Broadcasting in Wireless Mobile Ad Hoc Networks with Dynamically Adjusted Probabilistic Forwarding

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Abstract

Ad-hoc networking is a concept in computer communications, which means that users wanting to communicate with each other form a temporary network, without any form of centralized administration. Each node participating in the network acts both as host and a router and must therefore be willing to forward packets for other nodes. For this purpose, a routing protocol is needed.

An ad-hoc network has certain characteristics, which imposes new demands on the routing protocol. The most important characteristic is the dynamic topology, which is a consequence of node mobility. Nodes can change position quite frequently, which means that we need a routing protocol that quickly adapts to topology changes. The nodes in an ad-hoc network can consist of laptops and personal digital assistants and are often very limited in resources such as CPU capacity, storage capacity, battery power and bandwidth.

This means that the routing protocol should try to minimize control traffic, such as periodic update messages. Instead the routing protocol should be reactive, thus only calculate routes upon receiving a specific request. The Internet Engineering Task Force currently has a working group named Mobile Ad-hoc Networks that is working on routing specifications for ad-hoc networks.

Broadcasting is a major communication primitive required by many applications and protocols in Mobile Ad Hoc Networks (MANETs). It is frequently deployed for content distribution, service discovery or advertisement, and sensor data dissemination. Broadcast protocols are also a fundamental building block to realize principal middleware functionalities such as replication, group management and consensus. Broadcasting in MANETs has therefore been an active area of research recently. Most of the research conducted on broadcasting in MANETs has primarily focused only on carefully selected application and evaluation scenarios.

Broadcasting is a fundamental and effective data dissemination mechanism for route discovery, address resolution and many other network services in ad hoc networks.

Many MANETs routing protocols need to flood a route request to seek out a multihop route to the destination. Most ad hoc routing protocols use the IEEE 802.11 MAC protocol, which could cause serious contention when many adjacent nodes decide to broadcast simultaneously, such as in flooding. Contention, collision and redundant broadcasts are referred to as broadcast storm problem.

Existing Approaches: Many approaches i.e Probabilistic based Scheme, distance based Scheme, Counter based Scheme, Area based Scheme, Location based Scheme, a cluster based Scheme and neighbor knowledge-based etc are proposed for broadcasting in MANETs.

Disadvantages: All the broadcasting schemes described above: The simplest one is flooding, which also generates the highest number of redundant rebroadcasts. The probabilistic approaches reduce the number of rebroadcasts at the expense of reachability. Counter-based approaches have better throughput and reachability, but suffering from relatively longer delay. The neighbor-knowledgebased algorithms require the exchange of neighborhood information among hosts. The distance-based scheme succeed to reach a large part of the network but do not economize the number of broadcast messages.

Proposed Scheme: Here, we propose dynamically adjusted probabilistic forwarding (DAPF) to yield higher performance in term of reachability and save rebroadcast (SRB). In addition, it is simple enough for easy implementation without the use of neighbors information or maintaining a counter for duplicate packets.In our research study we contribute to minimize the Broadcast storm problem and propose two probabilistic approaches,

I. Distance-based dynamically adjusted probabilistic forwarding (DDAPF).

II.Coverage-based dynamically adjusted probabilistic forwarding (CDAPF).

In Distance based probabilistic broadcasting approach We use the distance of a node to estimate forwarding probability and adjust the rebroadcast probability. If a mobile node is located in the area closer to sender, its rebroadcast probability will be set lower. On the other hand, if a mobile node is located in the area far from sender, its rebroadcast probability will be set higher, because rebroadcast through this node can cover much extra area. The distance between sender and receiver can be estimated by signal strength or global positional system.

In Coverage-based dynamically adjusted probabilistic forwarding approach, we dynamically adjusts the rebroadcast probability according to the extra covered area.

The adaption is based only on additional coverage without the assistance of neighbor knowledge.

we compare our approaches with simple flooding and fixed probabilistic schemes. The proposed schemes keep up the reachability of blind flooding while maintaining the simplicity of probability based schemes. Simulation results show that our approaches can improve the average performance of broadcasting in various network scenarios

Keywords: broadcasting, probabilistic, MANETs.