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Realistic Mobility Model And Co-Operative Peer To Peer Data Transmission For VANET's Using SUMO And MOVE

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Abstract

In this paper we are implemented peer-to-peer systems in VANET's. Peer-to-Peer system is completely adapted for infrastructures free Communication between Vehicles in Vehicular Ad-hoc network. As we know that VANET's are a form of MANET's. Here in VANET's moving vehicles are consider as a mobile nodes. VANET's provide many services to provide comfort driving and safety for passengers. One of the major service is File sharing, sharing a large file is a challenge task. Therefore developing important scheme called peer-to-peer file sharing. In this research, we used P2P File sharing scheme using Medium Access Control Algorithm for VANET's using TDMA. By using TDMA it reduce collision and packet drops in the channel as well as provide sharing files in wireless medium. In this work our main aim is to develop P2P file sharing to improve the file downloading time between neighbor vehicles in the network topology. For this purpose, we used SUMO and MOVE softwares and also NS2. We used metric parameters like Packet Delivery Ratio, Throughput and End-to-End Delay to compare the results obtains from peer-to-peer system and infrastructure based system.

Keywords: *Vehicular Ad-hoc Network, Mobile Ad-hoc Network, Simulation of Urban Mobility (SUMO), (P2P)-Peer-to-Peer*

1. Introduction

In Wireless Communication, Mobile Ad-hoc Network is a part of wireless Communication System. We know that Vehicular Ad-hoc Network is a form of Mobile Ad-hoc Network. Vehicular Ad-hoc Networks are the important component of intelligent traffic system. VANET's enable the exchange of message between vehicles we called it as Vehicle to Vehicle communication. In Vehicular Ad-hoc network moving vehicles on road is consider as a mobile nodes, vehicles going to use some fixed infrastructure wireless access device called RSU, Road Side Unit fixed across road side to communicate with each other , we called it as Vehicle to Infrastructure communication . RSU's provide internet connection to vehicles.

In VANET's by using V2V, Vehicle to Vehicle Communication and V2I, Vehicle to Infrastructure Communication the main aim of these communications is to provide increase safety on road and to improve efficiency. It provides comfort driving and safety for passengers. Emergency messages also can transmit. Some of the stored information in the RSU's like Road map, traffic rules and traffic measurements like this data can be access by vehicle in the network topology.

There are many ad-hoc routing protocols are their which are used for data transfer between vehicle to vehicle and Vehicle to Infrastructure communication, DSRC is one of the protocol Dedicated short range routing communication with some fixed infrastructure called RSU's. The most commonly using protocol is AODV, Ad-hoc On Demand Vector Algorithm with MAC Medium Access Control 802.11 Wi-Fi.

In this paper we propose a peer-to-peer file sharing scheme for VANET's. In this work it will decrease the download time for files between two vehicles, during delivery of safety message. In our scheme we are using TC-MAC Algorithm. TC-MAC uses TDMA as a medium access control it going to assign a unique time slot to each vehicle. Here Files are sharing in the form of slots and foe each slots different timing will be assigned by TDMA. We are also used Ad-hoc on Demand Distance Vector Algorithm to share the data between vehicles. All the network information can share between all the nodes using transmission control protocol and Ad-hoc routing protocol. If any emergency messages are downloading between two vehicles that time slot assign for only that two vehicles, thus downloading speed for other vehicles will be less. The Node-ID will be stored in the Medium Access Control. Only those nodes can access data sharing.

