PERFORMANCE ENHANCEMENT AND EFFICIENCY EVALUATION FOR VANET APPLICATION BASED ON RLSMP TOOL

SIVAKUMAR P , SARAVANAN S
Assistant Professor, Department of Information Technology,
PSNA College of Engineering and Technology, Dindigul.

Abstract— **The efficiency by which a node of a vehicular ad hoc network (VANET) can route messages to destinations heavily depends on the VANET's ability to keep track of the locations of its nodes (vehicles). Current location management schemes lack scalability and, hence, are proven unable to work in large scale networks. Therefore, location management in VANETs remains a major challenge. In this project a new concept of region-based location-service-management protocol (RLSMP) that uses mobility patterns as means to synthesize node movement is deployed in large VANET applications. The protocol attempts to relax the scalability issue suffered by other protocols (SLURP, XYLS, HLS) by employing message aggregation in location updating and in querying. Furthermore, due to the protocol's intrinsic locality awareness, it achieves minimum control overhead. The process is implemented by using hexagonal shape topology and increasing the mobility of the network, the mobility of the nodes are noted. The performance of the protocol is compared with that of other prominent location management protocols through graphs.**

Index Terms— **Communication overhead, location service, performance analysis, vehicular ad hoc networks (VANETs).**

I. INTRODUCTION

VEHICULAR ad hoc networks (VANETs) represent a rapidly emerging and challenging class of mobile ad hoc networks (MANETs).Vehicle Ad hoc network (VANET) is another difference network comparison with mobile ad hoc network (MANET). The VANET also is emerging topic for recent years. The goals of VANET are bring more convenient for user some likes using internet service in cars or in trains. There have another application on VANET using communication system to delivery information on wireless technology. Therefore, the main issues of VANET discuss about the Information packets transmit between a vehicle and a vehicle or a vehicle and a access point like roadside beacons.

A MANET is a self forming network, which can function without the need of any centralized control. Each node in an ad hoc network acts as both a data terminal and a router. The nodes in the network then use the wireless medium to communicate with other nodes in their radio range. A VANET is effectively a subset of MANETs. The benefit of using ad hoc networks is it is possible to deploy these networks in areas where it isn't feasible to install the needed infrastructure. It would be expensive and unrealistic to install 802.11 access points to cover all of the roads. Another benefit of ad hoc networks is they can be quickly deployed with no administrator involvement. The administration of a large scale vehicular network would be a difficult task. These reasons contribute to the ad hoc networks being applied to vehicular environments.

In this paper, the quorum-based approaches is used to achieve efficient location service management by means of node clustering and message aggregation. Thus, the updates and the queries of nearby nodes are aggregated in one control message. Distinct groups of nodes called clusters are formed based on their geographical locations (i.e., nodes that are located in one geographical area are grouped in one cluster). In addition, since the communication patterns in VANETs are considered, to a great extent, to be local (i.e., vehicles inside one geographical cluster are more likely to communicate with each other), the proposed service-management protocol should be locality-aware. Consequently, location servers are assigned while considering the local traffic patterns.We formulate this strategy in the proposed region based location service management protocol (RLSMP).

II. RELATED WORKS

Location-service-management protocols that are designed for MANETs suffer from two main shortcomings that make them unsuitable for VANETs: 1) high control overhead and 2) lack of locality awareness. In what follows, we review some of the existing location-service-management techniques and, when applicable, highlight their shortcomings. Camp have proposed a flooding-based location protocol, namely, the dream location service. It is assumed that each node in the network sends location messages to update the location tables of all the other nodes. These messages are sent to nearby nodes more frequently than to faraway nodes. This results in high overhead, particularly in dense networks. Due to bandwidth limitations, the scalability of this protocol is questionable, as the number and the mobility of vehicles increase. A reactive location-service protocol has been proposed by Ksemann. When a node wants to communicate with a destination, it first checks its location table. If the location information is not available or is expired, then the source node floods a location-request packet in the entire network. In this case, the delay in receiving the location-reply message increases as the number of nodes in the network increases. This affects the scalability of the protocol, making it less suitable for large and dense urban scenarios. A SLURP has been proposed, this protocol divides the area covered by the network into rectangular regions. For a given node D, one specific region (called the home region) is selected by means of a hash function. As D changes its position, it transmits the corresponding updates to its home region. If another node wants to determine the position of D, it uses the same hash function to determine the region that may hold information about the new position of D.

