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RESEARCH ARTICLE

PBO based Enhancement of DSRC for VANET's Safety Application

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Abstract— VANETs are a form of mobile ad-hoc networks to provide communications among nearby vehicles and between vehicles and nearby fixed equipment. Safety applications like collision alert merge assistance, road condition warning, etc requires messages to be propagated from the point of occurrence to the target vehicles with very low latency. DSRC is a two-way short-to-medium range wireless communication capability that permits very high data transmission critical in communications-based active safety applications.

The previous work which we taken into consideration is to develope analytical model for the reliability of a dedicated short-range communication (DSRC) control channel (CCH) to handle safety applications in vehicular ad hoc networks (VANETs).In their work, they enhance the conventional dedicated short-range communication (DSRC) for VANET safety applications. They userealistic vehicular traces for simulation and validation of proposed model and enhanced algorithm.So in our work, we will enhance this by trained our system using back propagation model to increase system reliability in terms of the probability of successful reception of the packet and the delay of emergency messages in a harsh vehicular environment.

Keywords— AMBA, PBO, CCH, DSRC, VANET

INTRODUCTION

A wireless ad hoc network is a decentralized type of wireless network [6]. The network is ad hoc because it does not rely on a pre existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, so the determination of which nodes forward data is made dynamically on the basis of network connectivity.

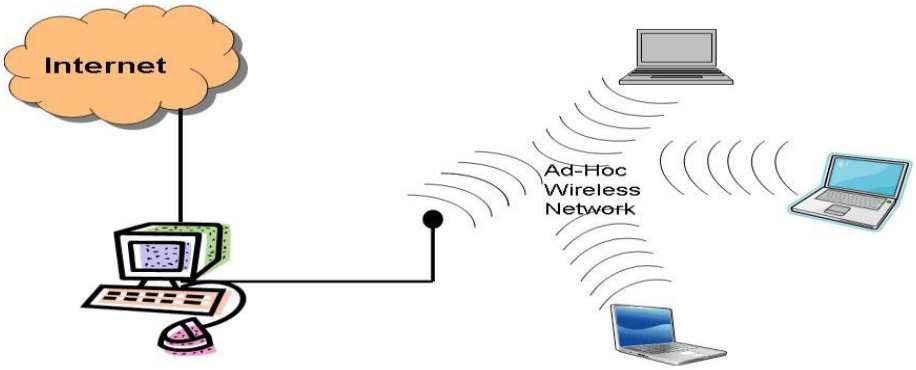

Figure 1: Wireless Adhoc Network [6]

VANET

Today's Internet has been developed for more than forty years. Recently many network researchers are studying networks based on new communication techniques, especially wireless communications. Wireless networks allow hosts to roam without the constraints of wired connections. People can deploy a wireless network easily and quickly. End users can move around while staying connected to the network. Wireless networks play an important role in both military and civilian systems [13]. VANETs stand for Vehicular Ad hoc Networks. Vehicular implies "mobility". Ad hoc is a Latin word and it means "for this only". VANET is an autonomous collection of Vehicular routers or nodes that communicate over wireless links. VANET is an Infrastructure-less wireless network. The routers or nodes moves randomly and organize themselves arbitrarily. The nodes directly communicate via wireless links within each other's radio range, while that are distant apart use other nodes as relay, in a multi-hop routing function. As the nodes are Vehicular, the structure of the network changes dynamically and unpredictably over time. Ad-hoc networks are self-configuring and self-organizing, so to maintain communication between nodes in the network, each node behaves as a transmitter, a host and a router

A Vehicular ad hoc network (VANET)[15] is a self-configuring infrastructure less network of Vehicular devices connected by wireless. Each device in a VANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a VANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet.

PROTOCOL

Ad–hoc on demand distance vector routing (AODV)[2] is a stateless on-demand routing protocol .The Ad-hoc On Demand Distance Vector (AODV) classified under reactive protocols. The operation of the protocol is divided in two functions, route discovery and route maintenance. In Ad-hoc routing, when a route is needed to some destination, the protocol starts route discovery. Then the source node sends route request (RREQ) message to its neighbors. And if those nodes do not have any information about the destination node, they will send the message to all its neighbors and so on. And if any neighbor node has the information about the destination node, the node sends route reply (RREP) message

to the route request (RREQ) message initiator. On the basis of this process a path is recorded in the intermediate nodes. This path identifies the route and is called the reverse path. Since each node forwards route request (RREQ) message to all of its neighbors, more than one copy of the original route request (RREQ) message can arrive at a node. A unique id is assigned, when a route request (RREQ) message is created. When a node received, it will check this id and the address of the initiator and discarded the message if it had already processed that request. Node that has information about the path to the destination sends route reply(RREP) message to the neighbor from which it has received route request(RREQ) message. This neighbor does the same. Due to the reverse path it can be possible. Then the route reply message travels back using reverse path. When a route reply message reaches the initiator the route is ready and the initiator can start sending data packets.

