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Use of Epidemic Routing Protocol in IOT for Vehicular Communication

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Abstract - The Now a days vehicle becomes primary need in everyday life. There are new invention has been done to make a safe and comfortable driving. Modern vehicles equipped with the different devices like camera, sensors, and actuator, radar which get the information, compute and make available for user while driving. There are lots of inventions has been done in vehicle to vehicle communication (V2V). There are lots of limitations in the existing system but here we are going to overcome scalability challenge which is one of the big issue. Scalability issue going to overcome using epidemic routing protocol. Epidemic routing protocol guarantees 100% message delivery which help to deliver message with minimum latency so that message reach to the another vehicle within time help to avoid traffic collision and decrease accident count rate.

***Keywords* - VCS (Vehicle communication system). VANET (Vehicular Ad Hoc Network), GPS (Global Positioning System), IOT (Internet of Things), ITS (intelligent transportation systems).**

1. Introduction

Modern vehicle equipped with devices (mobile devices, GPS devices, embedded computers, camera, radar, sensors). Particularly numerous vehicles have powerful sensing, networking, communication and data processing capabilities by itself and can communicate with other vehicles or exchange information with the external environments over various protocols include HTTP, TCP/IP, SMTP, WAP and NGTP (Next Generation Telematics Protocol). Many innovative services such as remote security for disabling engine and remote diagnosis have been developed to enhance drivers' safety, convenience and enjoyment. The advances in vehicle inventions and IoT have provided a promising opportunity to further address the increasing transportation issues such as heavy traffic, congestion, accident and vehicle safety. In the past few years, researchers have proposed a few models that use cloud computing for implementing intelligent transportation systems (ITS). For example, a new vehicular cloud architecture called ITS-Cloud was proposed to improve vehicle-to-vehicle communication and road safety. A cloud-based urban traffic control system was also proposed to optimize traffic control.

Now a days rapid advances in modern wireless telecommunication done, IoT has received a lot of attention and is expected to bring benefits to numerous application areas including health care, manufacturing and transportation.

IoT as an enabling infrastructure for developing a Vehicular Data where transportation related information such as traffic control and management, car location tracking and monitoring, road condition, car warranty and maintenance information can be intelligently connected and made available to drivers, auto-makers, part-manufacturer, vehicle quality controller, safety authorities and regional transportation division.

2. Literature Survey

The rapid increase of vehicular traffic and congestion on the highways began a big issue. Consequently, year by year, the ascending rate of car accidents and casualties in most of the countries. Therefore, exploiting the new technologies, e.g. wireless sensor networks, is required as a solution to reduce rode and traffic issues. This has motivated to propose a good system to utilize Wireless Sensor Networks for vehicular networks. Here introduce the vehicular network employing wireless Sensor networks as Vehicular Ad Hoc and Sensor Network, or VASNET in short. The proposed VASNET is particularly for highway traffic .VASNET is a self-organizing Ad Hoc and sensor network comprised of a large number of sensor nodes. In VASNET there are two kinds of sensor nodes, some are embedded on the vehicles-vehicular nodes- and others are deployed in predetermined distances besides the highway road, known as Road Side Sensor nodes (RSS). The vehicular nodes are used to sense the velocity of the vehicle for instance. We can have some Base Stations (BS) such as Police Traffic Station, Firefighting Group and Rescue Team. The base stations may be stationary or mobile. VASNET provides capability of wireless communication between vehicular nodes and stationary nodes, to increase safety and comfort for vehicles on the highway roads.

The main and big challenge of VASNET it requires the storage for data collection and also need to manage the retrieval of massive amounts of sensed data which is a big task.[2011 rama murthy]. In this paper author says vehicular networks become popular and many vehicles access data through a roadside unit. This paper proposes scheduling schemes for efficient delivery of data packets in vehicular adhoc network. On the basis of priority scheduling algorithm vehicles can download/upload the data from Road Side Unit. System can control the congestion and delay of data by assigning the priorities to the message. Process with highest priority is executed first and highest priority is assign to the processes which have the smallest data size. If the two processes having the same data size then assign the priority on first come first serve scheduling (FCFS). This paper combines these two algorithms and the new algorithm D*A. is introduced. This algorithm is responsible for only sending the commercial messages and the safety messages will be send on the different channel. The emergency messages will be sending through control channel with help of EDF scheduling. This paper, addressed some challenges in vehicle roadside data access. Here they proposed the framework of the congestion control approach. This will help in improving the reliability and scalability of a process.

