



Technique to control Data Dissemination and to support data accessibility in Meagerly Connected Vehicles in Vehicular Ad-Hoc Networks (VANETS)

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Abstract- To boost the safety and for the comfort of road traffic users Vehicular Ad Hoc Network (VANET) is envisaged by the automotive industry as one of the key to future technology. Including safety, traffic management, and infotainment, VANETs could maintain a large number of applications. Depending on the consistent working of these applications skilled transmission of different types of messages with required excellence of service works. Especially to aid security applications in VANET broadcasting in Vehicular Ad Hoc Networks (VANET) is a technique to be used. A capable data transaction technique is required for a safety application to transmit data to the vehicles. Bordering on emergency to vehicles, collision and reverberation, driver assistance are comes under safety applications. Similarly, data transaction and traffic related information are comes under non-safety applications. The Intelligent Transportation Systems (ITS) have been measured as a significant communication infrastructure by Vehicular Ad Hoc Networks. Existing protocols are not suitable for sustaining delay tolerate applications in thinly connected vehicular networks. So, in this research, an idea of helper node is introduces, where a moving vehicle hold the packet awaiting a new vehicle moves into its nearby area and forwards the packet. Predictable vehicle mobility is followed, which is limited by the traffic pattern and road outline. The results produced from this approach depicts that the proposed VADD protocols surpass existing solutions in terms of throughput, privacy, data packet delay and packet loss.

1. INTRODUCTION

A vehicular ad hoc network (VANET) uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes. Automotive companies like General Motors, Toyota, Nissan, Daimler Chrysler, BMW and Ford promote this term. VANET can achieve affective

communication between moving node by using different ad-hoc networking tools such as Wifi IEEE 802.11 b/g, WiMAX IEEE 802.10, Bluetooth, IRA. [3]

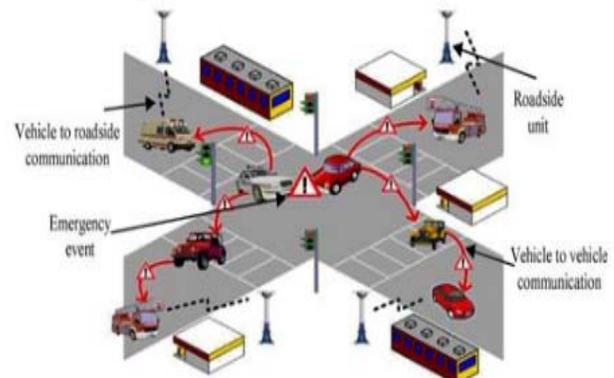


Figure 1- Basic structure of VANET [1]

Vehicular ad hoc networks (VANETs) have come forward as one of the most successful commercial applications of mobile ad hoc networks. One major aspiration of VANET deployment is to boost road safety and moving efficiency. Mainly VANET research has resolute on analyzing routing algorithms in a highly dark network topology under the over easy assumption that a classic vehicular network is well allied in nature. Another phenomenon that could lead to network disintegration in VANET is the low breach ratio of the DSRC technology at the first stages. This case implies that, even during hasten hours; the number of cars that are capable with DSRC radios could be extremely little due to the low incursion ratio of the DSRC expertise. This disconnected network problem poses a fundamental research confront for embryonic a reliable efficient routing protocol that can hold up safety applications in extremely diverse VANET topologies. [2]

2. VANET ARCHITECTURE

Data dissemination in VANET depends upon three architectures:

V2V

This is vehicle to vehicle architecture where vehicles act as both consumers and producers as vehicles receive information from other vehicles in the network and distribute that information to other vehicles in the network. So, both

collection and distribution of data are done within the network for faster delivery of messages.

V2I

This is vehicle to infrastructure wireless architecture in which infrastructure is used to collect information from vehicles and provide that information to other vehicles when necessary.

Hybrid

This is combination of both V2V and V2I architectures.

