Routing of VANET over MANET with Mobility for Various Routing Protocols

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ABSTRACT

A Vehicular Ad-hoc Network (VANET) is a form of Mobile Ad-hoc Network (MANET) that is used to provide communications between vehicles and fixed infrastructure on the roadside. In Mobile Ad-hoc networks (MANET) are self-organizing and self-configuring multihop wireless networks where, the structure of the network changes dynamically. Though VANET is a type of MANET but the routing protocols of MANET are not feasible with VANET. The difference between VANET and MANET is that in VANET, the nodes are moving on predefined roads, and their trails aren't too complicated and this is where the routing protocols have to be modified or changed. Because of highly changing network topology and frequent disconnection it's strenuous to design an efficient routing protocol for vehicles, there can be two types of VANET that are V2V (Vehicle to Vehicle) and V2RSU (Vehicle to Road Side Unit).This paper show the comparison of AODV and DSR routing protocol on MANET Urban and MANET Rural environment and VANET Urban and VANET Rural environment using different node mobility and analyze the result using different performance parameter like pdr, throughput, average end-to-end delay etc.

Keywords: Mobile Ad-hoc Networks (MANET), A Vehicular Ad-hoc Network, Dynamic Source Routing (DSR), Ad-hoc On Demand Routing (AODV), Rural area and Urban area

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I. INTRODUCTION:

Different type of wireless networks is Mobile adhoc Networks and a Vehicular Ad-hoc Network. Mobile Ad-hoc Networks (MANET) consists of a set of mobile nodes and free to move dynamically in the network in any direction or any speed. It does not require any fix infrastructure and they are operating on batteries and limited transmission range. In MANET, each node works as a router and as host the reactive, proactive and hybrid algorithms are working in MANET. The mobile ad-hoc Networks have characteristics like–

1) Distributed operation
2) Multi hop routing
3) Autonomous terminal
4) Dynamic topology
5) Light-weight terminals
6) Shared Physical Medium

Because of these characteristics its faces many challenges like limited bandwidth, Dynamic topology, Mobility-induced route changes, Battery constraints, Security threats.

As MANET has dynamic topology so it is very flexible and robust due to this it can be set up anywhere and it Self-configuring network and less expensive as compared to wired network.

II. VANET

VANET is a subset of Mobile Ad-hoc Networks. VANETs are vehicular ad hoc networks is a collection of wireless node that forms a temporary network to communicate between vehicles. The moving vehicles in the roadside are considered as nodes and these nodes can communicate with each other and roadside equipment. These vehicle nodes are equipped with wireless devices to connect with the other devices fitted in the vehicles. During the communication, the vehicle communicate and transfer many useful on information .Reliability value is calculated by collecting some information like node location, direction and the velocity of the node. There are different types of Communication in VANET'S occurs:

1. Inter-vehicle communication: the inter-vehicle communication configuration uses broadcast method to transmit traffic related information to other vehicles.

2. Vehicle-To-Roadside Communication: The vehicle-to-roadside communication configuration represents a single hop broadcast to the vehicles to equipment on the roadside.

VANET have characteristic like

1. High Mobility
2. Network topology
3. Unbounded network size
4. Frequent exchange of information

There can be two types of VANET- V2V and V2RSU.when vehicle to vehicle communicates with each other it is known as V2V. When Road Side Units are used for routing information exchange with the other vehicles it is known as V2RSU.

III. PROBLEM DOMAIN

In order to achieve better performance in vehicular communication, the problems regarding intersections need to be handled to improve the transfer vehicle-to-vehicle data. Although VANETs have proven to be promising for communication in urban and rural environments, VANETs need to be able to provide higher delivery ratios of all the applications in the networks.

IV. SOLUTION DOMAIN AND ALGORITHM

To enable encoding and decoding of packets we have used two types of packets namely normal packet and code packet. Where size of normal packet is fixed and size of code packet is will be size of normal packet plus size of header. Let at an aggregator node we need to encode pkt1 and pkt2. This is done as following: pkt1 is XORed with pkt2 and is encapsulated under new header and is then forwarded depending upon the new header. We have also included a bit in each packet namely code on bit which is set if packet is code packet and unset if it is normal packet (though it is redundant as type of packet can be identified by size) in our case. Decoding is performed by first removing the additional header and then again XORing the packet with other appropriate packets.

