Dynamic Threshold and Quality Meter Based Routing for Cooperative Broadband Wireless Networks

Ee Keng Tan[1], Chong Eng Tan[2]

Department of Computer Systems and Communication Technologies

Faculty of Computer Science and Information Technology

Universiti Malaysia Sarawak,

94300 Kota Samarahan, Sarawak, Malaysia

[1]`eekengtan@gmail.com`

[2]`cetan@fit.unimas.my`

Abstract —**One of the important aspects to deal with in ad hoc cooperative wireless network is the mobility nodes. In ad hoc wireless networks, the nodes themselves are responsible for the routing and forwarding of packets. Hence, nodes of these networks function as routers that discover and maintain routes to other nodes in the same network as well as regular hosts. Frequent changes in the network topology require huge communication overhead in order to establish new routes and thus slowing down the communication or causes packet losses. In this paper, we proposed Channel State Information (CSI) based routing scheme for ad hoc cooperative wireless networks. The proposed approach will apply dynamic threshold and quality meter to improve the wireless channel quality of all available ad hoc nodes over the cooperative network and making sure that the conventional TCP will still be effective. The proposed scheme takes into consideration of choosing the best route on the fly for successful packet delivery while minimizing errors over the network.**

Keywords— **Dynamic threshold, Quality meter, OFDM broadband, routing, link quality prediction**

I. INTRODUCTION

In a cooperative wireless ad hoc network environment, all wireless nodes rely on each other to relay information. In most cases, the multi-hop relay of information will cause long end-to-end delay between the corresponding nodes. When the wireless nodes are corresponding with any node in the Internet which is usually using the conventional TCP protocol, the long end-to-end delay can easily trigger TCP time-out and cause the respective TCP protocol to enter the state of slow start. Slow start in TCP is used to ease network problem caused mainly by congestion at the router. When slow start is triggered for the wrong reason such as the long end-to-end delay in wireless networks, the overall performance of the wireless network is distorted for the wrong reason. The situation got worse when more bit errors occur in the wireless channel due to poor channel quality. Naturally, conventional TCP cannot differentiate link error from network congestion and assumes the long delays in wireless network are due to congestion.

Owing to that, there is an essential need to introduce an appropriate scheme to complement the conventional TCP protocol for wireless nodes in a cooperative network to provide maximum protocol compatibility with most nodes in the Internet and maintains the high throughput in the wireless networks.

The rest of the paper is organized as follow: in Section 2, we will be presenting the background of ad hoc networks, various routing protocols and schemes proposed by previous researches. In Section 3, we discuss the proposed CSI based routing scheme as well as emphasizing the link quality prediction approach. Section 4 further discussed the simulation model and simulation results. The paper is later concluded in Section 5.

II. BACKGROUND

Ad-hoc cooperative wireless networks are infrastructureless mobile network that have no fixed routers. They are widely used for applications in military, educational environment and disaster discovery. All the nodes are dynamically connected and capable of moving in arbitrary manner.

There are subtle differences in routing protocol requirements for wired and wireless networks. In the wireless network, location of terminal may change from time to time due to portability. In addition, the nature of wireless networks is experience frequent packet loss, which is due to the noisy nature of the wireless channel and will not be mitigated by slowing down the overall transmission rate.

Currently, there are two types of ad-hoc routing protocols classified as proactive protocols and reactive protocols [1, 2]. The proactive protocols mandate each node to maintain one or more tables to store routing information to all possible destinations so that when a packet needs to be forwarded, the route is already known and can be immediately used. These protocols respond to changes in network topology by propagating updates throughout the network and maintain this information in consistent and up-to-date tables at every node. When the network topology changes such changes in link states are announced to all the nodes in an ad-hoc network.