There are many service scheduling issues in vehicle-roadside data access. [neha verma 2012]. In this paper author described hybrid approach for routing in opportunistic networks. In such networks there is no guarantee that a fully connected path between source and destination exists at any time, rendering traditional routing protocols unable to deliver messages between hosts. Thus, there is a need for a way to route through such networks. This paper proposes hybrid approach which combines Prioritized Epidemic Routing and Probabilistic Routing. This approach prioritizes bundles based on costs to destination, source, and expiry time. Costs are derived from per-link "average availability" information that is disseminated in an epidemic manner, but the problem with this hybrid approach is maintenance cost for this is high due to its combine nature and in case any problem occur sometimes it is difficult to handle the situation .[2013 Lokendra Singh]. This paper says IoT-based vehicular data cloud is efficient, scalable, secure and reliable and they can be deployed at a large-scale. But Existing algorithms and mechanisms are unsatisfactory to meet all the requirements at the same time.

There are some challenges. Out of that Scalability and Technology Integration is the major challenge. The effectiveness of a vehicular cloud depends on its scalability to handle a dynamically changing number of vehicles. In addition to handling regular traffic, vehicular clouds must be able to handle traffic spike or sudden demands caused by special events or situations such as sport games or emergencies. More development on optimization algorithms that coordinate virtual machines, storage space and network bandwidth to balance server workload and improve computing resource utilization on the vehicular clouds is needed. As new devices and technologies are coming out each year, developing effective IoT Middleware that supports integration of these new technologies and devices with existing in-vehicle technologies from automobile manufacturers will be a challenge.[2014] .

3. System Architecture

3.1 Epidemic Routing System

Routing protocols allow nodes with wireless adaptors to communicate with other without any pre-existing network infrastructure. Rapidly changing network topology help to deliver messages in the case where there is never a connected path from source destination. Here we are using Epidemic Routing, where random pair-wise exchanges of messages among mobile hosts ensure eventual message delivery. The goals of Epidemic Routing are to: I) maximize message delivery rate, ii) minimize message latency and iii) minimize the total resources consumed in message delivery. Wireless network adaptors in portable computing devices, such as cellular phones, personal digital assistants, and laptops. The goal of this type of protocol is to develop techniques for delivering application data with high probability even when there is never a fully connected path between source and destination or if there is lots of messages. In this way, messages are quickly distributed through connected portions of the network. Epidemic Routing then relies upon carriers coming into contact with another connected portion of the network through node mobility. At this point, the message spreads to an additional island of nodes. Through such transitive transmission of data, messages have a high probability of eventually reaching their destination.

Figure 1 shows Epidemic Routing at a high level, with mobile nodes represented as dark circles and their wireless communication range shown as a dotted circle extending from the source. In Figure 1(a), a source, S, wishes to send a message to a destination, D, but no connected path is available from S to D. S transmits its messages to its two neighbors, C1 and C2, within direct communication range. At some later time, as shown in Figure 1(b), C2 comes into direct communication range with another host, C3, and transmits the message to it. C3 is in direct range of D and finally sends the message to its destination.

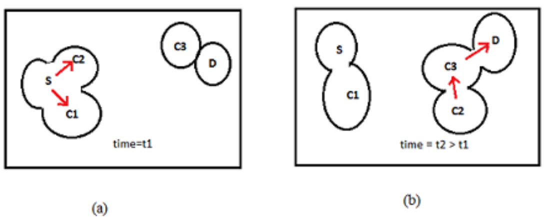

Fig1. A source, S, send message to a destination but no connected path is available in part (a). C1-C3 deliver the message to its destination as shown in (b).

The goal of Epidemic Routing is: to deliver a message (update) with high probability to a particular host. In fact if there is certain situation where message count is high than regular, in this case also routing protocol should be able to send or receive message eventually. Likewise Epidemic Routing should be able to message broadcast/multicast in partially connected ad hoc networks. The overall goal of Epidemic Routing is to maximize message delivery rate and minimize message delivery latency, while also minimizing the aggregate system resources consumed in message delivery. We explore message delivery rate and resource consumption under a number of different scenarios. Our results show that Epidemic Routing is able to deliver all messages in where existing ad hoc routing protocols fail to delivery some messages because of limited node connectivity. Epidemic Routing delivers 100% of messages assuming enough per-node buffering to store between 10-25% of the messages originated in the scenario.

