failed to receive the transmission, the packet has to be resent again. In effect, all nodes that have received the transmission that are closer to the destination than the transmitter could be relays, so it is not necessary to rely on a particular node to forward the data in principle.[13]

III. HYPOTHESES

H-1: Batch preparation
The source node generates the batch of packets all destined to the same host.

H-2: Proactive source routing
PSR runs in the background so that nodes periodically exchange network structure information. It converges after the number of iterations equal to the network diameter. At this point, each node has a spanning tree of the network indicating the shortest paths to all other nodes[14]

H-3: Large scale live update
When data packets are received by and stored at a forwarding node, the node may have a different view of how to forward them to the destination from the forwarder list carried by the packets. Since this node is closer to the destination than the source node, such discrepancy usually means that the forwarding node has more updated routing information. In this case, the forwarding node updates the part of the forwarder list in the packets from this point on towards the destination according to its own knowledge. When the packets with this updated forwarder list are broadcast by the forwarder, the update about the network topology change propagates back to its upstream neighbours.

H-4: Small scale retransmission
A short forwarder list forces packets to be forwarded over long and possibly weak links. To increase the reliability of data forwarding between two listed forwarders, we allow nodes that are not on the forwarder list but are situated between these two listed forwarders to retransmit data packets if the downstream forwarder has not received these packets successfully. Since there may be multiple such nodes between a given pair of listed forwarders, we coordinate retransmission attempts among them extremely efficiently[15]

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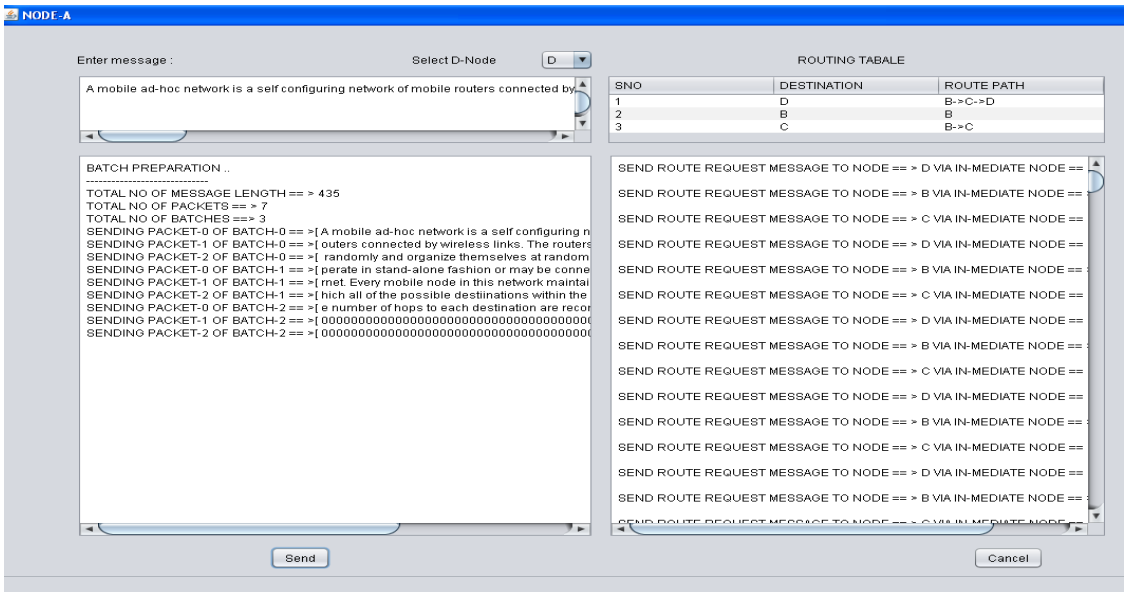
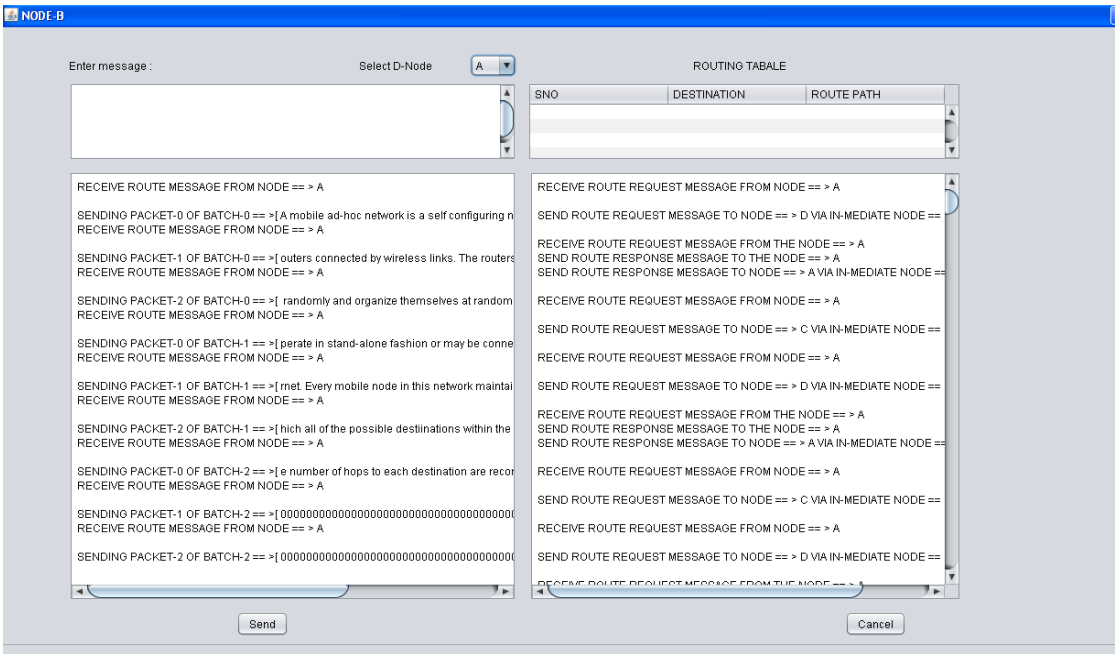
IV. RESULTS