A potential drawback of the SLURP is the lack of locality awareness since it assumes that any two nodes are equally likely to communicate with each other. As the home region can be far away from both the source and destination nodes, the total path length of both updating and querying messages can be excessive. Flury and Wattenhofer , assume that a node can start a communication session with any other node without knowing its current location. They use a hashing function that maps node IDs to certain locations called pointers. Each node updates its current location information on a hierarchical data structure formed by these pointers. The querying messages are then routed to the destination's pointers to retrieve the location information. Location information updating frequency to a hierarchy of pointers is proportional to the vehicles velocity. However, in a bandwidth-restricted environment, such as VANETs, such updates may cause channel congestion.

As in the SLURP, the geographic hashing location service (GHLS), which is a quorum-based protocol, uses a hashing function that maps the node ID to a region called the home region. It assumes that the node closest to the center of this home region is the location server. Nevertheless, the GHLS attempts to solve the locality awareness problem of the SLURP by generating a location-service region near the center of the whole network. Although the querying overhead is lower than that of the SLURP, the updating overhead remains high due to the randomness of the hash function. In the XYLS assumes that the network space consists of vertical and horizontal strips. For each destination node, the nodes that are located along the north–south direction form the location servers (called the updating quorum), whereas for each source node, the nodes that are located along the east–west direction form the query quorum. Thus, locationupdating information is disseminated in a direction such that a query can intersect an update quorum. The XYLS further assumes that the traffic pattern in the network may be random, i.e., any node can randomly initiate a communication session to any other node, and that the same node will frequently traverse the entire network, which is a rare case in VANETs. Indeed, in such ad hoc networks, the traffic pattern is mainly local, where vehicles often communicate in a local zone.

Achieving high scalability in VANET applications remains a major challenge. As such, we propose in this paper a scalable and locality aware RLSMP that improves both network performance and scalability. Furthermore, we derive explicit analytical models of both location updates and queries cost and formulate the total control overhead as an optimization problem. We demonstrate that the proposed scheme enables high scalability as well as signaling cost savings compared with existing solution.

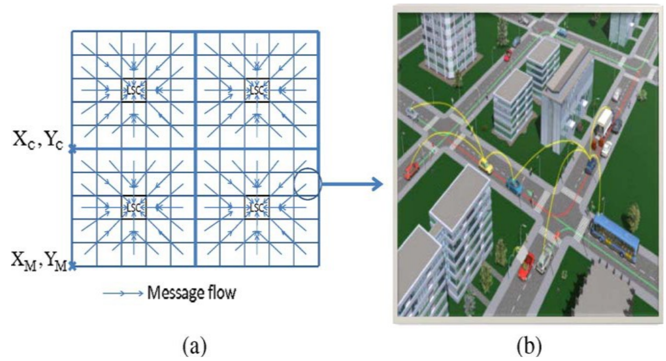

Fig. 1. System description. (a) LSC updating process. (b) Vehicle-to-vehicle communication in one cell.

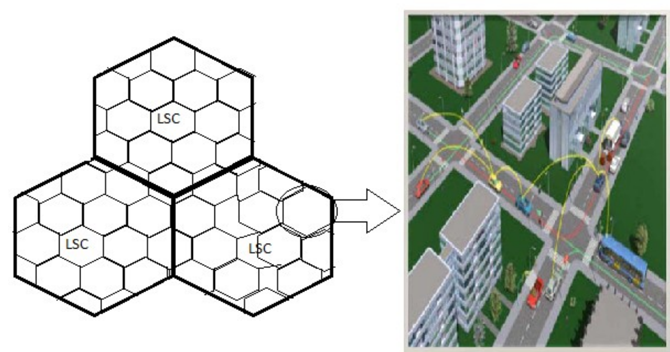

Fig.2. System Description of Vehicle to Vehicle Communication in one cell in a hexagonal topology

