PERFORMANCE EVALUATION OF VEHICULAR AD HOC NETWORK (VANET) USING CLUSTERING APPROACH

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ABSTRACT

Vehicular ad hoc networks (VANETS) have actually attracted a lot of attention over the last few years as being used to improve road safety. In this paper, cluster based technique has been introduced in VANET. As VANET is a new form of MANET, so with this cluster based technique in VANET, several handoff problems have been removed, which were actually difficult to remove in MANET. For this traffic infrastructure cluster based routing has been used, with two routing protocols i.e. AODV and AODV+. The network simulator NS2 has been used for removing unpredictable movements that may arise in the network.

KEYWORDS:

VANET, Clustering, AODV, AODV+

1. INTRODUCTION

IEEE 802.11p is an approved amendment to the IEEE 802.11 standard to add wireless access in vehicular environments [1].The IEEE 802.11 standard body is currently working on a new amendment, IEEE 802.11p, to address these concerns. This document is named Wireless Access in Vehicular Environment, also known as WAVE [2]. A Vehicular Ad-Hoc Network, or VANET, is a technology that uses moving cars as nodes in a network to create a mobile network. VANET turns every participating car into a wireless router or node, allowing cars approximately 100to 300 metres 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 [3] Vehicular Ad hoc network (VANET) is a new form of Mobile Ad hoc Network (MANET) [4]

2. PROBLEM FORMULATIONS

As earlier, research is done on Mobile ad hoc network (MANETS) [5].But with MANETs several handoff problems were difficult to remove. So a new cluster based technique in VANETS is introduced, to remove these handoff problems. And various unpredictable movements that may occur in the network can also be reduced or lessen using this Cluster based technique in VANET.

3. METHODOLOGY USED

Scenario is taken as under:

Work is done on Fedora and Windows. In Fedora [6], MOVE is used.
Following is the scenario representing clustered vehicles in VANET environment.
Scenario 1: At the very start, nodes i.e. vehicles are in random order. There is no source node and no destination node.

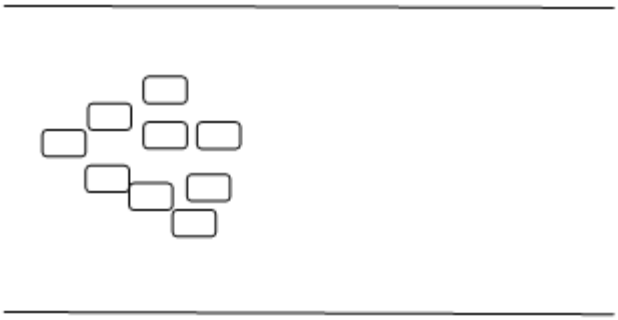

Fig 3.1 Initiation of nodes

In this scenario, vehicles are taken as nodes and these vehicles are moving in a cluster. Every vehicle is connected to another vehicle. Firstly a cluster head is decided, which can also be considered as a source node, after that only another nodes can start working. Source node sends data packets to next node and then to next one, resulting data packets to be passed on through various nodes to reach its destination (i.e. the receiving node).

MANET [5]: A **mobile ad-hoc network** (**MANET**) is a self-configuring infrastructure less network of mobile devices connected by wireless links. *Ad hoc* is Latin and means "for this purpose". Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently.

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This cluster based technique enables nodes or vehicles to remain connected to each other, as even a small problem if any occurs, it may come to know to the whole network and the whole network, having several nodes together tries to find out the root cause of the problem, by maintaining good internet connectivity.

Scenario2: After the gathering or generation of all the nodes in the VANET environment, a cluster head is formed, which actually controls the whole process. Cluster head is also considered as a source node.

Fig 3.2 Formation of a cluster head

Afterwards a simulation for VANET is done.
SIMULATION FOR VANET:
Rapid generation of realistic simulation for VANET.

