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Enhancement Performance of VANET Routing Protocols under Varying Node Density

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Abstract: ***Today the world is moving towards wireless system. Wireless networks are gaining popularity to its peak today, as the users want wireless connectivity irrespective of their geographic position. Vehicular ad-hoc networks (VANETs) are considered to be the special application of infrastructure-less wireless Mobile ad-hoc network (MANET). In these networks, vehicles are used as nodes. The paper work is based on analysis Ad hoc on demand Distance Vector routing protocol (AODV), Dynamic source routing protocol (DSR) and Destination sequenced distance vector routing (DSDV) in VANET on the basis of residual energy, packet delivery ratio, throughput and end to end delay. The tools which we used for the work of performance are NETWORK SIMULATOR (NS2).***

Keywords: MANET, VANET

1. Introduction

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. Most of the concerns of interest to MANET are of interest in VANET, but the details differ. Rather than moving at random, vehicles tend to move in an organized fashion. VANET offers several benefits to organizations of any size. The communication area which is related with the scope of this proposal is an emerging and exciting application of an ad-hoc network where vehicles are severing as nodes. This area has certain promised aspects and activities to be offered, which are broadly related with the safety, convenience, and entertainment topics.

2. Background

Wireless Ad-hoc Network:
A wireless ad-hoc network is a decentralized type of wireless network. 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, and so the determination of which nodes forward data is made dynamically based on the network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data. An ad hoc network typically refers to any set of networks where all devices have equal status on a network and are free to associate with any other ad hoc network devices in link range. Very often, ad hoc network refers to a mode of operation of IEEE 802.11 wireless networks.

VANET Routing Protocols:
All of the standard wireless protocol companies are experimenting with VANET. This includes all the IEEE protocols, Bluetooth, Integrated Resource Analyses (IRA) and Wi-Fi. There also are VANET experiments using cellular and satellite technologies. Dedicated Short Range Communications (DSRC) is a protocol that has been specifically for use with VANET. DSRC has several advantages: it already is operating at 5.9 GHz, it is easy to individualize and it is oriented to the idea of transmitting along a street grid framework--as opposed to the omni directional transmission, which is standard for most wireless protocols. Vehicular ad-hoc networks add to the complexity due to the fact that the nodes are travelling at high rates of speed. Overall, VANETs must work in all type of traffic i.e. high and low vehicle density environments in urban and rural environment respectively. This creates a challenge for the hardware design for VANETs. Because for example in low density vehicle environment the number of vehicle will be less so some vehicles will be out of rang for communication. In high density vehicle environment sharing of bandwidth is a challenge for VANET.

3. Performance Matrice

To evaluate the performance of a protocol for an ad-hoc network, it is necessary to test the protocol under realistic conditions, especially including the varying number of nodes.

Packet Delivery Ratio: This is the fraction of the data packets generated by the CBR sources to those delivered to the destination. This evaluates the ability of the protocol to discover routes.

Throughput: There are two representations of throughput; one is the amount of data transferred over the period of time expressed in kilobits per second (Kbps). The other is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received.

Residual Energy: This is the total amount of energy consumed by the nodes during the completion of Communication or simulation between the sending of the data packet by the CBR source. The unit of it will be in Joules.

End to end Delay: This is the average delay between the sending of the data packet by the CBR source and its receipt at the corresponding CBR receiver. This includes all the delays caused during route acquisition, buffering and processing at intermediate nodes.

4. Implementation & Results

4.1 Implementation

For better understanding of our work i.e. evaluation of routing protocol under VANET environment we have framed our work in four scenarios which consist of a simple MANET and some energy efficient quality oriented VANET protocols for now we have taken AODV, DSDV, DSR, TAODV and performed a analysis by implementing respective protocols on a custom generated topography. Then we have analyzed the results on the basis of various performance matrices such as packet delivery ratio, throughput, end to end delay and residual energy. This whole has been done using an open source Network Simulator NS-2. In our work we have performed 4 simulations First scenario is with a normalized AODV protocol. Second is for DSDV Protocol then DSR and at last modified AODV.

4.2 Results & Their Analysis

For our work to be done successfully we have used VANET scenario with varying number of nodes i.e. 20,40,60,80 and 100 nodes under static scenario using various routing protocols.

Packet Delivery Ratio under AODV, DSDV, DSR, TAODV Protocol: Figure shows the PDR under varying number of nodes i.e. 20,40,60,80 and 100 nodes for various protocols.