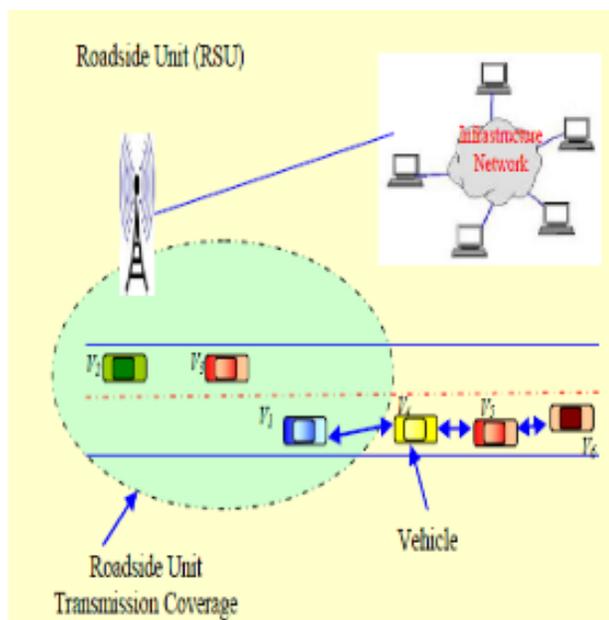


Figure 2- VANET Architecture [5]

Every node i.e., a vehicle or RSU communicates with other nodes in single hop or multi hop. VANETs are designed with the goals of enhancing driving safety and providing passenger comfort.

In VANETs, the types of communication are the following:

- Vehicle-to-Vehicular (V-V) or Inter-Vehicular Communication.
- Vehicle-to-Infrastructure (V-I) or Vehicle-to-Roadside Communication.
- Inter Roadside Communication

3. CHALLENGES IN VANETS

- a) Multi-hop data delivery is challenging task as frequent disconnections and high mobility is there in VANETS.

- b) Gathering of information like accident, speed limit, obstacle information, and traffic conditions etc. for safety and entertainment convenience purpose.
- c) Vehicles should be chosen for data delivery in such a way that packets will be transmitted with minimum delay to destination.

4. PROBLEM FORMULATION

In VANET, it is more effective to deploy roadside units in highly populated areas so as to serve more travelers with less cost. In these areas, data (such as traffic information or advertisement) need to be delivered too many vehicles and push-based approach is most widely used. The communication range of the roadside unit is limited but the data may need to be disseminated several miles along the road. Existing solutions are based on opportunistic data dissemination every vehicle buffers the data it receives, and relies on the intermittent connection between vehicles to propagate the data. However, the performance of the opportunistic dissemination suffers in the areas with high vehicle density due to MAC layer collisions. Different applications in VANET often call for different delay requirements. The network should maintain a low level of channel utilization, so as to ensure enough bandwidth for on time delivery of more time stringent data. Therefore, it is very important to reduce the bandwidth consumed by those more delay tolerant data. A vehicle far from the service roadside unit may have to go through multiple hops over long distance to access the data on the roadside unit. However, data access through multi hop is much more difficult since VANET is highly mobile and sometimes sparse. The network density is related to the vehicle traffic density, which is affected by both location and time. Although it is very difficult to find an end-to-end connection for a meagerly connected network, the high mobility of vehicular networks introduces opportunities for mobile vehicles to connect with each other intermittently during moving.

5. PROPOSED SYSTEM

TLO (The Last One) is a position based algorithms which provide proper data dissemination in an ad hoc network. TLO algorithm provides an effective solution to reduce end to end delay and broadcast storm problem. In TLO, there are a series of assumptions to be made which makes the algorithm yield better results. In this algorithm it is assumed that every node in the network is completely equipped with GPS, i.e. each vehicle knows the exact geographical location of the other vehicles which are in the communication range. Frequent updating of information should take place at closer intervals. Relative velocity between vehicles should change slowly in order to have longer updating interval. Whenever an accident takes place, the accident vehicle broadcasts an alert message to all

the other vehicles within its communication range. So all the vehicles within the communication range of the accident vehicle will be receiving the alert message, after receiving the message it will not rebroadcast it immediately. It will wait for some time and will perform TLO algorithm and it will select the last vehicle within that particular communication range.

Vehicle Index	Vehicle location from start of the road (in meters)	Calculated distance from the emergency initiator Vehicle A (in meters)
Vehicle A	060	000
Vehicle B	120	060
Vehicle C	180	120
Vehicle D	240	180
Vehicle E	300	240

