"OVERVIEW OF DATA DISCOVERY AND DISSEMINATION IMPROVEMENT IN VANET USING GENETIC ALGORITHM"

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ABSTRACT: *Several Vehicular Ad hoc Network (VANET) studies have focused on the communication methods based on IEEE 802.11p, which forms the standard for Wireless Access for Vehicular Environments (WAVE). This paper proposes a hybrid architecture, namely VMaSC-LTE, combining IEEE 802.11p based multi-hop clustering and the fourth generation cellular system, Long Term Evolution (LTE), with the goal of achieving high data packet delivery ratio and lo/w delay while keeping the usage of the cellular architecture at minimum level. In VMaSC-LTE, vehicles are clustered based on a novel approach named VMaSC: Vehicular Multi-hop algorithm for Stable Clustering.*

Keywords: VANET, WAVE, VMaSC, LTE, MANET.

1. INTRODUCTION

Vehicular Ad hoc Network (VANET) studies have focused on the communication methods based on IEEE 802.11p, which forms the standard for Wireless Access for Vehicular Environments (WAVE). In the networks employing IEEE 802.11p only, the broadcast storm and disconnected network problems at high and low vehicle densities respectively degrade the delay and delivery ratio of safety message dissemination. Recently, as an alternative to the IEEE 802.11p based VANET, the usage of cellular technologies has been investigated due to their low latency and wide range communication. However, a pure cellular based VANET communication is not feasible due to the high cost of communication between the vehicles and the base stations, and high number of hand-off occurrences at the base station considering the high mobility of the vehicles.

In VMaSC-LTE, vehicles are clustered based on a novel approach named VMaSC: Vehicular Multi-hop algorithm for Stable Clustering. The features of VMaSC are cluster head selection using the relative mobility metric calculated as the average relative speed with respect to the neighboring vehicles, cluster connection with minimum overhead by introducing direct connection to the neighbor that is already a head or member of a cluster instead of connecting to the cluster head in multiple hops, disseminating cluster member information within periodic hello packets, reactive clustering to maintain cluster structure without excessive consumption ofnetworkresources,andefficientsizeand hop limited cluster merging mechanism based on the exchange of the cluster information among the cluster heads. These features decrease the number of cluster heads while increasing their stability therefore minimize the usage of the cellular architecture.

2. PROTOCOLS USED IN DATA DISSEMINATION

A. CodeDrip: It is a data dissemination protocol proposed by Nildo et al. and can be used in Wireless Sensor Networks. This protocol is mainly used for dissemination of small values. Network Coding is a mechanism that combines packets in the network thus increasing the throughput and decreasing number of messages transmitted. CodeDrip uses Network Coding to improve reliability, and speed of dissemination [3]. Rather than simply retransmitting received data packets, sensor nodes try to combine various packets of small data items into one, and re-transmit the combined packet to its neighbors. Thus, packet loss is avoided since lost packets might be recovered through the decoding of others combined packets.

B. Dip: DIP (Dissemination Protocol) is a data detection and dissemination protocol proposed by Lin et al. [4]. It is a protocol based on the Trickle algorithm. It works in two parts: detecting whether a difference in data in nodes has occurred, and identifying which data item is different. It uses the concept of version number and keys for each data item.

C. DHV: It is a code consistency maintenance protocol given by Dang et al. [5]. It tries to keep codes on different nodes in a WSN consistent and up to date. Here data items are represented as tuples (key, version).This protocol tries to overcome the disadvantages of previous protocols like DRIP and DIP by reducing the complexity involved in the updating of data in the network. It is based on the observation that if two versions are different, they may only differ in a few least significant bits of their version number rather than in all their bits.

D. Typhoon: It is a reliable data dissemination protocol used in wireless sensor networks given by Liang et al. [7]. It is mainly used for dissemination of bulky data similar to Deluge. So here also large data objects are divided into fixed sized pages and then again sub-divided into fixed sized packets. Unlike other protocols, Typhoon sends data packets in uncast

fashion. This approach allows receivers to acknowledge the receipt of packets and thus quickly recover lost packets if any. While data packets are sent in unicast manner, interested nodes can receive those packets by snooping on the wireless medium.