III. REGION BASED LOCATION SERVICE MANAGEMENT PROTOCOL

Here, by introduce the RLSMP. By envision a VANET environment that consists of roads with intersections, which is a typical scenario in urban areas. The RLSMP uses the location of nodes as a criterion for building geographical clusters. That is, each vehicle automatically determines its geographical cluster while moving, with no additional communication or delay. Furthermore, the geographical clustering suggests the possibility of message aggregation, which is essential in suppressing the number of control signals in the network. To better understand the functionalities of our protocol, we consider the following network structure as shown in Fig. 1. The vehicles in this network are considered as nodes of an ad hoc network, partitioned into virtual cells that form a virtual infrastructure. Thus by using the square shape topology shown in (fig.2), the scalability or the performance are low in this shape topology, Thus the corner nodes cannot be properly communicate with the Location Service Cell(LSC). To overcome the disadvantage in the square shape topology, a new hexagonal shape topology is introduced. By using this type of topology, all the nodes in the cell including the corner nodes having the equal power in the cell, so the corner nodes also properly communicate with the Location Service Cell (LSC). So that the performance of the Cell Leader and Location Service Cell has been improved.

A key property of the RLSMP is that nodes are grouped into geographical clusters. Consequently, the location information is restricted in a geographical cluster in the network. This explains the strategy of the protocol in denoting the central cell of each cluster as a home region or a location-service-management entity. Thus, nodes that are physically located in the central cell of one cluster are responsible for storing current location information about all nodes that belong to that cluster. This central cell is called the location service cell (LSC). Thus, the location information is locally kept inside one cluster. The CL aggregates the location information about all the nodes in its cell and forwards the aggregated control message to the LSC of its cluster. Specifically, each CL stores detailed information about the mobile nodes that it manages. sections.

A. A. CL Updating in the RLSMP

As stated before, the CL tracks the mobility of nodes within the cell and keeps the mobile node location information uptodate. For each movement, a mobile node updates its location to the CL as follows.The decision of CL updating is based on the mobile node's location relative to the center of the cell. By analyzing this information, the mobile node can make a decision without consulting other nodes, which minimizes the overhead.

In the fig 3 CL updating cost. Random-walk mobility model. The RLSMP, on the other hand, reduces the update cost since the CL is located in the center of the cell. It is worth noting that the cost of CL updates in the RLSMP is equivalent to the cost of intracell movement when r is large as it is a dominant cost.

B. LSC Updating in the RLSMP

The LSC is defined as the central cell of a cluster whose member nodes are responsible for keeping track of all the mobile nodes that are located in the cluster. The RLSMP relies on aggregating and forwarding the location updating The LSC is defined as the central cell of a cluster whose member nodes are responsible for keeping track of all the mobile nodes that are located in the cluster. The RLSMP relies on aggregating and forwarding the location updating messages. This process is achieved by all CLs residing in the cluster and must be synchronized among them. Indeed, a time schedule, which is denoted by *Time_to_Send*, is used in each CL to know when to begin sending the aggregated message. Recall that in each cell, the CL is responsible for

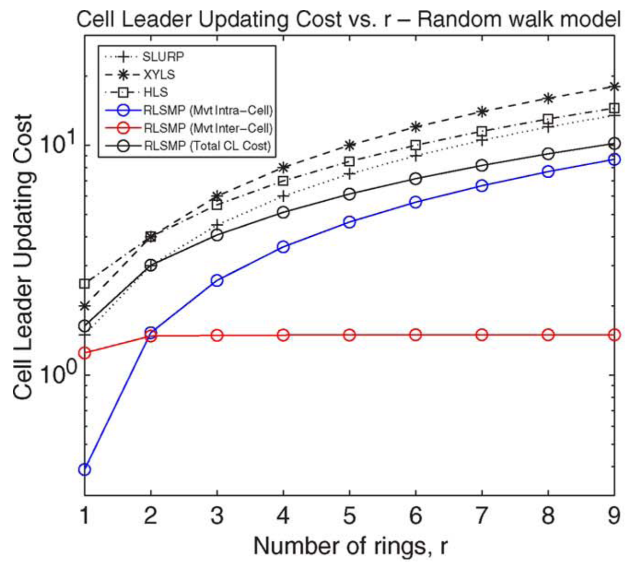

Fig. 3. CL updating cost by Random-walk mobility model.