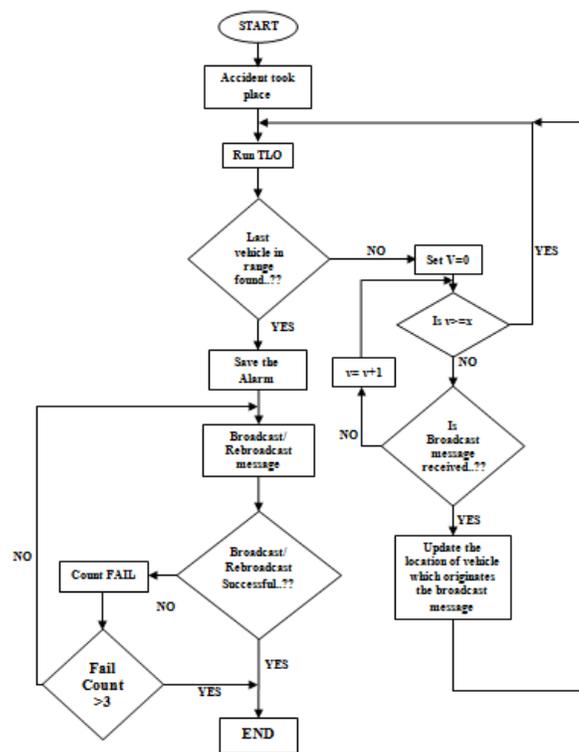
Table 1- Neighbor Location Table

With the updated Table, each vehicle calculates their distance from the emergency initiator vehicle or the repeater vehicle (from accident table) and also it compares their neighbor distances from the emergency initiator vehicles. Each vehicle which receives the alert message does this operation, the vehicle with the largest difference in the distance from the emergency initiator is considered as the last one.

Proposed Algorithm (VADD):

VADD (Vehicle Assisted Data Delivery Technique with carry forward technique)

- Step 1:** Generate network scenario using NS-2
- Step 2:** Start with some initial elements like transmission range, neighbor node, source vehicle and destination vehicle.
- Step 3:** Initialize with n no. of nodes.
- Step4:** Implement Carry forward technique.
- Step 5:** Start Data Transmission with VADD where carry forward system start.
- Step 6:** In carry forward technique, a node will be generated which will contain forward path for destination node.
- Step 7:** Then finally data will be transferred from source to destination with automatic switching of nodes for efficient data transmission.
- Step8:** This process continuation until the data dissemination is done.



Flowchart 1- Flow control of TLO

6. SIMULATION AND RESULTS

In below figure 3, it depicts the basic setup of simulation. Here, eight nodes are used to represent the whole scenario. The nodes are labeled as node 0, node 1 and so on up to node 7.

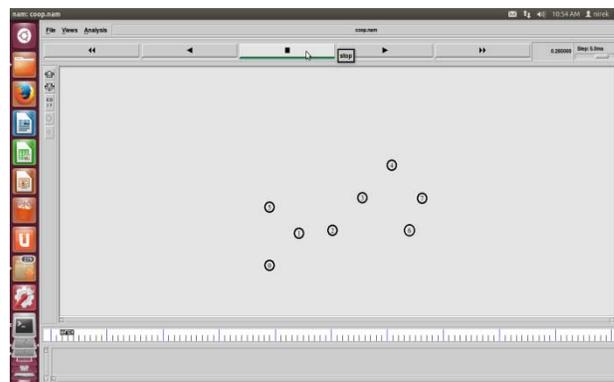


Figure 3- Basic Setup

The basic setup is based on system The Last One (TLO). TLO is an algorithm which works on behalf of a position of a node. With the help of TLO end to end delay can be reduced. Only the node which is equipped with GPS facility can be a part of this setup. With the GPS facility only, every node can be tracked in the network and every vehicle on highway can track the actual position of other vehicles.

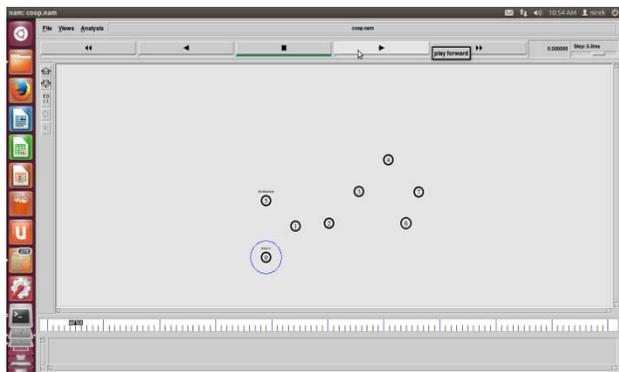


Figure 4- Source and destination

In Figure 4, both source and destination are represented. Node 0 is acting as source node which will transfer the data and node 5 will act as the destination node which will receive the data from source node. In case of VANET, all the nodes are assumed as vehicles which are running at highway. All nodes are not moving.