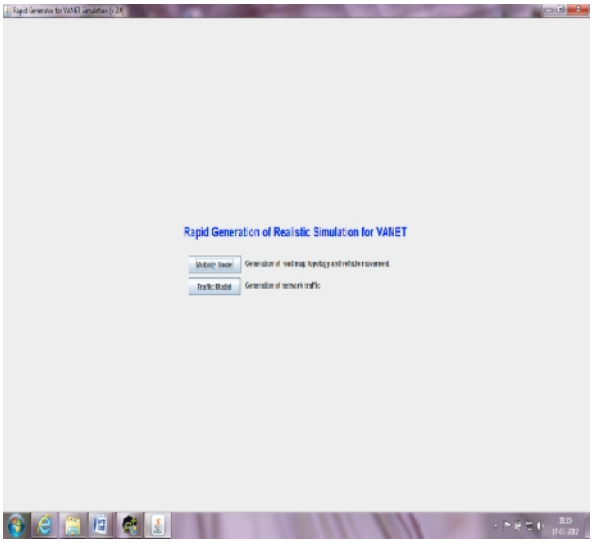

Fig 3.3 Rapid generator for VANET

Here, two models are taken into consideration:
Mobility Model
Traffic Model
Mobility Model: It represents the generation of road map topology and vehicle movement.

Fig 3.4 Mobility Model

In mobility model configuration can be set for roads or the whole scenario with the help of Map configuration editor.

Map configuration Editor: It specifies the input and the output files and the road defaults if road types are not defined and road parameters if they are not inputted.

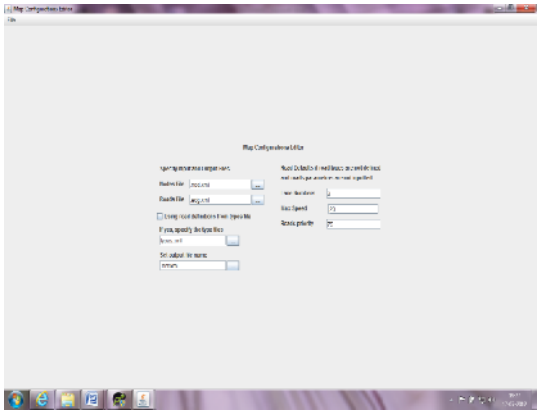

Fig 3.5 Map configuration Editor

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Random Map Generator: It specifies the total random layout which includes Grid layout and the spider layout.

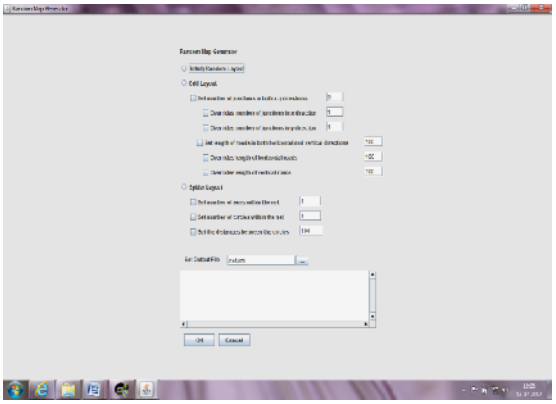

Fig 3.6 Random Map Generator

Traffic Model: It basically represents the Generation of network traffic.

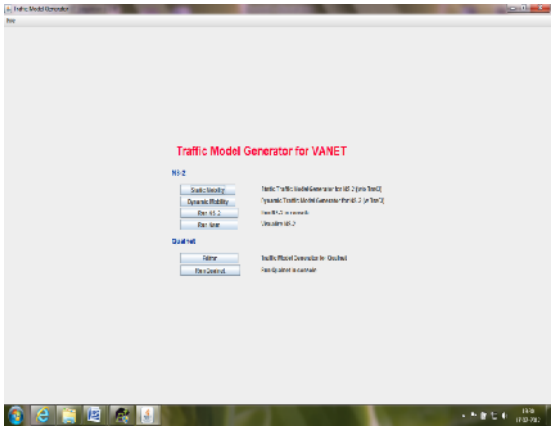

Fig 3.7 Traffic Model

Traffic model shows two mobility for Ns2 i.e.
Static Mobility
Dynamic Mobility

Static Mobility: It is a static traffic model generator for Ns2.It includes general options like channel type, network interface type, interface queue type, antenna model, ad hoc routing protocol, radio propagating model, Mac type, Max packet in, link layer type and mobile node starting positions, agent options, and connections.