When aggregate node receives data from the sensor nodes function *f* finds the difference between the data. If difference is less than some predefined γ and is not significant then there is no need of encoding and one of the data selected at random, is forwarded to sink node. If the difference is greater than γ then aggregate node encode (XORs) data and forward to sink node. Each aggregate node caches the previously received data from the sensor nodes. If data difference between previously received data and currently received data is significant then encoding done and data transmitted to sink node. Otherwise no encoding done and the data is transmitted normally.

Algorithm: Aggregate Heuristic(packet pkt1, packet pkt2)

//pkt_{1i}& pkt_{2i} is ith packet sent by leaf node 1 and leaf node 2 respectively.

{

Apply function f on data (pkt_{1i}), data (pkt_{2i}) and if it returns 0 then

{

If data (pkt_{1i}), data (pkt_{1i-1}) not equals to 0

Then

{

Perform network coding on pkt_{1i} and pkt_{1i-1} // pkt_{1i-1} is cached copy

Transmit data obtained by encoding in previous step

}

Else If data(pkt_{2i}),data(pkt_{2i-1}) not equals 0

{

Perform network coding on pkt_{2i} and pkt_{2i-1}

Transmit data obtained by encoding in previous step

}

Else

{

Select either of the packets and transmit

}

}

Else

{

Perform network coding on pkt_1 and pkt_2

Transmit data obtained by encoding in previous step

}

//End of Algorithm

Function data(packet pkt)

{

Return data encapsulated in packet "pkt"

}

V. SIMULATION AND RESULT

To analyze Mobile Ad-hoc Networks (MANET) and Vehicular Ad hoc Networks (VANET) we have used AODV and DSR as a routing protocol and compared the results on urban and rural environment. NS-2 is use as a simulation tool for this analysis. Performance is analyzed using different simulation metrics such as packet delivery ratio, throughput and average end to end delay and by using different node mobility. For our analysis we have used different node mobility as 15m/sec, 30m/sec,45m/sec,60m/sec.

1. Packet delivery ratio (PDR): The packet delivery ratio in this simulation is defined as the ratio between the number of packets send by source and the number of received packets at destination. In Fig 1 pdr is calculated using AODV routing protocol and in Fig 2 pdr is calculated using DSR routing protocol.

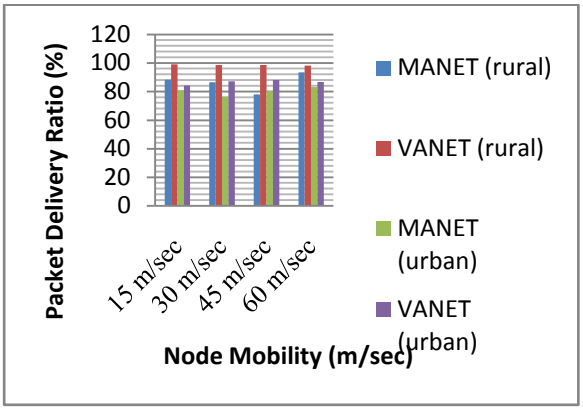

Fig 1. PDR using AODV routing protocol

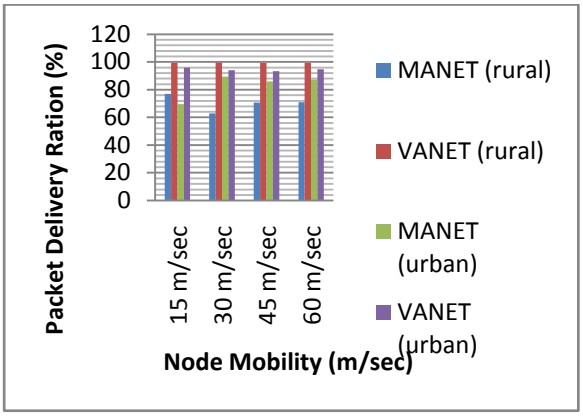

Fig 2. PDR using DSR routing protocol

2. Average end-to-end delay: There are possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times. In Fig 3 end-to-end delay is calculated using AODV routing protocol andin Fig 4end-to-end delayis calculated using DSR routing protocol.

