Vehicular Traffic Re-Routing using Genetic Algorithm

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Abstract— Traffic management is one of the most important concerns of the modern world since there is a steady increase in the number of vehicles on the road. Several techniques evolved in order to manage the traffic effectively. The centralized system suffered from two main problems-scalability and privacy. The centralized server has to perform intensive computation and hence the network load on the server is high. The server requires real time locations of the vehicles and hence the vehicle traces are completely disclosed. Hence privacy is the major concern. To overcome these problems we use a cluster formulation where cluster head plays a vital role. The parameters involved in electing cluster head are direction of the vehicle, speed of the vehicle, duration for which is has been cluster head in the past, density of the cluster, packet delivery ratio, network life time, degree of the node and transmission range. The cluster head communicates with the server and passes the re-routing details to the vehicles with in its cluster range using VANET. To overcome the privacy issue we use a privacy enhancement protocol.

Key words: VANET, Cluster Head, Traffic Density, Re-Routing

I. INTRODUCTION

The vehicular ad-hoc network (VANET) is also called network on wheels, which is used to provide communication between vehicular nodes. In VANETs, vehicular nodes are self-organized and communicate with each other in an infrastructure less environment. Vehicular communication system (VCS) has two main types of communications: vehicle to vehicle (V2V) communication and vehicle to infrastructure (V2I) communication. The main advantages of VANET include information sharing and cooperative driving.

Congestion is one of the major problems in Vehicular Networks. Congestion reduces efficiency of transportation infrastructure and increases travel time, air pollution and fuel consumption. Congestion is largely thought of as a big city problem, delays are becoming increasingly common in small cities and some rural areas as well. Hence finding effective solutions for congestion mitigation at a reasonable cost is becoming a stringent problem. The objective of the Vehicle Services is to provide better information for the users of this system for better results for their maintenance in the routing information from server. Centralized solutions for vehicular traffic re-routing to alleviate congestion suffer from two intrinsic problems: scalability, as the central server has to perform intensive computation and communication with the vehicles in real-time; and privacy, as the drivers have to share their location as well as the origins and destinations of their trips with the server.

To overcome these problems, we introduce a Terminal Intersection (TI) model for a source or destination vehicle. Compared with an end-to-end routing path for each communication pair, this model makes a group of communication pairs (sharing the same TIs and QoS requirements) directly forward data packets using the explored backbone paths, and thus this scheme is beneficial to the decrease of routing exploration time and network congestions. An ACO-based algorithm is proposed to search for the optimal QoS route between two terminal intersections. This algorithm mainly consists of the candidate route derivation process and the optimal route selection process, and it enables different communication pairs and ants closely collaborate with each other, so as to update the latest routing information and adaptively cope with rapid topology changes. An opportunistic method is proposed in the candidate route derivation process by means of both local and glob- al pheromone. Compared with blind flooding or broadcast mechanisms, our method helps to explore new routing paths, decrease routing exploration time and reduce network over- head.

II. LITERATURE SURVEY

N.Loulloudes et.al [2012] proposed and investigated that automobile congestions have an adverse effect in modern societies, causing the loss of billions of dollars and man-hours every year throughout the world. In this era of global economic recession, drivers will require the necessary solutions and driving aids that facilitate the improvement of daily road transport and minimize unnecessary expenditure. In this work, we lay the groundwork for V-Radar, a query protocol for retrieving vehicular traffic information using V2V communications. The advantage of V-Radar over related works is its ability to monitor using location-dependent queries the prevailing traffic conditions in a number of road- paths from a vehicle’s current location towards its final destination. We introduce its modular architecture and provide preliminary evaluation results showing significant improvements over a similar scheme.

R.Dingledine et.al [2011] proposed and investigated that anonymous networks provide security for users by obfuscating messages with encryption and hiding communications amongst cover traffic provide by other network participants .The traditional goal of academic research into these networks has been attacks that aim to uncover the identity of network users. But the success of an anonymous network relies not only on its technical capabilities, but on adoption by a large enough user base to provide adequate cover traffic. If anonymous network node can be identified, the users can be harassed, discouraging participations. Tor is an example of widely used anonymous network which uses a form of Onion Routing to provide low latency anonymous communication. This paper demonstrates that traffic from a simulated Tor network can be distinguished from regular encrypted traffic, suggesting that real world Tor users may be vulnerable to the same analysis.