forwarding the aggregated packets of all mobile nodes residing in the cell. Each CL stores detailed information about the mobile nodes that it manages. This information contains the node ID, the X–Y coordinates of the node location, the time of the last update, and the velocity and direction of the node movement. At the same time, the CL forwards summarized information (node ID, cell ID, and time stamp) about those nodes to the LSC of its cluster. The forwarding zone is defined by the tree structure (shown in Fig. 1), which visits the CLs. In this figure, the arrows represent flows of message aggregation, and each square represents a cell with one CL. When a CL receives location information messages from another CL in its sub-trees, it collects and combines them into one aggregated message, which is forwarded to its parent until it reaches the LSC of the cluster. Such message aggregation process effectively suppresses the number of itinerant messages in the whole network. The LSC updating algorithm is described by the pseudo code in Algorithm 1.

Algorithm 1 Location Information Updating Algorithm

1: **In one Cluster do:**
2: **if** (Cell Leader) **then**
3: Save detailed information (nodes_ID, X, Y, V, Dir) in local_table;
4:Aggregate summarized information (nodes_ID,Cell_ID, Time Stamp);
5: **if** (packet_size ≥ packet_size_limit) **then**
6: Go to step 13;
7: **else**
8: Continue aggregation in the same packet;
9: **if** (Time_to_Send) **then**
10: Go to step 13;
11: **end if**
12: **end if**
13: Send the aggregated message to the next Cell Leader in the downstream direction toward the LSC;
14: **if** (next Cell Leader is the LSC) **then**
15: Stop;

16: **end if**
17: **end if**
Using this strategy, nodes located in the center of the LSC can act as a CL of that LSC. This "special" CL has detailed information of the mobile nodes of that LSC, as well as summarized information of all nodes belonging to the corresponding cluster. Hence, LSC renewal depends on the renewal of this "special" CL. This latter operation follows the same procedure stated above in Section III-A, i.e., using the beaconing mechanism.

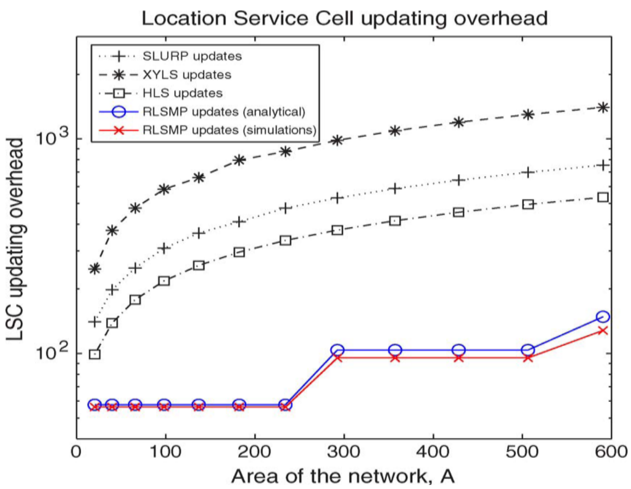

Fig. 4. LSC updating cost.

Fig. 4 depicts the LSC update cost (in terms of bytes) of all underlying protocols as a function of the network area *A* under the 2-D random-walk model.

C. Location-Information Retrieval in the RLSMP

The RLSMP is the first protocol that uses message aggregation in location querying.. When a vehicle wants to communicate with another one, it forwards a query to the CL, which aggregates the querying messages and forwards them to the location servers, i.e., the nodes that are located in the local LSC. If the queries are answered by the local LSC, i.e., the destinations are registered in the same cluster as the source code is called as local query otherwise this query is called as *global query,* where the destinations are located in a cluster other than the local cluster of the source nodes. In this case, the local LSC does not directly forward global queries; instead, they are delayed for a pre-specified time. This delay is essential for aggregating queries that are sent by the vehicles residing in that cluster.
The forwarded aggregated queries pass through the different LSCs, as shown in Fig. 5. They are forwarded in a spiral shape around the local LSC, where this spiral shape visits all surrounding LSCs until it finds information about the destinations' location. The nodes inside the visited LSCs will make use of the information stored in their own tables to determine the destinations' IDs. The use of the spiral shape is motivated by the fact that any location service protocol has to account for the locality awareness property of VANETs.

