Congestion Adaptive Routing in Wireless Mesh Networks

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***Abstract* –The main reason for packet loss in Wireless Mesh Networks (WMNs) is due to congestion. Presently, routing in WMNs is not congestion-adaptive. Routing may let a congestion happen which is detected by congestion control. The way in which the congestion is handled results in longer delay and more packet loss and requires significant overhead if a new route is needed. Hence, we propose a congestion adaptive routing protocol (CARP) for WMNs with such properties. Our ns-2 simulation results confirm that CARP can successfully achieve a high packet delivery ratio with lower routing overhead and latency in WMNs.**

Keywords *- Wireless Mesh Networks, routing protocols, HWMP, congestion adaptivity.*

I. INTRODUCTION

A WMN is formed with the help of two distinct types of nodes i.e. Mesh Routers/Mesh Access Point (MAP) and Mesh Clients/Mesh Point (MP). The Mesh Routers, with multi-radio transceivers and access to external power sources, form the multi-hop wireless backhaul network. This network is used by the Mesh Clients to communicate among each other and also to gain access to an external network through a gateway. The Mesh Routers are generally static and act as general packet forwarders, while the Mesh Clients portray a disparate mobility pattern and only communicate through the Mesh Routers.

A Hybrid WMN is formed when, in addition to the Mesh Routers, the Mesh Clients also act as packet forwarders and assist in establishing the backhaul network [1] and [8]. Thus a Mesh Client in a Hybrid WMN episodically performs the role of a Mesh Router by executing a routing protocol. A Hybrid WMN is the most versatile form of autonomic network and depicts self-configuring, self-healing and self-optimizing characteristics. Owing to the peculiar characteristics of Hybrid WMNs, these networks are considered a promising technology for Public Safety and Disaster Recovery communications. A typical Hybrid WMN is shown in fig.1.

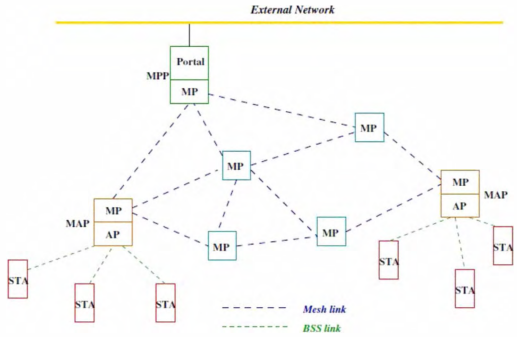

Fig.1. A typical Hybrid Wireless Mesh Network

Routing is an important problem in need of a solution that not only works well with a small network, but also sustains efficiency and scalability as the network gets expanded and the application data gets transmitted in larger volume. Though essential, routing in WMNs (e.g. [7], [9], and [15]) is a nontrivial matter. Routing protocols assure connectivity between the Client- Router and Router-Router pairs. A number of approaches have been proposed for providing communication support in WMNs. These approaches can be broadly categorised into three types i.e. Pro-active, Reactive and Hybrid.

In proactive protocols (e.g. [2]) routes between every two nodes are established in advance even though no transmission is in demand. This is realized by a node periodically updating its neighbors with the routing information it has known thus far, hoping that every node eventually has consistent and up-to-date global routing information for the entire network. This approach is not suitable for large networks because of the persistent overhead due to route management and the resulting limited scalability.

The reactive approach (e.g. [3]) is more efficient in that a route is discovered only when needed for a transmission and released when the transmission no longer takes place. The advantage of the reactive approach is the low routing overhead at the cost of increased route discovery latency.

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