In figure 5, it is represented that the initial transmission has been started between source node 0 and destination node 5. When an accident happened then a vehicle start transmitting signal in the form of alert message to all the other vehicles those comes within its range. All the other vehicles will surely receive the alert message. All the vehicles those receive the alert message will not broadcast it instantly. Indeed vehicle will wait for some time and will run TLO algorithm. Due to TLO the vehicle will select the last vehicle that will be available in a particular communication range.

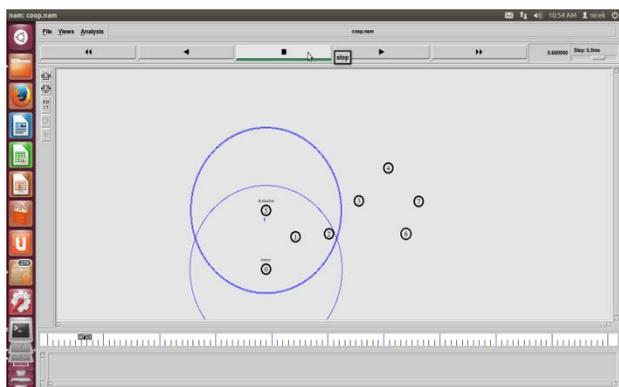


Figure 5- Data transmission between source and destination

Figure 6 depicts the data packet loss. It shows that when some node moves out of a range from the initial node, and no other node exists between them which act as an intermediate node, then packet loss will occur. In this figure, node 5 is moving out, so node 0 is left with only one alternative that it will transfer the signal to node 1 and then node 1 will transfer it to the destination. Under this scheme only, the data packet will be transferred from source to destination without any loss. Node 1

here will perform an additional duty of carry-forward. Under this scheme, node 1 will carry data packets from node 0 and then forward it to the node 5. This is just like hold and wait. In figure 7, node 1 is receiving data packets from node 0 and then transferring it to the node 5.

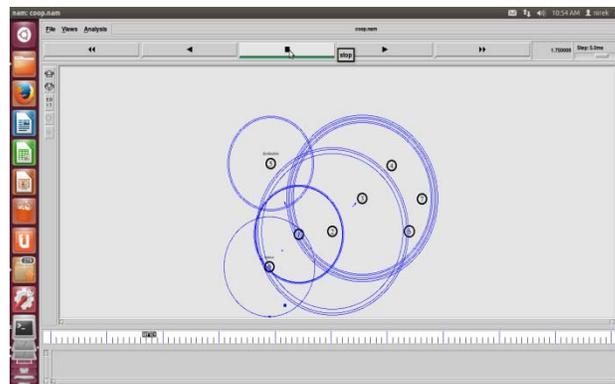


Figure 6- Data packet loss

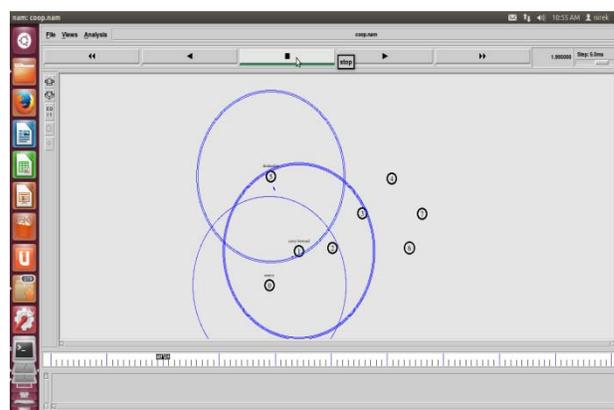


Figure 7- Carry forward

Figure 8 is showing that vehicle number 5 is moving away from vehicle number 0. Vehicle 1 is performing carry forward operation as vehicle 5 is still in its range. Same performance is still given by all the participated nodes. When vehicle 5 moves out of the range of vehicle 1 then only another node that is between 0 and 5 will perform the job of carry forward.