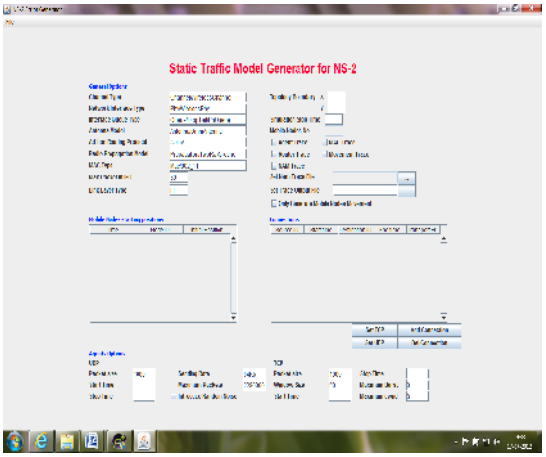

Fig 3.8 Static model generator for VANET

Dynamic Mobility: It is a dynamic traffic model generator for Ns2. It also includes general options like channel type, network interface type, interface queue type, antenna model, ad hoc routing protocol, radio propagating model, Mac type, Max packet, link layer type and mobile node starting positions, agent options, and connections for dynamic mobility of vehicles.

Fig 3.9 Dynamic model generator for VANET

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Results and Discussion

Results come out in the form of Generated packets and dropping packets, for Clustered vehicles in VANET environment.

(i)Generated packets: It tells us about how many packets are generated as well as their packet identification. Here is a graph of generated packets is plotted on the XY axis. When a packet is transmitted, some packet delay comes. Like if 1000 packets are to be transmitted, all the 1000

cannot be transmitted at once, but the packets can be transmitted in instalments, thereby resulting in the packet delay.

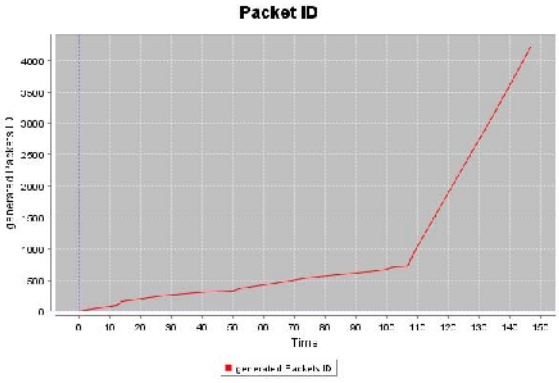

Fig Generated Packets

(ii)Packet Status: Packet status tells the actual status of the packets i.e how many packets are send,how many are received and how many of them are dropped during the process. Here is a graph plotted on the XY axis. Time in seconds is on the X axis and traffic in bytes is on the Y axis. Red colour signifies the message, blue is indicating the acknowledgement and green one is showing TCP.TCP sink basically tells us about the source node i.e which node can be considered as a source node and the path of the nodes.

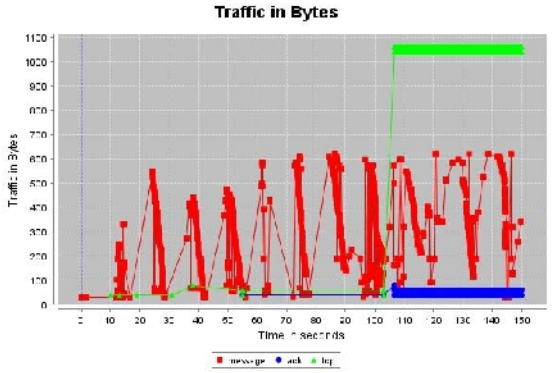

Fig Packet Status

(iii)Throughput of sending packets: It tells the throughput of sending packets on XY axis,with throughput of sending packets i.e the number of packets send per second on y axis and time on x axis.