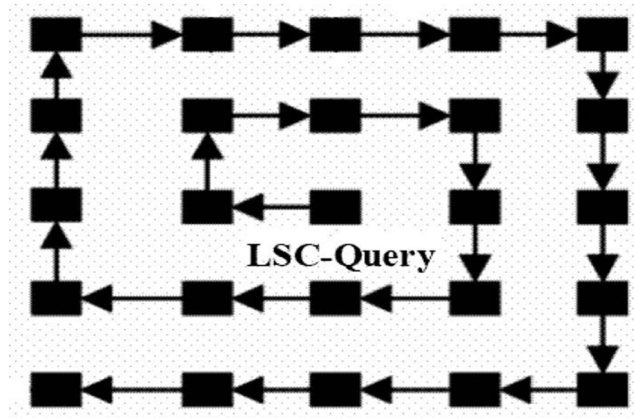

Fig. 5. Spiral shape of the location-information retrieval.

IV. CONCLUSION

To improve the efficiency of VANETs network, the RLSMP used, which is a new location-service-management protocol that supports minimum overhead and locality awareness in VANETs. The RLSMP uses message aggregation that is enhanced by geographical clustering to reduce signaling overhead. It also resolves the localization of a destination node by using local search, which begins by exploring the vicinity of the source node. Thus, to avoid the relatively long distance signaling incurred in other protocols in both location updating and querying processes. Using both analytical and simulation approaches, the RLSMP is compared with existing solutions (the SLURP, the HLS, and the XYLS). To achieve this, firstly ,develop the analytical models to evaluate both the location updates and queries for a general 2-D random-walk model. In addition, simulations have been conducted using real mobility patterns to evaluate the performance of the protocol in real mobility situations. Secondly, by investigating the optimal configuration of the RLSMP that minimizes the total signaling cost. Therefore the RLSMP minimize communication overhead and improves the locality awareness when increasing the cell size as well as the network size. As such, the RLSMP stands out as a promising candidate for large-scale wireless ad -hoc networks such as VANETs.

REFRENCES

[1] J. Zhao and G. Cao, "VADD: Vehicle- assisted data delivery in vehicular ad hoc networks," *IEEE Trans. Veh. Technol.*, vol. 57, no. 3,pp. 1910–1922, May 2008.
[2] S.Panichpapiboon andW. Pattara-atikom, "Connectivity requirements for self-organizing traffic information systems," *IEEE Trans. Veh. Technol.*, vol. 57, no. 6, pp. 3333–3340, Nov. 2008.
[3] J. Zhao, Y. Zhang, and G. Cao, "Data pouring and buffering on the road:A new data dissemination paradigm for vehicular ad hoc networks," *IEEE Trans. Veh. Technol.*, vol. 56, no. 6, pp. 3266–3277, Nov. 2007.
[4] B. Ducourthial, Y. Khaled, and M. Shawky, "Conditional transmissions:Performance study of a new communication strategy in VANET," *IEEE Trans. Veh. Technol.*, vol. 56, no. 6, pp. 3348–3357, Nov. 2007.
[5] K.-H. Chiang and N. Shenoy, "A 2-D random-walk mobility model for location-management studies in wireless networks," *IEEE Trans. Veh. Technol.*, vol. 53, no. 2, pp. 413–424, Mar. 2004.
[6] M. Ksemann, H. Fler, H. Hartenstein, and M. Mauve, "A reactive location service for mobile ad hoc networks," Dept. Sci., Univ Mannheim, Mannheim, Germany, Tech. Rep. TR-02-014, Nov. 2002s