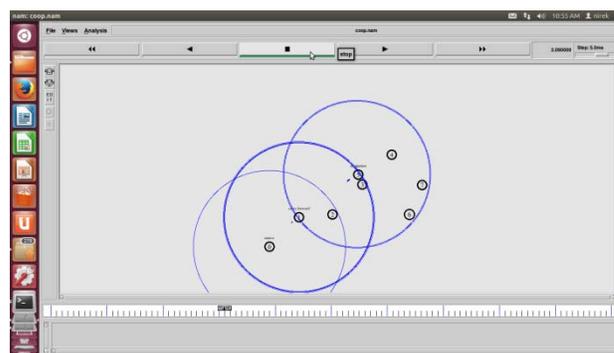


Figure 8- Destination is moving

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In figure 9, node 5 moves out of range of node 1, it means now node 1 is not able to transfer packets to node 5 because if node 1 still continue to perform carry forward operation then the chances of data loss will always be there. So, under this scenario carry forward job will be assigned to some another available node. Now, node 2 will perform the entire task those were performed by the node 1.

There is one table which is maintained by all the nodes and this table is keeps on updating, each vehicle calculates their distance from the emergency initiator vehicle and also it compares their neighbor distances from the emergency initiator vehicles. Each vehicle available at highway which receives the alert message does this operation, the vehicle which is far away from the initiator with the largest difference in the distance is considered as the last one from the table.

When one node, which is acting as a last node in the setup under TLO algorithm, is over taken by another node, then the new node will be considered as the last node in the setup. Due to this, the last node will be changed. In figure 10, the destination changed from 5 to 6 as 6 is far from 5 and now it will act as TLO in the scenario. In the mean time when no one exists there to collect data, some of the packets will be lost. After this, again everything will follow the same routine and same process will be performed.

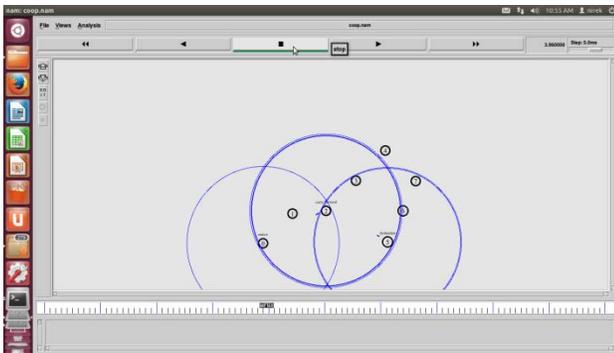


Figure 9- Carry forward changed

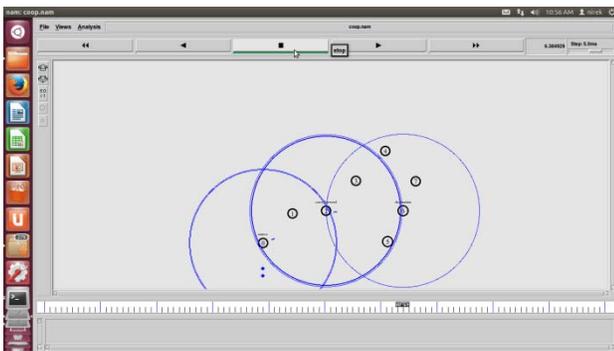


Figure 10- Destination changed

Node 6 is also acting as a moving vehicle at highway. So in figure 11, node 6 is changing its position and becoming the TLO. Node 0 which is an accidental vehicle is sending signals to the nearby nodes from the initialization of setup. Node 0 is sending to node 2. Node 2 is sending packets to node 3 where node 3 is now performing carry forward job. The distance between node 3 and node 6 is more so there must be some other node that can act as an intermediary and help node 3 to forward packets to node 6. So this job is performed by node number 4.

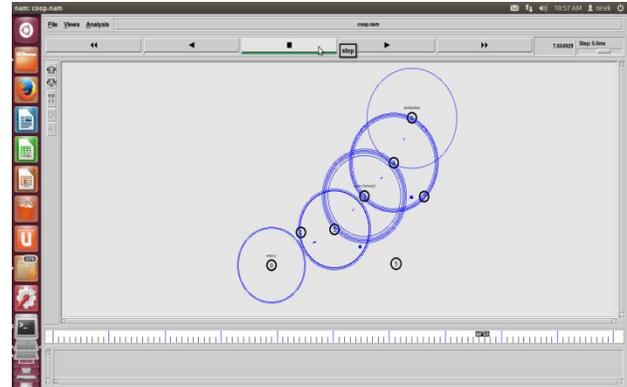


Figure 11- Destination moving

The performance of the scenario is evaluated on behalf of some parameters like throughput, delay and packet loss. Here delay is reduced due to use of VADD and TLO algorithm. If delay is reduced then it will automatically bring the performance of a network up. Vehicle assisted data delivery technique improve the network performance. The delay is represented by figure 12 where green line indicates the delay of the current scenario.