1. Goal:- The goals of Epidemic Routing are to:
   - Efficiently distribute messages through partially connected ad hoc networks in a probabilistic fashion,
   - Minimize the amount of resources consumed in delivering any single message
   - Maximize the percentage of messages that are eventually delivered to their destination

2. Epidemic Routing Protocol: Epidemic Routing supports the eventual delivery of messages based on minimal assumptions like only periodic pair-wise connectivity is required to ensure eventual The Epidemic Routing protocol works as follows.

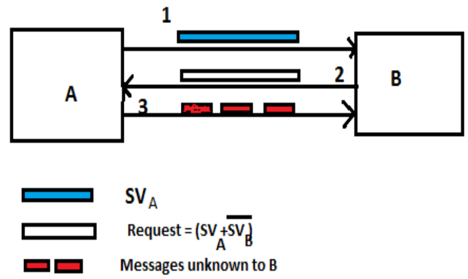

Figure 2: Operation of Epidemic Routing protocol when two hosts, A and B, come into transmission range with one another.

Each host maintains a buffer consisting of messages that it has originated as well as messages that it is buffering on behalf of other hosts. For efficiency, a hash table indexes this list of messages, keyed by a unique identifier associated with each message. Each host stores a bit vector called the summary vector that indicates which entries in their local hash tables are set. When two hosts come into communication range of one another, the host with the smaller identifier initiates an anti-entropy session.

To avoid redundant connections, each host maintains a cache of hosts that it has spoken with recently. Anti-entropy is not re-initiated with remote hosts that have been contacted within a time period. During anti-entropy, the two hosts exchange their summary vectors to determine which messages stored remotely have not been seen by the local host. In turn, each host then requests copies of messages that it has not yet seen. The receiving host maintains total autonomy in deciding whether it will accept a message. For example, it may determine that it is unwilling to carry messages larger than a given size or destined for certain hosts. We do model a maximum queue size associated with each host, which determines the maximum number of messages a host is willing to carry on behalf of other hosts. Figure 2 depicts the message exchange in the Epidemic Routing protocol. Host A comes into contact with Host B and initiates an anti-entropy session. In step one, A transmits it summary vector, and SVA to B. SVA is a compact representation of all the messages being buffered at A. Next, B performs a logical AND operation between the negation of its summary vector, SVB, and SVA. That is, B determines the set difference between the messages buffered at A and the messages buffered locally at B. It then transmits a vector requesting these messages from A. In step three, A transmits the requested messages to B. This process is repeated transitively when B comes into contact with a new neighbor.

3.2 Proposed System Architecture

Given sufficient buffer space and time, these anti-entropy sessions guarantee eventual message delivery through such pair-wise message exchange. Epidemic Routing associates a unique message identifier, a hop count, and an optional acknowledgment request with each message. Thus, high priority messages might be marked with a high hop count, while Given that messages are delivered probabilistically in epidemic routing, certain applications may require acknowledgments of message delivery.

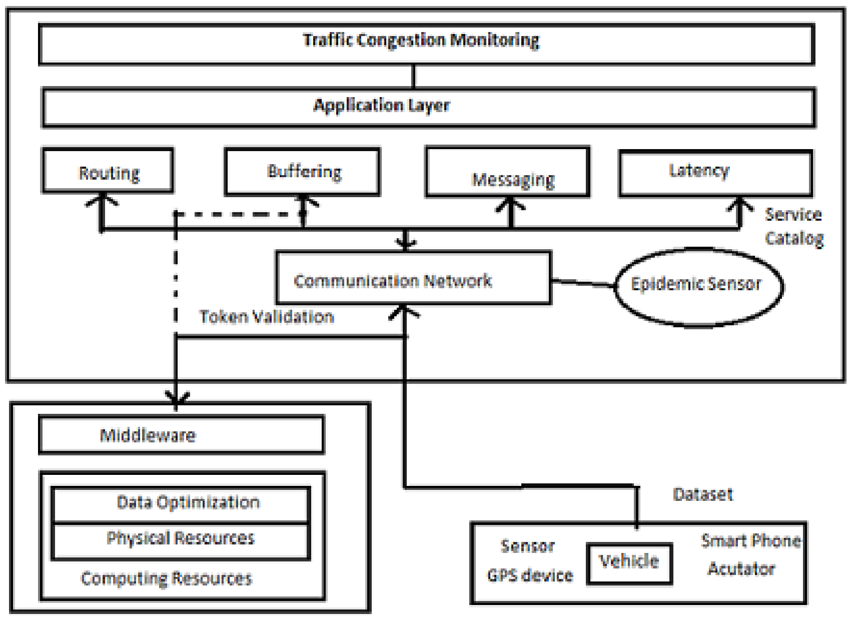

Fig 3: System Architecture

Each host sets a maximum buffer size that it is willing to allocate for epidemic message distribution. The buffer size limits the amount of memory and network resources consumed through Epidemic Routing. In general, hosts will drop older messages in favor of newer ones upon reaching their buffer's capacity. To ensure eventual delivery of all messages, the buffer size on at least a subset of nodes must be roughly equal to the expected number of messages in transit at any given time. Otherwise, it is possible for older messages to be deleted from all buffers before delivery. Fig 3 shows system architecture diagrammatically.