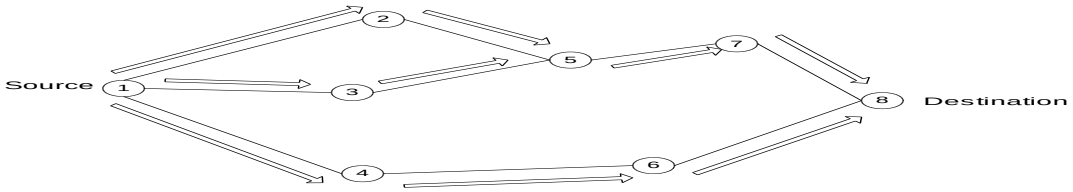

Figure 2: PropaGPBOtion of Route Request (RREQ) packet [2]

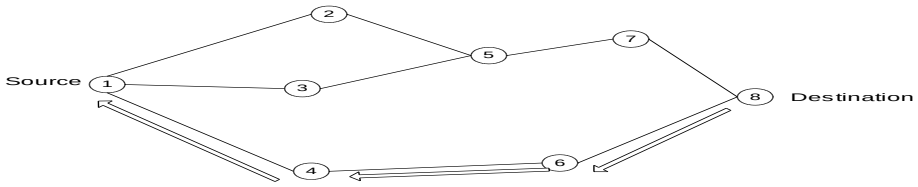

Figure 3: Path taken by Route Reply (RREP) packet [2]

Khalid Abdel Hafez [16] An analytical model for the reliability of a dedicated short-range communication (DSRC) control channel (CCH) to handle safety applications in vehicular ad hoc networks (VANETs)is proposed. Specifically, the model enables the determination of the probability of receiving status and safety messages from all vehicles within a transmitter's range and vehicles up to a certain distance, respectively. The proposed model is built based on a new mobility model that takes into account the vehicle's follow-on safety rule to derive accurately the relationship between the average vehicle speed and density. Moreover, the model takes into consideration

1) the impact of mobility on the density of vehicles around the transmitter,

2) The impact of the transmitter's and receiver's speeds on the system reliability,

3) The impact of channel fading by modeling the communication range as a random variable. 4) The hidden terminal problem and transmission

Collisions from neighboring vehicles. It is shown that the current specifications of the DSRC may lead to severe performance degradation in dense and high-mobility conditions. Therefore, an adaptive algorithm is introduced to increase system reliability in terms of the probability of successful reception of the packet and the delay of emergency messages in a harsh vehicular environment. The proposed model and the enhancement algorithm are validated by simulation using realistic vehicular traces.

PROPOSED WORK

Ad-hoc networks are temporary networks that are used only for the duration of the communication sessions. Cellular phones, laptops etc are the devices that used for Vehicular