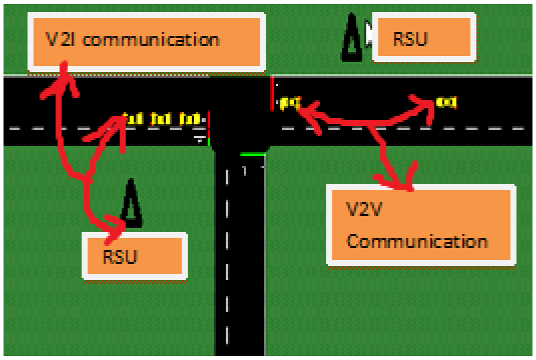


Fig. 1. Safety and Non-safety Communication over DSRC

2. Related Work

Already we are using infrastructure based communication system. But P2P system in VANET has been a recent topic nowadays. There are a number of the proposed systems for P2P on either on an existing infrastructure or the cellular system. ZIPPER is also one of the methods introduced by Abuelela. Zero Infrastructure Peer-to-Peer system for VANET's. It is designed mainly for multi-media data sharing such as Movies and music in VANET's. Another method is Car-Torrent a work that extends the bit-Torrent protocol for Vehicular network scenarios. There are many other various types of applications that work on Peer-to-Peer system can be implemented in Vehicular Ad-hoc Network. Since Peer-to-Peer is a Powerful platform for a variety of multimedia streaming applications over the Internet, such as video on-demand, video conferencing and line broadcasting.

3. Proposed System

In our proposed system we are implementing Peer-to-Peer system we are going to use TC-MAC Algorithm and also TDMA assignment technique for cluster based VANET's. TC-MAC allows Vehicle to exchange data with a high reliability; both non-safety and safety messages will be exchanged. In TC-MAC it assumes an N-Vehicle cluster. The transmission time is partitioned into non overlapping logical TDMA frames. It assumes existence of K slotted SCH's numbered from 0 through K-1. Each logical frame consists of [N/K]+1 slots number 0 through [N/K].

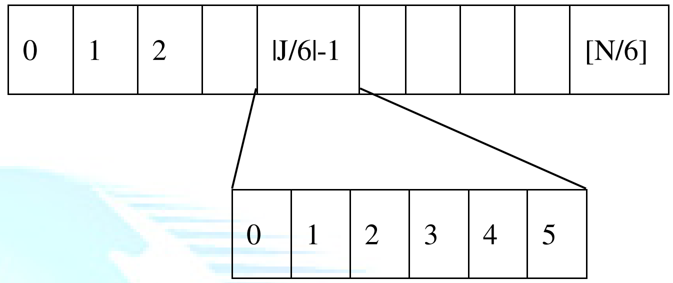


Fig. 2. TDMA Frame

Each vehicle in the cluster will receive a local ID between 0 to N. The CH will always ID1 while ID0 is reserved for a virtual vehicle. TC-MAC not going to expect all the nodes in the network so that all N node in the cluster to be communicating, or active simultaneously. The CH going to keep the list of active vehicles and disseminates this list to all the members of the cluster.

3.1 Peer-to-Peer File Sharing Scheme

The goal of the proposed system is to allow neighboring vehicles to run non-safety application.
Suppose Vehicle 'a' wishes to share a file with vehicle 'b' following connection take place as follows.

- By tuning into vehicle b's own mini-slot, vehicle a determine whether or not vehicle b is available.
- If so, vehicle 'b' going to transmit a packet on channel 'b' mod k during timeslot [b/k]
- They are sharing a file vehicle 'a' will ask a permission from the CH to use other time slots on the SCH's.
- CH going to check the unused timeslots on the SCH's and grant them to vehicle a & b. These granted time slot is available on the SCH's because no other vehicle is assigned for that ID's.
- Now Vehicle 'a' and 'b' can start transmission.

4. Simulation and Results

In this proposed system we are going to use SUMO, Simulation for Urban Mobility and MOVE is the software used for VANET's and Network simulator NS2.35 software to run simulation.

In SUMO and the MOVE we are going to create realistic mobility model for Vehicular Ad-hoc Network. Then by using TC-MAC algorithm and Ad-hoc routing protocol data is transferred between two vehicles. Obtained simulation result is compared with infrastructure based system results.

Table -1: Simulation Parameters

Parameters	Values
Simulator	NS2.35
Protocol	AODV
Antenna	Omni Antenna
Traffic Source	TCP,UDP
Application Agent	CBR
Mobility Model	Random Waypoint
Simulation area	1000*1000
Packet size	512
Channel	Wireless Channel
MAC	TDMA,802.11
Number of Nodes	24

