IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 2, Issue 2, Apr-May, 2014
ISSN: 2320 – 8791 (Impact Factor: 1.479)
www.ijreat.org

Reducing Delay and Improving the Performance of 2 Hop - Relay in MANET

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Abstract

In the existing system of conventional 2HR(f,g) algorithm has the capability of controlling delay, but where in very simple scenario in which only a single node is selected randomly from one hop neighbor for the transmission which may result in waste of opportunity when wrong node is selected. This paper enhance the performance of 2HR algorithm where not only one but many or all one hop neighbor will be selected for source to relay and from relay to destination which will not waste any single transmission opportunities. In this algorithm with a packet redundancy limit f and group size g will be considered and the packets will be delivered to all one hop relay without any redundancy limit (i.e) (f=infinity). A Markov chain based theoretical framework is developed to analyze mean and variance of packet delivery with parameter f,g.

Index Terms*-Delivery delay, mobile ad hoc networks (MANETs), packet redundancy, two-hop relay.*

1. Introduction

TWO-HOP relay and its variants have been a class where the source first transmits packets to the mobiles (relays) it encounters; relays then transmit the packets only if they come in contact with the destination [1]. Thus, each packet travels at most two hops to reach its destination.The available two-hop relay algorithms include out-of-order or strictly in-order reception, which are the two extreme cases of reception mode. In the in-order two-hop relay algorithms, each packet should be received in order at its destination. The algorithm out-of-order two-hop without redundancy states that a packet has at most one copy and gets accepted by its destination if it is "fresh" (never received before). On the other hand ,the out-of-order two-hop relay with redundancy is said for when each packet may have multiple copies in the transmission process. For the two-hop relay with in-order reception, lot of reception opportunities may be wasted as the destination only accepts packets according to their sequence orders, resulting in an increase in the packet delivery delay. The out-of-order two-hop relay, on the other hand, can take the full advantage of each reception opportunity, but each mobile node there should potentially carry a very big (if not infinite) buffer to accommodate all possible arrivals, which is not really practical for the MANETs. Also, the early arrived packets there may need to wait a long time for the arrivals of other related packets, which may make the early arrived packets become expired and thus useless. They result in delays. These delay results indicate that the available out-of-order or strictly in-order two-hop relay protocols, although simple and easy to operate, cannot provide a flexible control for the packet delivery delay.

The paper extends the conventional two-hop relay to a group-based two-hop relay with packet redundancy to enable the packet delivery delay to be flexibly controlled in a large region. The main contributions of the paper are as follows.

- A new 2HR- algorithm, where each packet is delivered to at most distinct relay nodes and can be accepted by its destination if it is a fresh packet to the destination and also it is among packets of the group the destination is currently requesting.
- To capture the complex packet delivery process in a MANET with 2HR- , a general theoretical framework based on the multidimensional Markov chain, which covers the available

frameworks for conventional two-hop relay analysis is said to be developed in the paper. The theoretical framework is powerful in the sense it enables not only the mean value, but also the variance of packet delivery delay to be derived analytically considering medium contention, interference, and traffic contention issues.

- Extensive simulation and theoretical results are provided to validate the 2HR- algorithm and the Markov chain theoretical framework. These results indicate that the theoretical framework is very efficient in packet delay analysis and the new 2HR- algorithm makes it possible to flexibly control the packet delivery delay in a large region through the proper settings of f and g[5][3]. The main objective of the paper is to enhance the performance of 2HR algorithm where not only one but many or all one hop neighbor will be selected for source to relay and from relay to destination which will not waste any single transmission opportunities. The algorithm with a packet redundancy limit f and group size g will be considered and the packets will be delivered to all one hop relay without any redundancy limit (i.e) (f=infinity). A Markov chain based theoretical framework is developed to analyze mean and variance of packet delivery with param f and g.

The rest of this paper is outlined as follows. Section II introduces the system models, the 2HR- algorithm, and the corresponding transmission scheduling scheme. In Section III, we develop the Markov chain-based theoretical framework and provide some basic results. In Section IV, we analytically derive the expected value and standard derivation for packet delivery delay. Section V presents the numerical results to validate the theoretical framework and the 2HR- algorithm.Finally, we introduce the related works in Section VI and conclude this paper in Section VII.

2. Existing System

The available two-hop relay protocols with out-of-order or strictly in-order reception cannot provide a flexible control for the packet delivery delay, which may signif- icantly limit their applications to the future mobile ad hoc net- works (MANETs) with different delay requirements. This paper extends the conventional two-hop relay and proposes a general group-based two-hop relay algorithm with packet redundancy. In such an algorithm with packet redundancy limit and group size (2HR- for short), each packet is delivered to at most distinct relay nodes and can be accepted by its destination if it is a fresh packet to the destination and also it is among packets of the group the destination is currently requesting. The 2HR- covers the available two-hop relay protocols as special cases, like the in-order reception ones , the out-of-order reception ones with redundancy , or without redundancy . A Markov chain-based theoretical framework is further developed to analyze how the mean value and variance of packet delivery delay vary with the parameters and , where the important medium contention, interference, and traffic contention issues are carefully incorporated into the analysis. Extensive simulation and theoretical results are provided to illustrate the performance of the 2HR- algorithm and the corresponding theoretical framework, which indicate that the theoretical framework is efficient in delay analysis and the new 2HR- algorithm actually enables both the mean value and variance of packet delivery delay to be flexibly controlled in a large region.