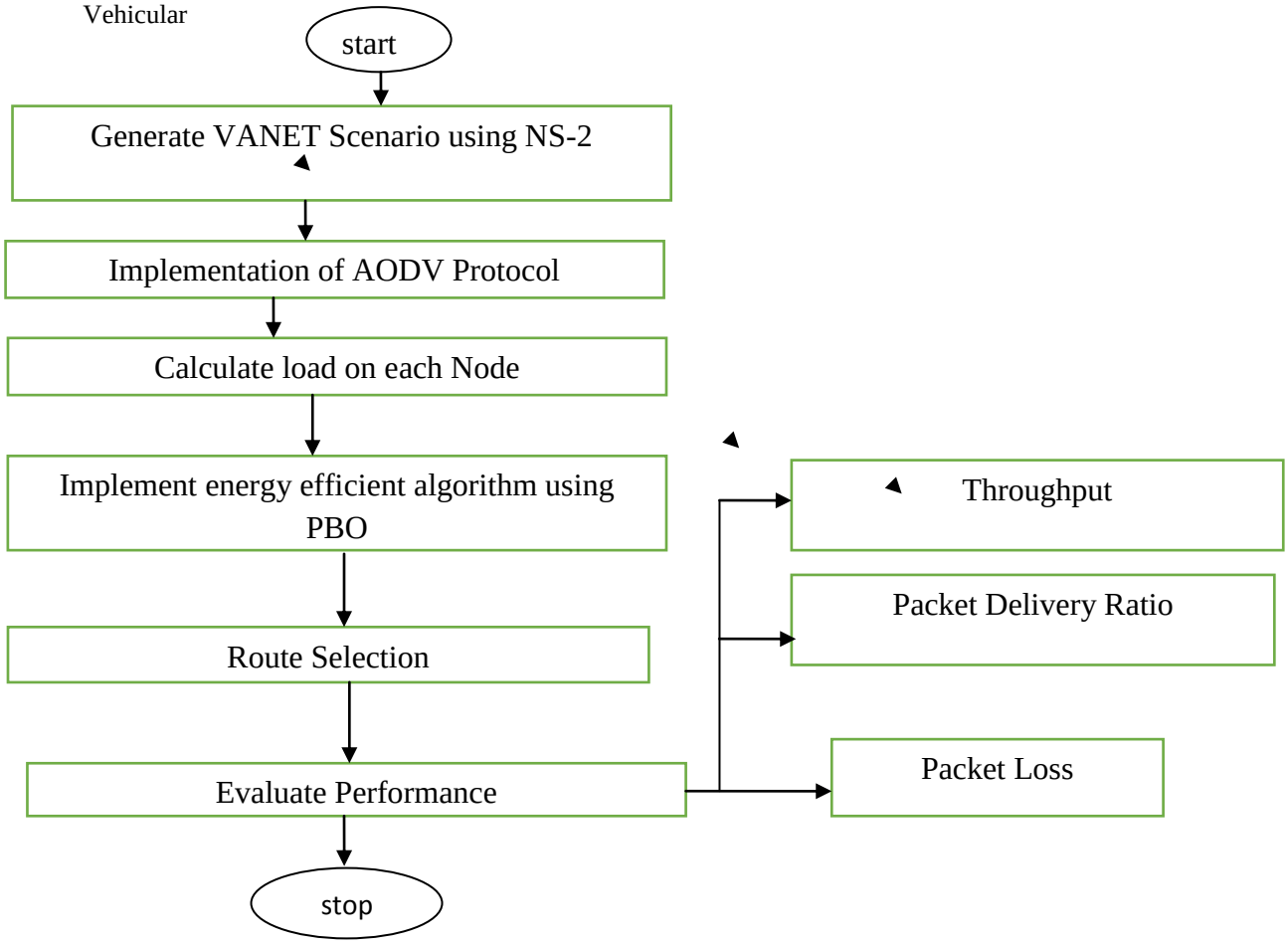

Figure 4: Flow chart of PROPOSED Work

Networks. However, Vehicular devices can be classified into the following two categories: Networks having a fixed infrastructure using a base station that covers a certain areas. During communication Vehicular devices communicates with the nearest base station that transmits the information to other base station or wired networks or other Vehicular devices. Cellular phone is the example of this type of network. A Vehicular ad-hoc network which does Network and base station system is composed of a group of Vehicular and wireless nodes. There are various types of restrictions. The biggest restriction is the confined energy of the batteries. In our PROPOSED work, use an energy efficient algorithm using (GPBO) & (LPBO) mechanism to resolve quality of service (QoS). Thus, the problem taken for this research work is divided into some objectives which are explained in the next chapter. One is presenting a protocol (AODV) with an energy efficient hybrid algorithm using PBO that avoids the congestion in the router using and also concentrating on increase the efficiency of the system. One main objective is to increase the lifetime of the system and emphasize on the maintenance the quality of services. We will also analyze the PROPOSED solution using Network Simulator-2 (NS-2) under different network parameters.

In this algorithm first we are generating the scenario using the NS2 by creating nodes in the scenario by using AODV protocol. After creating a scenario calculate load on each node and then apply energy efficient algorithm to nodes using GPBO and LPBO. Selection of route is done then evaluate the performance of nodes by measuring the parameters like throughput, packet delivery ratio and packet loss ratio. By adapting such steps the QOS is improved.

Proposed Algorithm

Step1. Deploy the nodes (50).
Step2. Initialize the Energy for whole System.
Step3. Define the Input Parameter of all the nodes.
Step4. Applying PBO for Path Routing.
a) Plants=Nodes
b) Plants, seasons, week = Energy, Distance, Probability factor no. of nodes
c) Acc. To Local & Global pollination values node will be selected in the path.
d) Checking Energy, Distance etc the input factor of the current habitat for the selection of AODV routing in a protocol.
Step5. Applying formula node can be or cannot be in rout.
a) If Etx < Ei {always} local pollination of the node.
b) Else condition is not satisfy, Global the node.
c) Distance (i=i+1) total distance selected is less than previous selected distance.
Step6. Repeat step e up to total no. of iteration.
Step7. Find total life time of the system.
Step8. End