M.Haklay et.al [2008] proposed and investigated that the OpenStreetMap project is a knowledge collective that provides user-generated street maps. OSM follows the peer production model that created Wikipedia; its aim is to create a set of map data that's free to use, editable, and licensed under new copyright schemes. A considerable number of contributors edit the world map collaboratively using the OSM technical infrastructure, and a core group, estimated at approximately 40 volunteers, dedicate their time to creating and improving OSM's infrastructure, including maintaining the server, writing the core software that handles the transaction with the server, and creating cartographical outputs. There's also growing community of software developers who develop software tools to make OSM data available for further use across different application domains, software platforms, and hardware devices. The OSM project's hub is the main OSM web site.

K. Sampigethayaet.al[2007] proposed and investigated that the Communication messages in vehicular ad hoc net- works (VANET) can be used to locate and track vehicles. While tracking can be beneficial for vehicle navigation, it can also lead to threads on location privacy of vehicle user. In this paper, we address the problem of mitigating unauthorized tracking of vehicles based on their broadcast communications, to enhance the user location privacy in VANET. Compared to other mobile networks, VANET exhibits unique characteristics in terms of vehicular mobility constraints, applications requirements such as a safety message broadcast period, and vehicular network connectivity. Based on the observed characteristics, we propose a scheme called AMOEBA that provides location privacy by utilizing the group navigation of vehicles. By simulating vehicular mobility in freeways and streets, the performance of the proposed scheme is evaluated under VANET application constraints and two passive adversary models. We make use of vehicular groups for anonymous access to location based service applications in VANET, for user privacy protection. The robustness of the user privacy provided is considered under various attacks.

III. PROBLEM DEFINITION

The central server has to perform intensive computation to reassign vehicles to new paths and communication with the vehicles to send the paths and to receive location updates in real-time. The server requires the real time locations as well as the origin and destination of the vehicles. Hence privacy is an issue here. The other key issues when routing also includes flooding in route discovery, wasted bandwidth, delay, increasing network congestions and so on.

IV. METHODOLOGY

A. *Dynamic Source Routing Protocol*

DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration. DSR contains two phases

1) Route Discovery.
2) Route Maintenance.

B. *Particle Swarm Optimization Algorithm*

A basic variant of the PSO algorithm works by having a population of candidate solutions. These particles are moved around in the search-space according to a few simple formulae. The movements of the particles are guided by their own best known position in the search space as well as the entire swarm's best known position. When improved positions are being discovered these will then came to guide the movements of the swarm. The process is repeated and by doing so it is hoped, but not guaranteed that a satisfactory solution will eventually be discovered.