3. BASICS OF ROUTING IN VANET

The core design goal of VANETs is to reliably and efficiently disseminate safety messages to all the related (endangered) vehicles on the road. The intended propagation region could be the immediate transmission range of about 300 meters or the long multi-hop forwarding range spanning more than a kilometer distance depending on the type of safety application. 5 Highly dynamic VANET topology and wireless signal environment make message propagation and routing a constant challenge. The distribution of vehicles is highly non-uniform, and the connectivity among them is highly random. Furthermore, the inevitable use of the common control channel for safety applications makes message propagation immensely vulnerable to collisions and interference. In the following, some of the challenges faced in VANET safety-message propagation are briefly outlined. Several safety messages need to be propagated to vehicles beyond the immediate transmission range, e.g., safety alert messages about hazardous driving situations such as dangerous road surface, unexpected road block, accidents, and unexpected fog banks. The propagation of a message beyond the immediate transmission range involves multi-hopping in the highly dynamic network. Consequently, the propagation scenario becomes much more complex since multi-hop increases the chances of collision and also causes the over consumption of radio resource resulting from unnecessary retransmissions. The propagation requires multi-hop forwarding of the message by selected vehicles among a large number of contenders. The problem becomes severe in dense urban traffic where a higher number of contending vehicles results in excessive packet collisions. Since these collisions greatly impact the reliability of reception and the overall message-dissemination speed, it remains the core concern while developing ideas for message routing in VANETs. The lack of feedback mechanism resulting from the broadcast communication scenario is another serious problem in VANET message propagation. The propagation path, either single-hop or multi-hop, involves a number of factors that obstruct some vehicles along the way from receiving the safety-alert message. As a result, the obstructed vehicles either receive the message not intact or are completely oblivious of the activity in the channel. Furthermore, since safety-message dissemination is carried using broadcasting, there is no feedback mechanism to recover the impeded vehicles, thus always compromising reliability.

4. WORKING STRATEGY

Proposed multi-hop cluster based IEEE 802.11p-LTE hybrid architecture for the first time in the literature. The features of the multi-hop clustering algorithm used in this hybrid architecture, called VMaSC, are cluster head selection using the relative mobility metric calculated as the average relative speed with respect to the neighboring vehicles, cluster connection with minimum overhead by introducing direct connection to the neighbor that is already a head or member of a cluster instead of connecting to the cluster head in multiple hops, disseminating cluster member information within periodic hello packets, reactive clustering to maintain cluster structure without excessive consumption of network resources, and efficient size and hop limited cluster merging mechanism based on the exchange of the cluster information among the cluster heads. Combining all of these features in a multihop cluster based hybrid architecture, using minimum overhead cluster connection, and size and hop limited cluster merging mechanism are unique characteristics of VMaSC.

Using the Genetic Algorithm (GA), we are planning to reduce the delay, and improve the energy efficiency and increase throughput of the system. This will also improve the lifetime of the network. So to reduce delay in data dissemination and also to improve the energy efficiency of the system, Genetic algorithm (GA) is used.We propose a Genetic Algorithm based data discovery and dissemination protocol which gives a near optimum solution for the system as the fitness function incorporates all the 3 parameters, it works as follows:

1. Generate a random set of solutions for the system.
2. For each iteration-
A. Find the fitness of each of the solutions (fitness is a function of delay, energy and throughput).
B. Find the mean value of fitness.
C. If fitness of a solution is less than mean fitness, then discards the solution and generates a new one on its place, else uses the solution for the next iteration.
3. At the end of nth iteration, the best fitness solution will be the most optimal one .Using Genetic Algorithm (GA), we are planning to reduce the delay, and to improve the energy efficiency and increase throughput of the system. This will also improve the lifetime of the network.

5. FEATURES OF V-MASc ALGORITHM FOR STABLE CLUSTERING

The features of the proposed multi-hop clustering algorithm V-MaSC are as follows:

1) It provides stable cluster head selection by the use of the relative mobility metric calculated as the average relative speed with respect to the neighboring vehicles in multi-hop clustered vehicular network.

2) It provides cluster connection with minimum overhead by introducing direct connection to the neighbor that is already a head or member of a cluster, instead of connecting to the cluster

head in multiple hops, and disseminating cluster member information within periodic hello packets.
3) It provides reactive clustering to maintain cluster structure without excessive packet transmission overhead.
4) It provides minimum inter-cluster interference by minimizing the overlap of clusters in space through prioritizing the connections to existing clusters and introducing efficient size and hop aware cluster merging mechanisms based on the exchange of the cluster information among the cluster heads.

6. AIMS AND OBJECTIVES

Hybrid architecture, namely VMaSC-LTE, combining IEEE 802.11p based multi-hop clustering and the fourth generation cellular system, Long Term Evolution (LTE), with the goal of achieving following objectives:

1) High data packet delivery ratio.

2) Low delay while keeping the usage of the cellular architecture at minimum level.

3) Decreasing the number of cluster heads and increasing stability.

7. CONCLUSION

The main objective of the review paper was to throw some light on the previous proposed work. We also discussed the various architecture and their strengths and weaknesses associated. We believe that all of the algorithms surveyed in this paper are effective , but the advantages favors more for Genetic Algorithm due to its iterative selection from the population to produce most optimized and efficient results .

8. REFERENCES

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