SIMULATION AND RESULTS

Input Parameters

Table.1 input parameter

Parameter	Value
Modulation and Data rate	BPSK , 3 Mbps
Message and Header sizes	512 , 64 Bytes
Status packets rate λ_s	10 packets/s
vehicle's speed	80-120Km/h
vehicle's arriving rate β	1 vehicle/s
Exponent factor α	2.00
Communication range $\overline{R}$	300 m
Transmission power $P_t(300m)$	20 mW
Emergency Min. Contention Window W_e	3
Status Min. Contention Window W_s	15
Received power threshold P_{th}	3.162e-13 W
Carrier sense power percentage ρ	0.5
Noise-floor	1.26e-14 W
T_{tx} & T_{rx} antennas heights	1.5 m
T_{tx} & T_{rx} antennas Gain $G_t = G_r$	1
DIFS	64 μ s
Slot time ϱ	13 μ s
Propagation delay δ	1 μ s
Percentage of drivers that follow safety rule ε	80%
CCI	100ms
T_{alg}	$10 \cdot CCI$ s
Number of lanes N_l	4

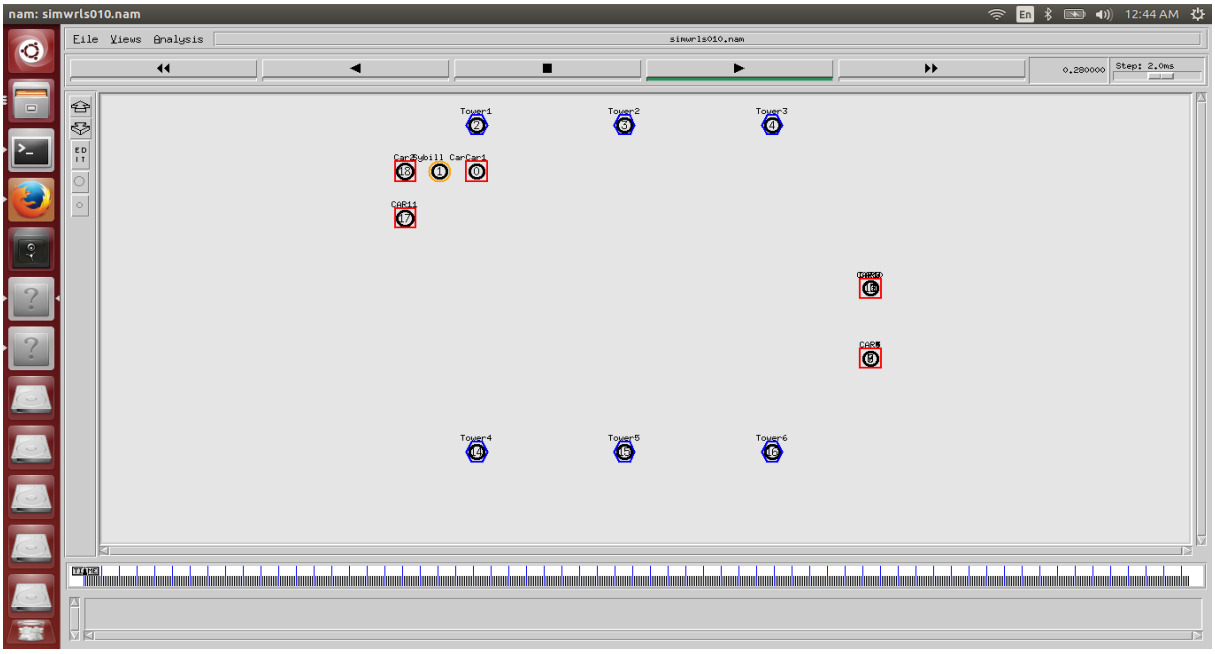