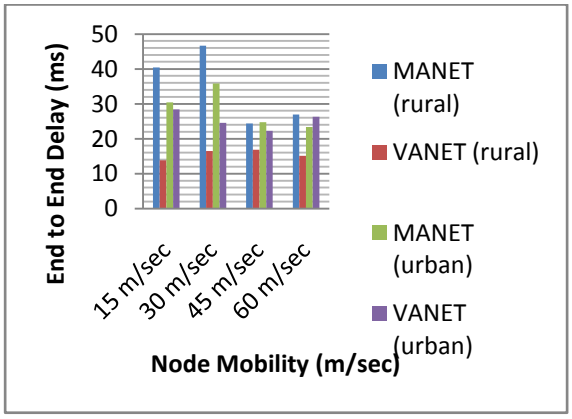

Fig 3. Average end-to-end delay using AODV routing protocol

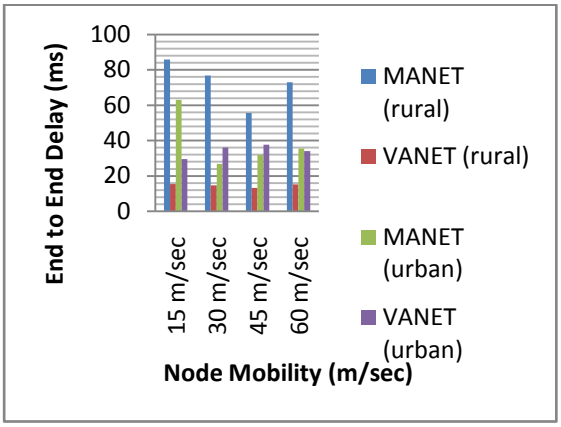

Fig 4. Average end-to-end delay using DSR routing protocol

3. Throughput: Throughput is the average number of successfully delivered data packets on a communication network. Throughput is calculated in bytes/sec or data packets per second. In Fig 5 throughput is calculated using AODV routing protocol andin Fig 6 throughput is calculated using DSR routing protocol.

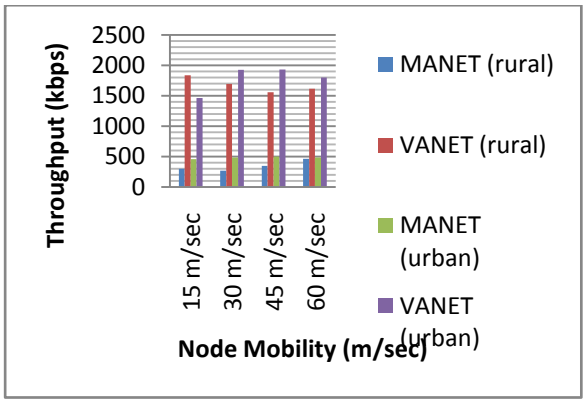

Fig 5. Throughput using AODV routing protocol

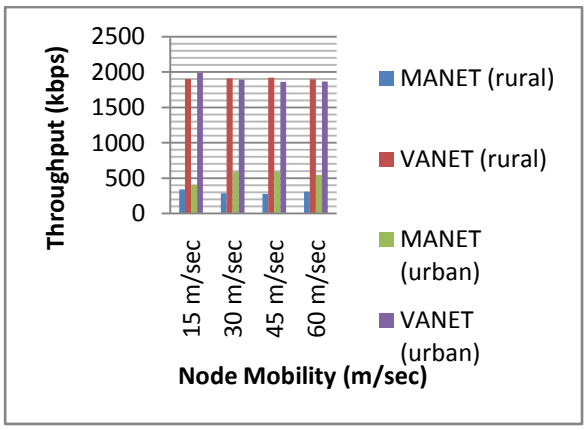

Fig 6. Throughput using DSR routing protocol

VI. CONCLUSION AND FUTURE WORK

In this paper we have done comparative analysis between the mobile ad-hoc network and the vehicular ad-hoc network. We have used MANET urban and rural environment and VANET urban and rural environment and on the bases of AODV and DSR routing protocol with different node motilities we analyze that PDR of VANET rural environment give the best result for DSR routing protocol. Throughput of VANET urban environment gives the best result for DSR routing protocol. Average end-to-end delay ofMANET rural environment gives the best result for DSR routing protocol.

FUTURE WORK: -In wireless network community VANET received attention of many researchers due to its unique nature. Although amount of research has been thoughtful to the various routing issues in VANET but still there are some areas that need more attention. Due to time constraint, we only focused on dynamic ad hoc routing with various speed with various protocols but still there are some areas in these routing protocols that need more attentions.

- Other performance metric such as jitter etc should be measure for all topology in VANET.
- Secure routing is one of the challenging fields. Due to the unsecure and ad hoc nature of VANET, there is prone to several security attacks that may lead to devastating consequences. So security attacks should be checked with respect to different attacks in VANET.
- New algorithms should be proposed to provide good QoS for safety and comfort applications in VANET.
- Position based routing protocols should be assess in real environment of VANET to check their efficiencies in real situation.

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