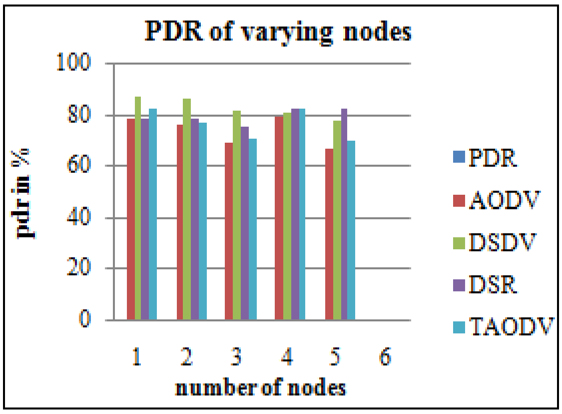

Figure Packet Delivery Ratio for varying number of nodes

Throughput under AODV, DSDV, DSR, TAODV protocol: Figure shows the overall throughput in kbps under varying number of nodes i.e. 20,40,60,80 and 100 nodes for various protocols.

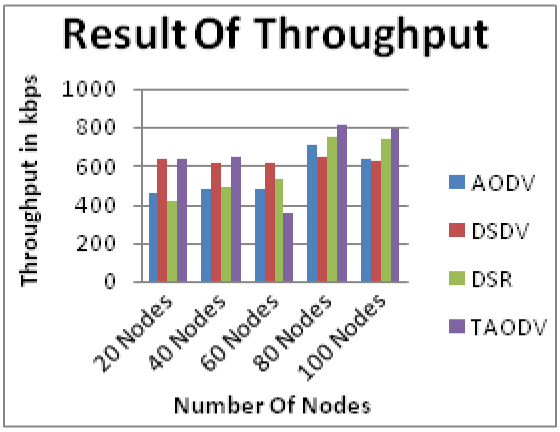

Figure Throughput for the varying number of nodes

Residual Energy under AODV, DSDV, DSR, TAODV Protocol: Figure shows the residual energy under varying number of nodes i.e. 20,40,60,80 and 100 nodes for various protocols.

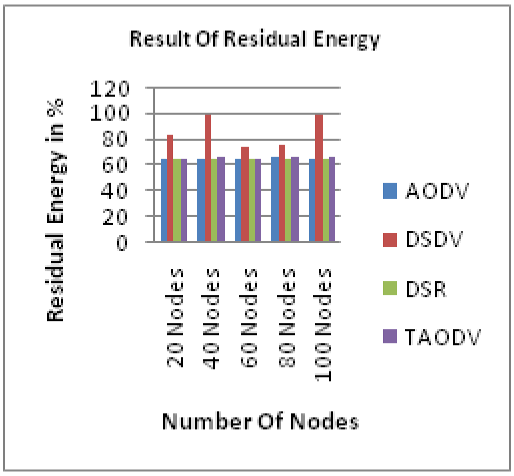

Figure: Residual Energy for varying number of nodes

End to End Delay under AODV, DSDV, DSR, TAODV protocol: Figure shows the average End to End Delay in ms under varying number of nodes i.e. 20,40,60,80 and 100 nodes for various protocols.

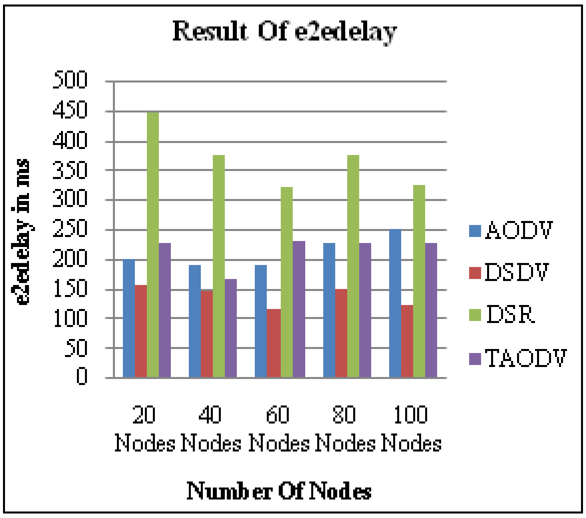

Figure End to End Delay for the varying number of nodes

5. Conclusion

We have analysed protocols AODV, DSR, DSDV and TAODV under performance metrics end to end delay, PDR, throughput and residual energy for varying number of nodes i.e. 20, 40, 60, 80 and 100 nodes. We can summarize the conclusion as:

- The behaviour of routing protocols analyzed that TAODV have enhanced packet delivery ratio by 4 then AODV.
- In case of end to end delay DSDV has increased value of it.
- TAODV gives higher values of residual energy then AODV. Overall DSDV have higher values of residual energy on changing number of nodes.
- In case of throughput TAODV has enhanced value by 12 then AODV.

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