Figure 5: Vanet Scenario with 12-cars and 6-towers

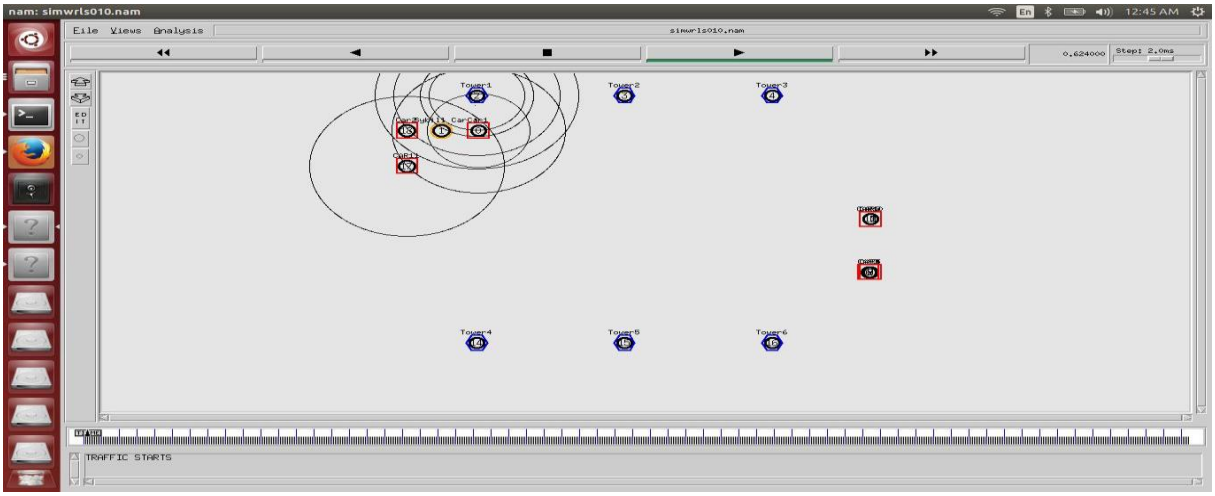

Figure 6: Cars gathering information about road or rout

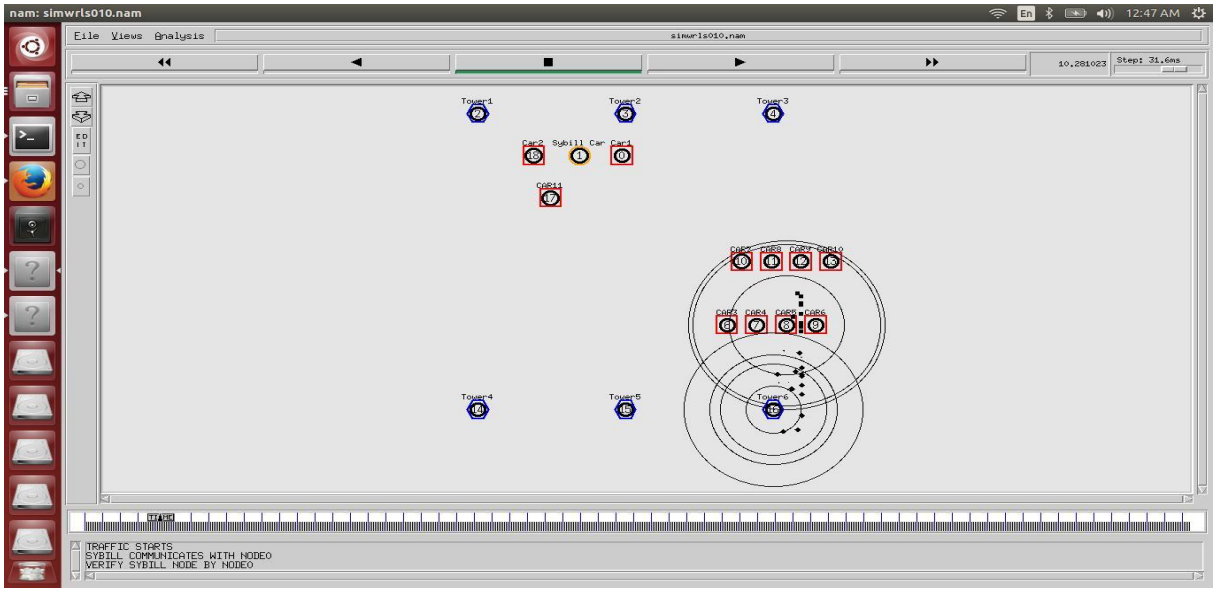

Figure 7: Vehicle collecting information about density of vehicles

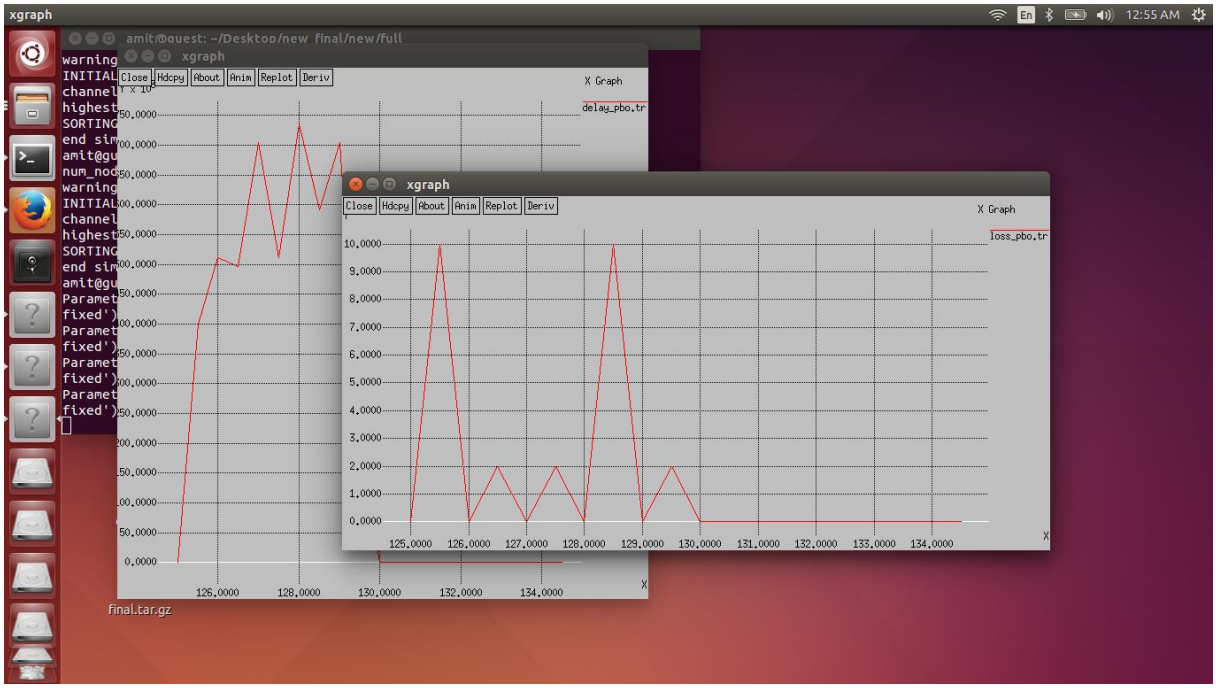

Figure 8: No of packets Vs packets loss

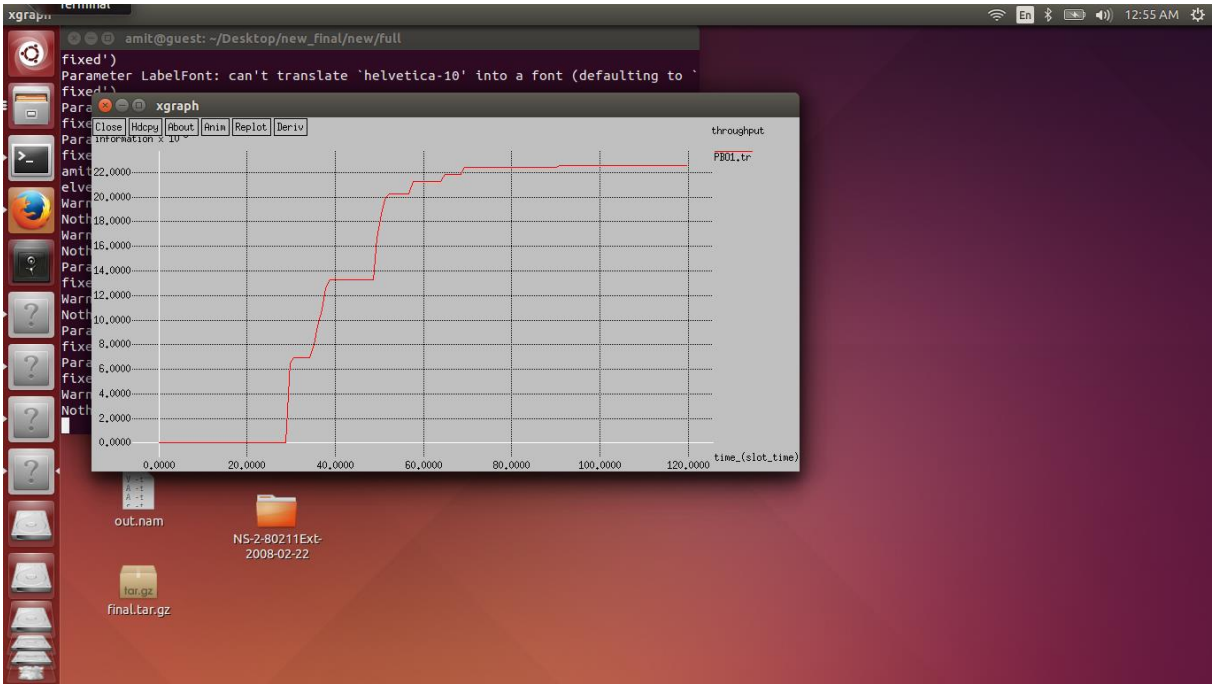

Figure 9: No of packets Vs time(For PBO)

