Vehicular Ad-Hoc Networks Clustering

Sadaf Momeni, Mahmood Fathy, Nasser Mozayani, Iran University of Science and Technology, Tehran, Iran
sadaf_momeni@comp.iust.ac.ir
mahfathy@iust.ac.ir
mozayani@iust.ac.ir

Abstract— **Routing of data in a vehicular ad hoc network is a challenging task due to the high dynamics of such a network. Recently, it was shown for the case of highway traffic that position-based routing approaches can very well deal with the high mobility of network nodes. In this paper we analyze a position-based routing approach that makes use of the Geographic Positioning System (GPS) and direction of vehicles. By means of simulation we compare this approach with non-Directional Ad-Hoc routing strategies (Location Routing Algorithm with Directional Cluster-Based Flooding and Location Routing Algorithm with Cluster-Based Flooding). In our proposed algorithm, it is possible to have more than one cluster heads in the limited area, but with two opposite direction, this strategy have more stability in the clusters form and more effective.**

Keywords—**Location routing algorithm with directional cluster based flooding (LORA-DCBF), Ad-Hoc networks, VANET networks, inter-vehicular communication, rotating.**

I. INTRODUCTION

As mobile wireless devices, such as PDAs, laptops, and mobile phones, become an essential part of our lives, "any-time, anywhere" connectivity becomes an increasingly important requirement for wireless systems. Since an average user spends hours in the traffic everyday, Internet access from vehicles is in great demand. Ad hoc (or self-organizing) networks operate without a predefined fixed (managed) infrastructure. Vehicular ad hoc networks (VANET) using 802.11-based WLAN technology have recently received considerable attention. In such a network vehicles equipped with Wi-Fi hardware constitute the mobile nodes (hosts) [1].

Communication between vehicles by means of wireless technology has a large potential to improve traffic safety and travel comfort of drivers and passengers [2]. Current advances in the field of wireless ad hoc networks show that inter-vehicle communication based on vehicular ad hoc networks is a feasible approach that has a competitive edge over cellular network-based telematics with respect to several aspects: low data transport times for emergency warnings, robustness due to the networks mesh structure, and low costs for usage due to the use of unlicensed frequency bands [3].

Traditional ad hoc routing protocols have difficulties in dealing with the high mobility specific to vehicular ad hoc networks [4]. In a recent research show that for highway scenarios that routing approaches using position information, e.g., obtained from on-board GPS receivers, can very well deal with the mobility of the nodes [5]. Location based routing algorithms form the basis of any Vehicular Ad-hoc Network (VANET) because of the flexibility and efficiency they provide with regards inter-vehicular communication [6].

In this paper we present a simulation study that compares a directional cluster-based flooding routing approach with non-directional cluster-based flooding routing methods (LORA-DCBF and LORA-CBF) because of these advantages:

1. It employs local information to improve the traditional routing used in non-positional algorithms
2. It minimizes flooding of its control traffic by using only the selected nodes, called gateways nodes, to disseminate its messages.
3. We can have two cluster head in limited area with two opposite directions so will have more stability in clusters form.

II.

III. LOCATION ROUTHING ALGORITHM WITH DIRECTIONAL CLUSTER BASE FLOODING (LORA-DCBF)

We propose a reactive algorithm for mobile wireless ad-hoc networks, which we have called Location Routing Algorithm with Directional Cluster-Based Flooding (LORA_DCBF). The algorithm has the properties of reactive routing algorithms and the advantage of acquiring routing information only when a route is needed (Figure 1) [7]. LORA-DCBF is formed with one cluster head, zero or more members in every cluster and one or more gateways to communicate with other cluster heads. Each cluster head maintains a "Cluster Table" which is a table that contains the addresses, directions and geographic locations of the member and gateway nodes [8].