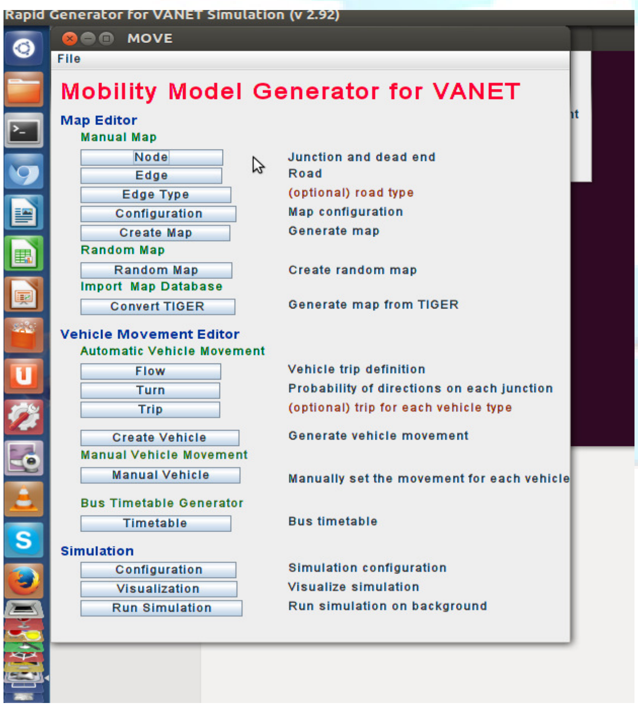


Fig 3.Mobility model generation for VANET's using SUMO and MOVE

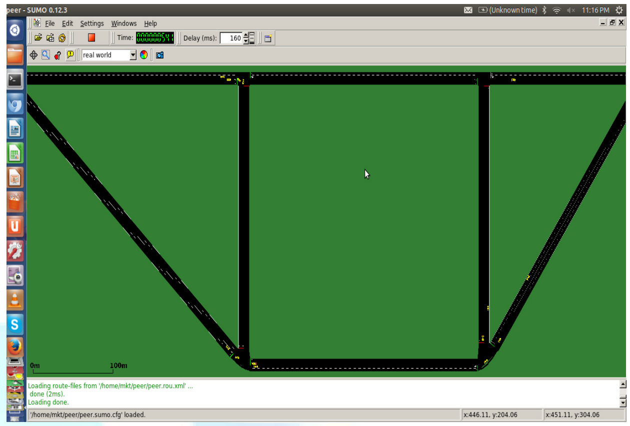


Fig 4 Realistic mobility Model for VANET's created using SUMO and MOVE

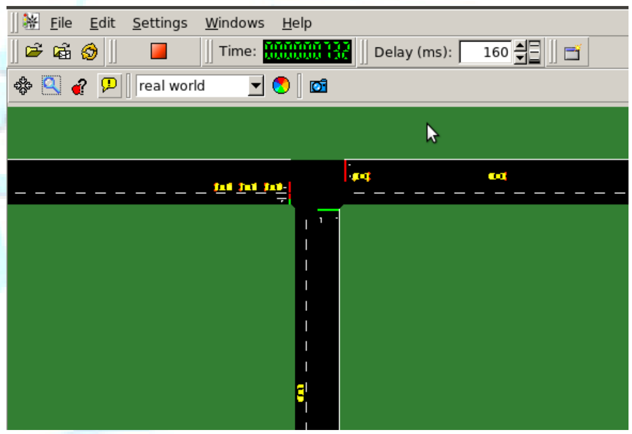


Fig. 5 Vehicles moving on road

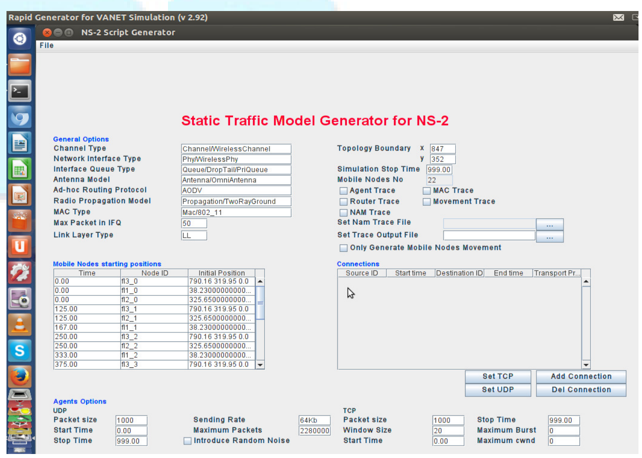
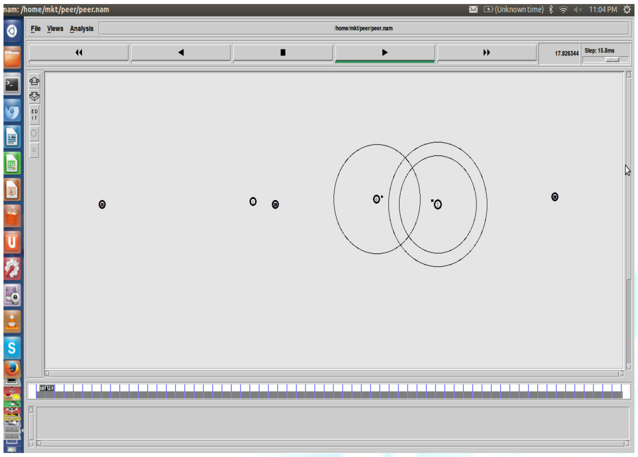


Fig. 6 Running Generation Model using NS2



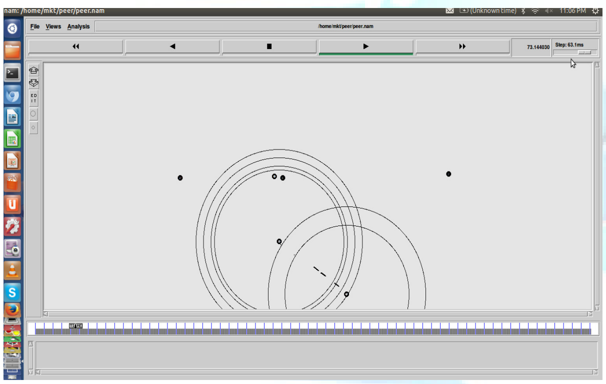