4. Result

In this project we have covered traffic related cases where N number of vehicles can transfer the data to each other where data will deliver with minimum latency, with high reliability. Here we will first connect service provider program where server will start successfully first and then search client program with start where the vehicle will search station location. Here vehicle will transfer the data with each other if first vehicle source location and second vehicle destination location match then first vehicle will send traffic related data to second within time with high probability.

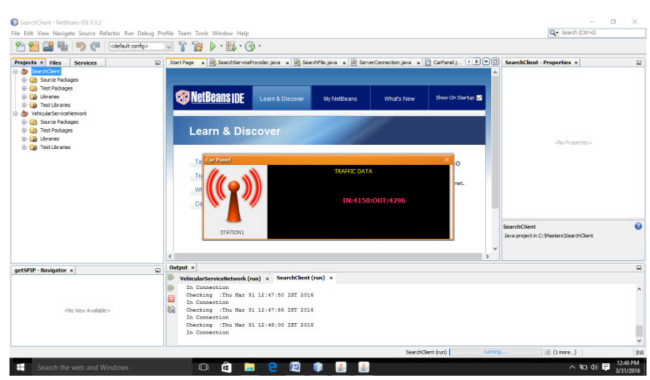

Fig. 4 Vehicle detect network station

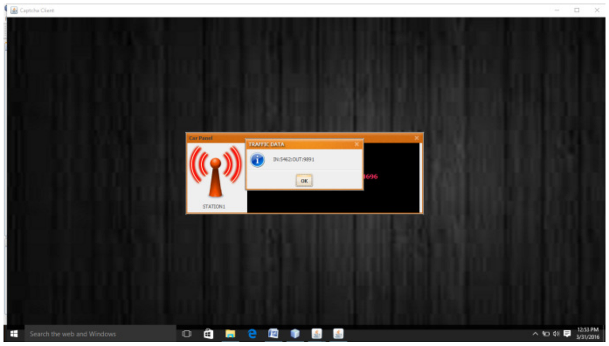

Fig 5 Message transmission between vehicle to vehicle where first vehicle source station is second vehicle destination station.

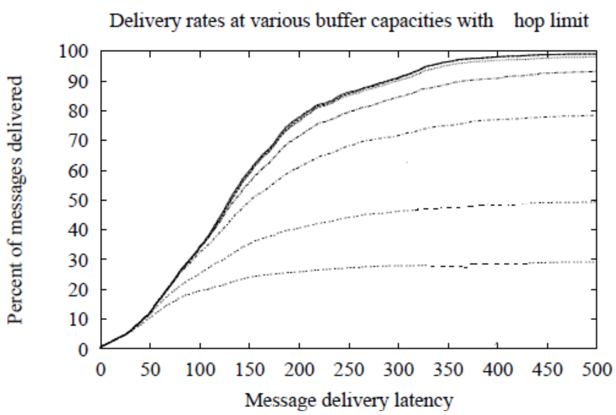

Fig6. Eventual message delivery with epidemic routing protocol. Result figure 6 gives the exact idea how epidemic routing protocol provide eventual message delivery even if the message count increase the message delivery rate is 100%.

5. Conclusion

In this result paper, we used epidemic routing protocol which allow confirm message delivery even if there are 100 or 1000 of messages to be deliver in some special cases. Existing ad hoc routing protocols are robust to rapidly changing network topology, but they are unable to deliver packets in the presence of a network partition between source and destination.

The exact problem here which we are going to overcome is scalability issue where current system is able to handle only certain vehicle message count but here we are using epidemic routing in IOT where random pair-wise exchanges of messages among mobile hosts ensure eventual message delivery. The goals of Epidemic Routing are to maximize message delivery rate and to minimize message latency while also minimizing the total resources (e.g., memory and network bandwidth) consumed in message delivery.

In our case we will show that Epidemic Routing delivers 100% of eventual message delivery with reasonable resource consumption where existing ad hoc routing protocols are unable to deliver some messages because no end-to-end routes are available.

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