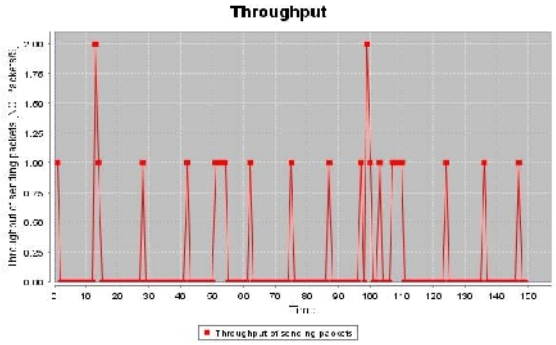

Fig Throughput of sending packets

(iv)Throughput of receiving packets: It tells the throughput of receiving packets on XY axis,with throughput of receiving packets i.e no.of packets packets received per second on y axis and time on y axis.

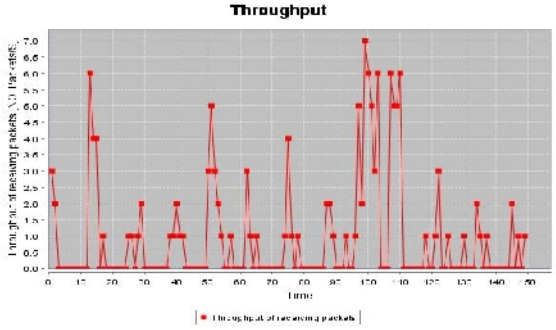

Fig Throughput of receiving packets

(v)Throughput of dropping packets: It tells the throughput of the dropped packets on XY axis, with throughput of dropping packets on X axis and throughput of dropping packets(No. Of packets) on Y axis.

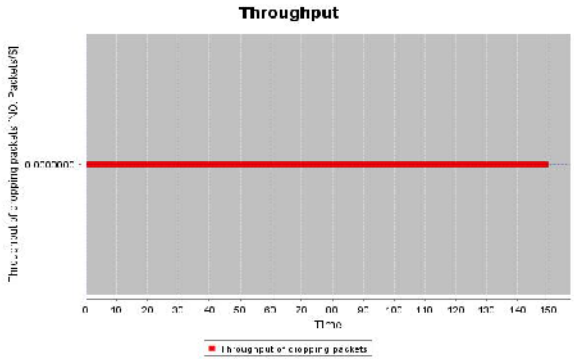

Fig Throughput of dropping packets

CONCLUSION

In this paper, analysis has been done on VANET, using the Cluster based technique in terms of Generated packets in the network and the throughput of the dropping packets that have been dropped out of the network. And it is concluded that VANET with this Cluster based technique proves to be helpful in removing the handoff problems that usually occurred in MANETS and were not possible to remove. This clustered based technique in VANETs also helps a great deal in removing or lessen the unpredictable movements in the network, which sometimes may cause dangerous problems like dropping down the whole network for any small mistake. Each vehicle in the VANET with cluster based technique is connected to one another, resulting in a good internet connectivity.

ACKNOWLEDGEMENTS

Foremost of all, I express my sincere indebtedness to the “Almighty”, for bestowing me with all the favourable circumstances and kept me in high spirits. I am very grateful to my advisor, Er Parminder Singh, Asst Prof. at Chandigarh Engineering College, Landran for his patience, encouragement, and many fruitful discussions from the very early stage of this research.. Finally, I wish to express my appreciation to my family for their continuous love and encouragement, for always believing in me, for never failing to provide all the support, and for coping with the pressure that naturally comes with such endeavour.

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