Figure 12- Delay graph

Figure 13 shows the packet loss. In this figure, again it can be seen that after introducing the proposed technique packet loss also reduced at very high rate.

The throughput is also improved as it is reflected by figure 14. If delay is reduced then on the either end throughput will

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repeatedly move up. Privacy of the nodes in the scenario is also an issue which is also considered. The nodes will openly communicate with each other and incase of privacy there will be no compromise. Secure network will generate better results. Figure 15 shows the graph of security. The graph of security is keep on increasing with the simulation and it is ended up at the extreme level.

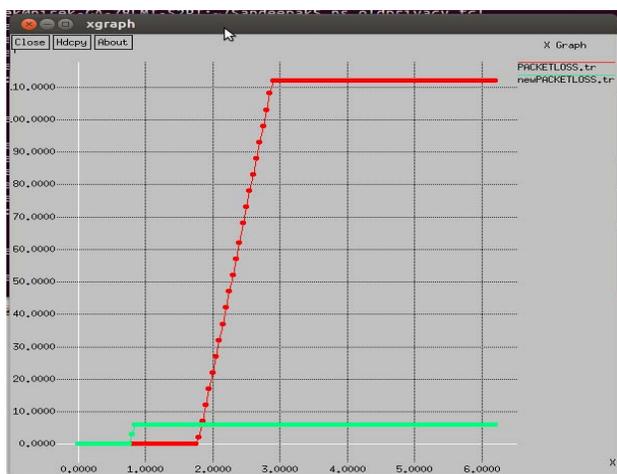


Figure 13- Packet loss graph

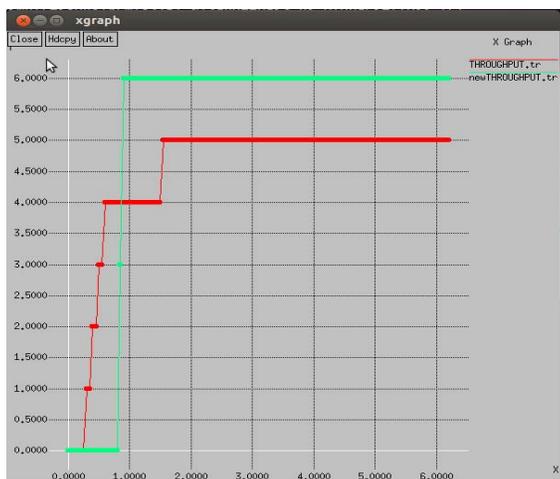


Figure 14- Throughput graph

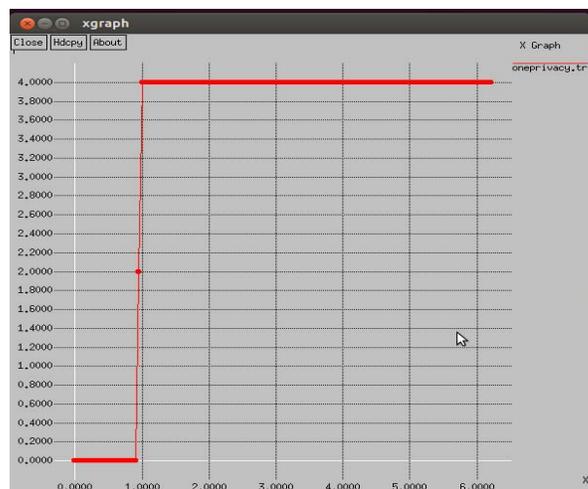


Figure 15- Privacy graph

7. CONCLUSION

Numerous researchers and industry players accept as true that the assistance of vehicular networks on traffic security and many commercial applications should be able to validate the cost. With such a vehicular network, many data delivery applications can be supported without extra hardware cost. Though, existing protocols are not appropriate for supporting delay tolerate applications in sparingly connected vehicular networks. To address this problem, the idea of helper node is opted, where a moving vehicle carries the packet until a new vehicle moves into its surrounding area and forwards the packet. Different from existing helper node solutions, predicable vehicle mobility is used, which is limited by the traffic pattern and road layout. Experimental results showed that the proposed VADD protocols outperform existing solutions in terms of throughput, privacy, data packet delay and packet loss. Among the proposed VADD protocols, the helper node technique is better than the previous technique.

8. FUTURE SCOPE

As future work, advance GPS system and more security feature should be taken by better experimental as securing something is a never ending process.

9. REFERENCES

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