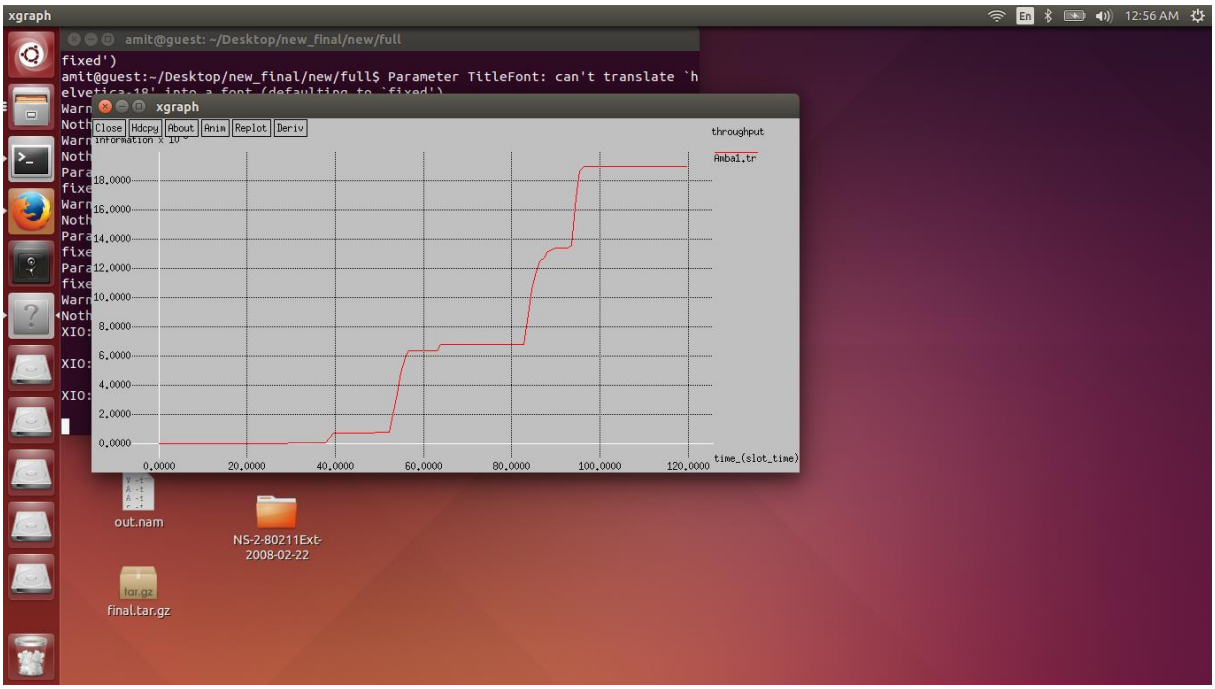

Figure 10: No of packets Vs time(for Amba)

5.4-Following are the simulation and comparison graph of Vanet (with PBO and AMBA)

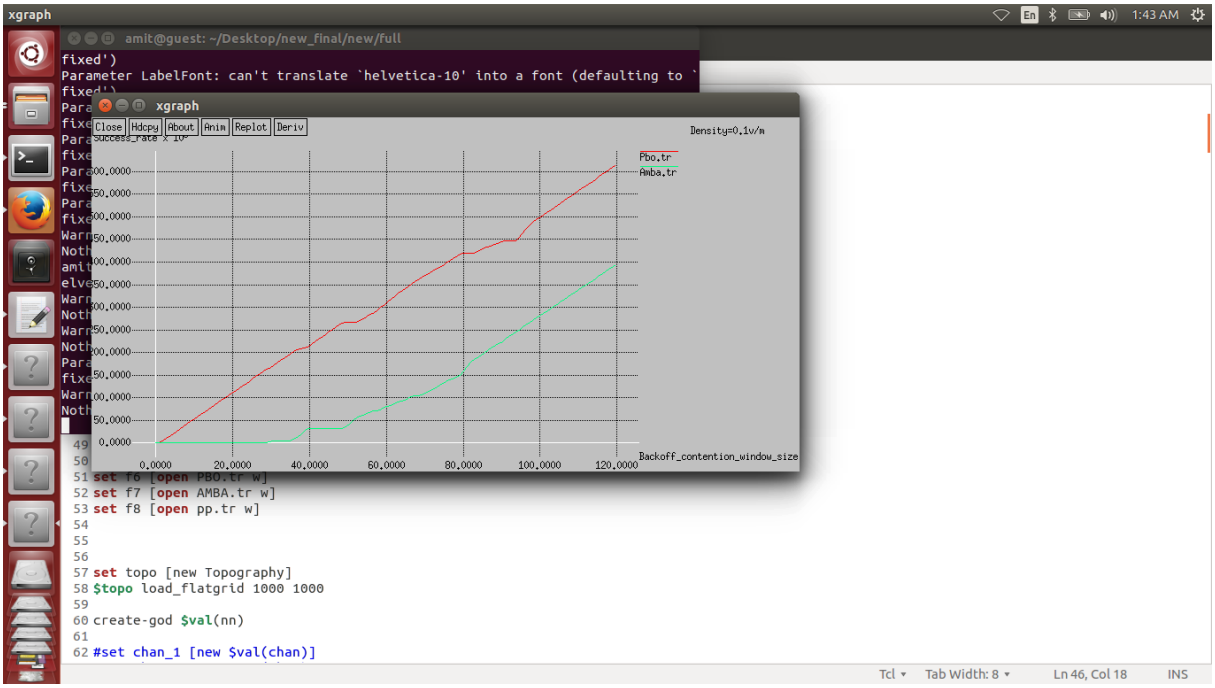

Figure 11: System reliability versus contention window size for different vehicle densities.