Fig 7 NAM results obtain from NS2

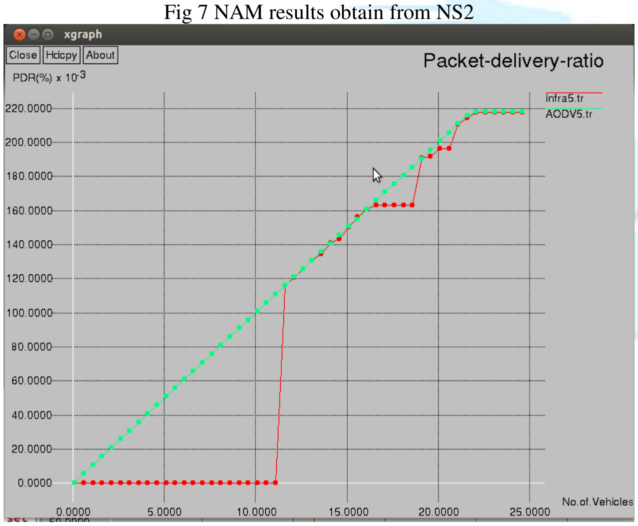


Fig. 8. Comparison graph of Packet Delivery Ratio

The Fig 8 Shows the Comparison graph of Packet Delivery Ratio, X-axis taken as No of Vehicles and Y-axis has taken Packet Delivery Ratio (%). Graph Shows the Comparison for Peer to Peer system PDR graph and Infrastructure Based System PDR (%).Green Color line in graph shows the Peer to Peer System and Red Line graph shows Infrastructure based system.