C. *System Architecture*

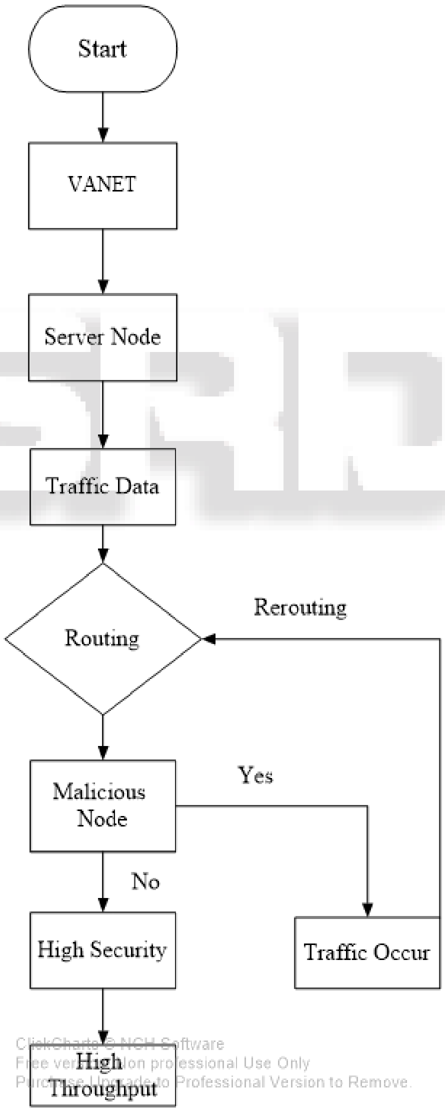

Fig. 1: Flow Diagram for Vehicular Traffic Re-Routing

D. Flow Diagram

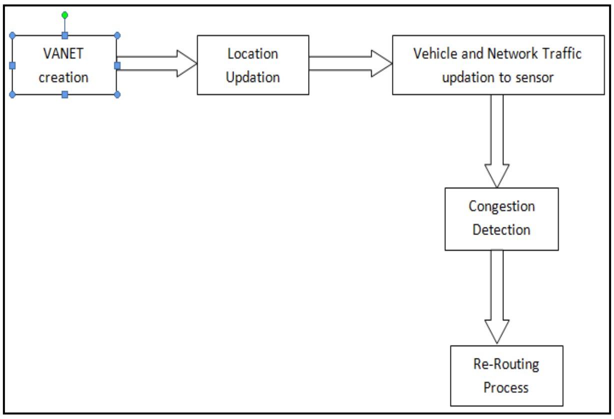

Fig. 2: Flow Diagram to Denote the Re-Routing Process

V. SYSTEM IMPLEMENTATION

A. Modules

1) Node Deployment

Nodes numbered from 0 to 50 are deployed. The 50th node is assigned as the server. Every node identifies its neighbour using the distance formula. The communication takes place between a node and its neighbour by sending hello messages. The node responds by sending an acknowledgement.

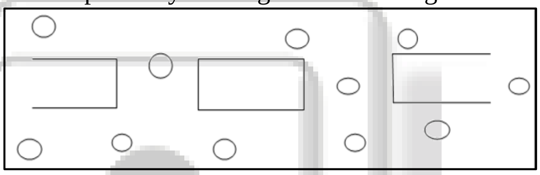

Fig. 3: Node Deployment

2) Data Forwarding

In this part, initially the server send the traffic data to vehicle and then the vehicle are sending neighbour density values to server. This process is followed in all the vehicles within the particular cluster.

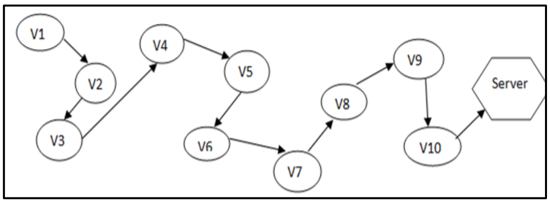

Fig. 4: Data Forwarding

3) Routing

In this part, routing concept is followed. Routing is finding the shortest path from source to destination. The routing process finds the optimal route and privacy condition is also maintained.

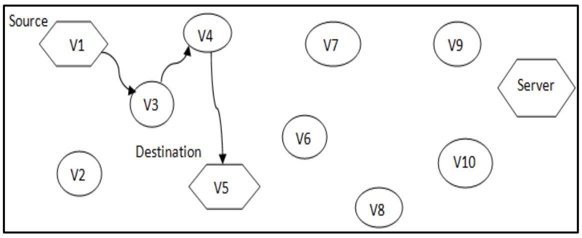

Fig. 5: Routing Process

VI. RESULTS

The technique reduces the network load on the server which is highly useful as the number of vehicles increases. The reactive routing protocols have no need to periodically flood the network for updating the routing tables. Intermediate nodes are able to utilize the route cache information efficiently to reduce the control overhead. The initiator only tries to find a route if actually no route is known. This protocol is bandwidth saving since no hello message is needed. This system preserves the privacy of the user with the effectiveness of rerouting. In this project we are finding the future enhancement for reducing the time delay to reaching the routing information to server. So we are including new process is called “Clustering Process”. The clustering process is a Choose the group of nodes and then the group of all nodes compare the distance and energy value and then the checking the value to low distance and high energy choose the CH. After the group nodes sending the message to CH and CH send to next CH to reaching the Server node.

VII. CONCLUSION

The paper demonstrates that a practical, cost-effective, and efficient traffic re-routing system can be implemented and deployed in real-life settings. This system, DIVERT, offloads a large part of the re-routing computation at the vehicles, and thus, the re-routing process becomes scalable in real-time. To make collaborative re-routing decisions, the vehicles exchange messages over VANETs. We have optimized VANET data dissemination to allow for efficient distributed re-routing computation. In addition, the system balances user privacy with the re-routing effectiveness. The simulation results demonstrate that, compared with a centralized system, DIVERT increases the user privacy substantially, while the re-routing effective- ness is minimally impacted. The system avoids jitter that is the variation in the delay of received packets. The packet loss is minimized to a greater extent and hence the packet delivery ratio of the packets successfully received to the total packets send remains same.

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