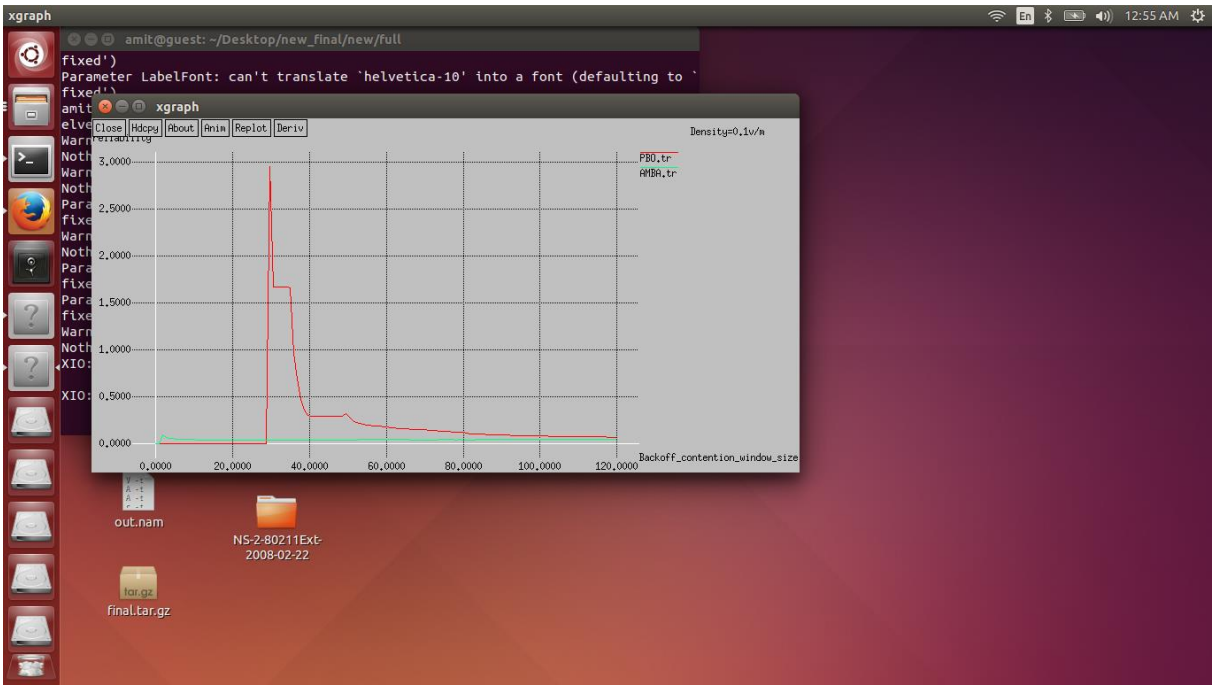

Figure 12: Delay of status packets versus contention window size for different vehicle densities.

By analyzing all above parameters and simulation, we can see improvement in success rate and reliability factor when we introduce Pollination method for rout selection.

CONCLUSION

This analysis relies on a replacement quality model within which the link among vehicle density, speed, and also the innings distance rule comes. within the analysis, many factors

are thought-about, like the impact of quality on the link accessibility between the transmitter and also the receiver, the distribution of vehicles on the road, and also the average range of vehicles at intervals the vary of the transmitter. The planned model is made on the very fact that vehicles ar broadcasting their standing messages optimize at intervals the SI and model chain, as well as the channel busy chance in each state. The effective most communication vary that may be employed in sure conditions to realize a precise booming rate is shown by simulation. it's shown from the simulation results that the present DSRC specifications might result in undesirable performance underneath harsh transport environments. Therefore, a replacement accommodative and optimize formula, PBO, is introduced to boost VANET's reliableness. By mistreatment the PBO formula, vehicles are ready to estimate the vehicle density and alter their transmission parameters consequently supported their current average speed to boost VANETs' performance. The simulation results, that coincide with the analytical results, show that the planned model is sort of correct in conniving the system reliableness, and also the planned PBO formula has high performance compared with AMBA algorithms.

Future Scope

In future, we will additionally think about another security parameters for additional sweetening.

1. In future we will apply new artificial intelligence(BBO).
2. It may analyze hidden terminal node mistreatment same technique.

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