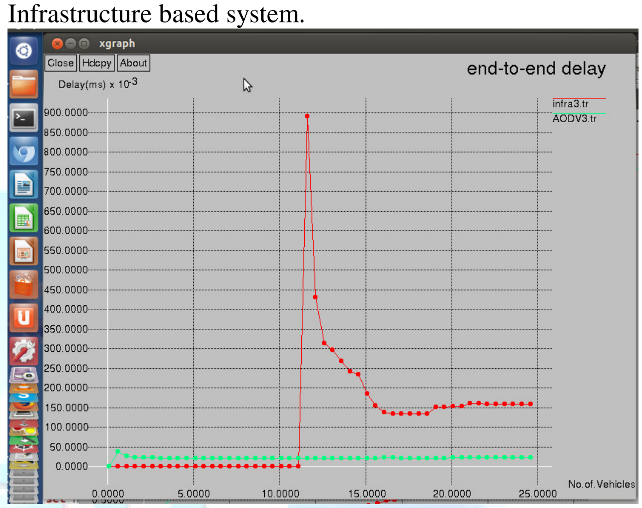


Fig. 9. Comparison graph of End to End Delay

The Fig 9 Shows the Comparison graph of End-to-End Delay, X-axis taken as No of Vehicles and Y-axis has taken End-to-End Delay. Graph Shows the Comparison for Peer to Peer system E2E graph and Infrastructure Based System E2E.Green Color line in graph shows the Peer to Peer System and Red Line graph shows Infrastructure based system.

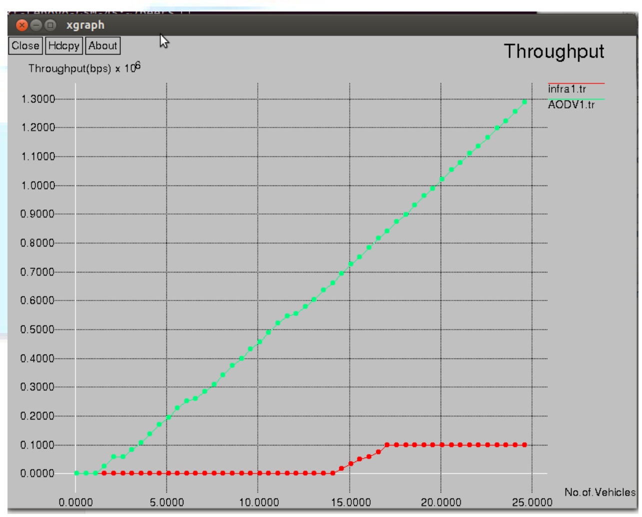


Fig. 10. Comparison graph from throughput

The Fig 8 Shows the Comparison graph of Throughput, X-axis taken as No of Vehicles and Y-axis has taken

Throughput. Graph Shows the Comparison for Peer to Peer system Throughput graph and Infrastructure Based System Throughput. Green Color line in graph shows the Peer to Peer System and Red Line graph shows Infrastructure based system

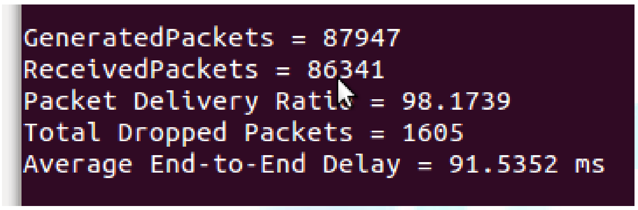


Fig 11 Results obtain for Peer to Peer System

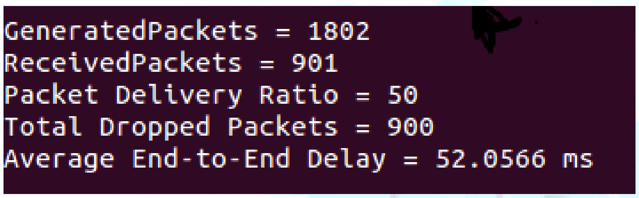


Fig. 12. Results obtain for Infrastructure based System

5. Conclusions

The main objective of this paper is to provide Peer to Peer Data Transmission between Vehicles. For this system, we used TC-MAC Algorithm with TDMA. In this technique the intra-cluster and collision free communications are managed by the cluster head using TDMA. In this method Cluster Head checks the unused time slot on the SCH's and grant to those Vehicle which want to share the data, these granted time slot on the SCH's could be available because no vehicles were assigned to their ID's or because the vehicles assigned to them are inactive. By this Peer to Peer system there will be congestion control and it provides comfort driving and also efficiency is more. In future we can use Wi-MAX technology to improve the data transmission range.

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An Optimized Two-Purpose Peer-to-Peer VANET to Disseminate Traffic Information and Reduce Travel Time

[5] Peer-to-Peer File Sharing in VANETs Using TC-MAC

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