BATCH PREAPARATION AT NODE A



INTERMEDIATE NODE B FORWARDS PACKET

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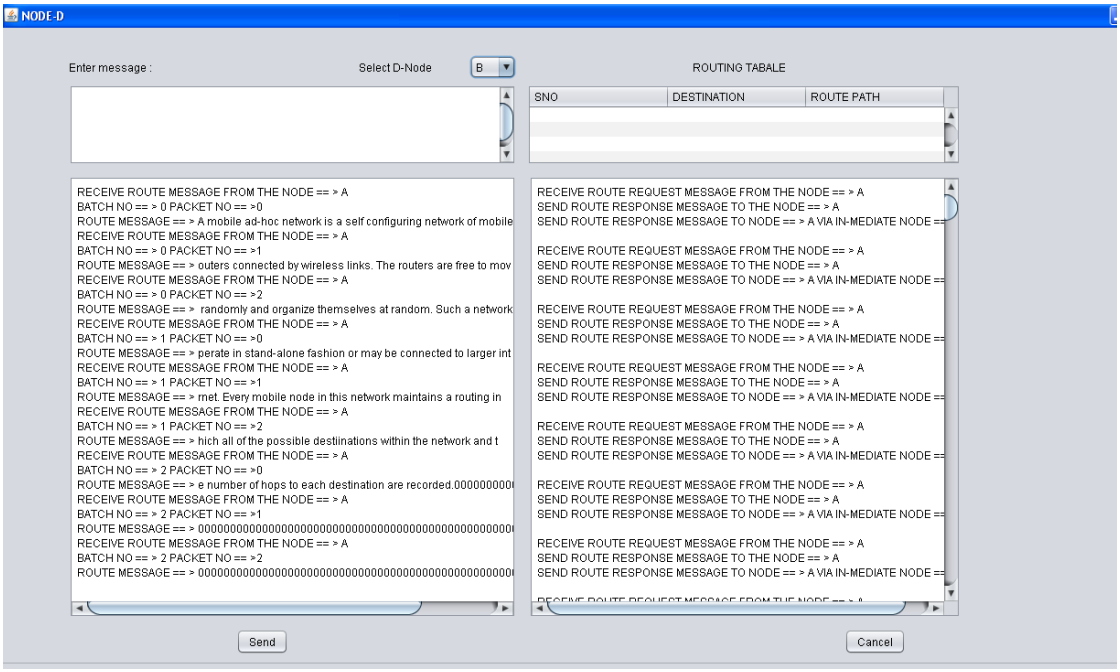

MESSAGE RECEPTION AT NODE D

V. SUMMARY AND CONCLUDING REMARKS

In this paper, I have proposed proactive source routing protocol to support opportunistic data forwarding in mobile ad hoc networks with fixed batch size which composed of three components. 1) PSR—a proactive source routing protocol, 2) large-scale live update of forwarder list, and 3) small-scale retransmission of missing packets. All of these explicitly utilize the broadcasting nature of wireless channels and are achieved via efficient cooperation among participating nodes in the network.

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