2.1 Architecture

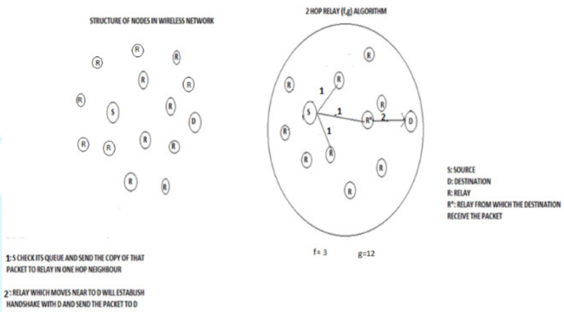

Fig1.architecture

3. Proposed System

This paper enhance the performance of 2HR algorithm where not only one but many or all one hop neighbor will be selected for source to relay and from relay to destination which will not waste any single transmission opportunities. In this algorithm with a packet redundancy limit f and group size g will be considered and the packets will be delivered to all one hop relay without any redundancy limit (i.e)

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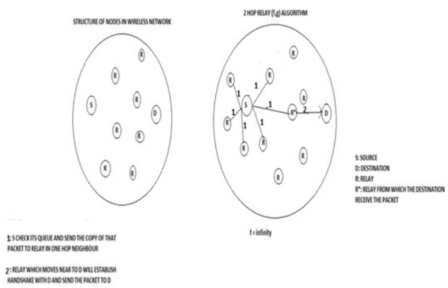
3.1 Architecture



4. Overview

We propose the group based 2 Hop Relay from which we enhance the performance of 2HR algorithm [2] where not only one but many or all one hop neighbor will be selected for source to relay and from relay to destination which will not waste any single transmission opportunities[6][7][9]. The main parameters considered in this 2HR algorithm is g and f. Where g is group size and f is redundancy limit of the packet. In this paper the packets will be delivered to all one hop relay without any redundancy limit (i.e) (f=infinity).

The advantages of this paper are source will use all transmission opportunities for delivering the packet to the destination. Delay can be reduced and performance of the MANET can be automatically improved.

5. Modules

5.1 Two Hop Relay

Relay can be selected by any one of this following method

(Source-to-Destination) :If the node D is among its one-hop neighbors, it initiates a handshake with D to get its RG(D) and IN(D) Then, it tries to transmit a fresh packet directly to D ,where the packet to be transmitted is selected as follows:

It first checks its local queue. Then it tries to retrieve a fresh packet from the already-sent queue. Otherwise, if the node D is not among the one-hop neighbors of S, the node S randomly chooses one of the following two operations to perform.

(Source-to-Relay): It first randomly selects one node (say R) ,then initiates a handshake with R and it delivers a new copy of Ph to R ,or else it remains idle for this time-slot.

(Relay-to-Destination) :Relay selects one node (say D) as the receiver from its one-hop neighbors. It first initiates a handshake with D to get the RG(D) and IN(D). Then it delivers this packet to D and deletes all packets from its relay queue[3][4][8].

5.2 Two HR (f,g):

The two main parameters used in this algorithm is f and g. Where g is group size and f is redundancy limit of the packet. The packets will be transmitting across the nodes within the group limit. The nodes in the network will be grouped based on the group size as declared.

In 2HR-(f,g) algorithm, the source node S will deliver at most f copies of a packet P to distinct relay nodes, while the destination D may finally receive the packet from one relay node .In this module we declare f is equal to infinity. Instead of sending the packet to one relay in the one hop neighbor, source will send the copy of the packet to all relays which are one hop neighbor [2]. By doing like this the source node will use all the transmitting opportunities.

6. Conclusion

This paper proposed a general 2HR-(f,g) algorithm for MANETs and also developed a Markov chain-based theoretical framework for corresponding performance modeling. In this paper we assume f=infinity, so the copy of the packet will be send to all one hop neighbor relay. Therefore the source node use all the possible transmission opportunities to send the packet to their destination, We proved that the 2HR-(f,g) algorithm has the capability of flexibly controlling packet delay and its variance in a large region, an important property for future MANETs to support various applications of different delay (and delay variance) requirements. The results in this paper indicate that the control parameters and of the 2HR-(f,g) algorithm may affect the packet delay and its variance in very different ways, and a target packet delay (and delay variance) requirement can be actually achieved through various combinations between f and g . Thus, a careful tradeoff among packet delay (and delay variance) requirement, packet redundancy f , and node buffer limitation (related to g s) should be examined for the efficient support of a target application.

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