# Performance Analysis of Ad Hoc Routing Protocols For Vehicular Ad Hoc - Networks

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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 thesis works is based on comparison between Ad hoc on demand Distance Vector routing protocol (AODV) and Destination sequenced distance vector routing (DSDV) in VANET on the basis of packet delivery ratio and average delay. Researchers are continuously publishing papers on performance work on VANET hence we worked on the issue. The tools which we used for the work of performance are TRACEGRAPH and NETWORK SIMULATOR (NS2).



**Keywords:** VANETS, MANETs, Ad- hoc Network, NS-2.34, Trace graph

**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 MANETs are of interest in VANETs, 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 [1].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][3]

**1.1 Problem Statement**: It is sometimes not possible for vehicles to establish direct link between one another with the help of single hop, which is related with the specified area of coverage because of the varying velocities of vehicles and abrupt moves of paths without

any notification, This proposal is highlighting the importance of routing protocols in VANET environments under different conditions and to observe and analyze their effects accordingly by mean of rigorous simulation test cases and comparative analyses.

## 2. WIRELESS Ad-Hoc NETWORK

**2.1 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.

**3. VANET:** 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. VANET offers several benefits to organizations of any size. While such a network does pose certain safety concerns (for example, one cannot safely type an email while driving), this does not limit VANET's potential as a productivity tool. GPS and navigation systems can benefit, as they can be integrated with traffic reports to provide the fastest route to work. A computer can turn a traffic jam into a productive work time by having his email downloaded and read to him by the on-board computer, or if traffic slows to a halt, read it himself. It would also allow for free, VoIP services such as Google Talk or Skype between employees, lowering telecommunications costs. Future applications could involve cruise control making automatic adjustments to maintain safe distances between vehicles or alerting the driver of emergency vehicles in the area. To support message differentiation in VANET, IEEE 802.11e standard is incorporated in vehicular communication [4].

**3.1 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 [5].

**4. AODV:** Ad hoc On-Demand Distance Vector (AODV) Routing is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad-hoc networks. It is jointly developed in Nokia Research Center, University of California, Santa Barbara and University of Cincinnati by C. Perkins, E. Belding-Royer and S. Das. It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. In contrast, the most common routing protocols of the Internet are proactive, meaning they find routing paths independently of the usage of the paths. AODV is, as the name indicates, a distance-vector routing protocol. AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route updates, a technique pioneered by DSDV. AODV is capable of both unicast and multicast routing [6].

**4.1 Working**: In AODV, the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sent a message backwards through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time. When a link fails, a routing error is passed back to a transmitting node, and the process repeats. Much of the complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, each request for a route has a sequence number. Nodes use this sequence number so that they do not repeat route requests that they have already passed on. Another such feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted. Another such feature is that if a route request fails, another route request may

not be sent until twice as much time has passed as the timeout of the previous route request. The advantage of AODV is that it creates no extra traffic for communication along existing links. Also, distance vector routing is simple, and doesn't require much memory or calculation. However AODV requires more time to establish a connection, and the initial communication to establish a route is heavier than some other approaches.

## 5. SIMULATION AND RESULT

**5.1 Simulation Enjoinment:** In our scenario we take 30 nodes .The simulation is done using NS-2, to analyze the performance of the network by varying the nodes mobility. The protocols parameters used to evaluate the performance are given below:

i) Total No. of Drop Packets: It is the difference between senting and received packets.

ii) Throughput: Throughput is the average rate of successful message delivery over a communication channel.

iii) End to end Delay: It can be defined as the time a packet takes to travel from source to destination.

### 5.2 Simulation Parameter:

**Table 1: Simulation Parameters Considered**

| Parameters | Values |
|---|---|
| Simulator | NS-2.34 |
| Mobility Model | Random Way Point |
| Antenna type | Omini |
| Area of Map | 500X500 |
| PHY/MAC | IEEE 802.11p |
| Routing Protocol | AODV,DSDV |
| Network Traffic | TCP,UDP |
| Simulation Time | 300sec |
| Antenna type | Omini |

### 5.3 Simulation results of AODV:

**5.3.1) Sent received and dropped Packet:** The graph shows the Simulation result between no. of sent, received and dropped packets with the simulation time in seconds.

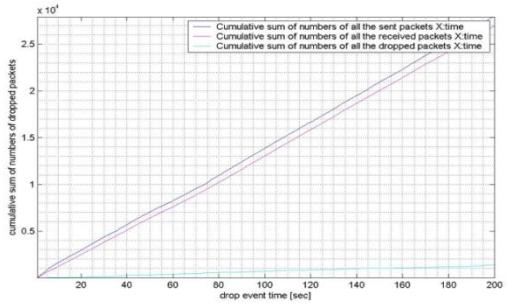


**Fig.1 Simulation of sent, received and dropped packet in AODV**

**5.3.2) End to end delay:** The graph shows the Simulation result between end to end delays with respect to packet sent time at source node

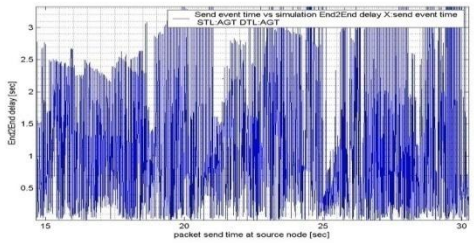


**Fig .2 Simulation of End to End delay in AODV**

**5.3.3) Throughput of**

**5.3.3.1) Sending packets:** The graph shows the Simulation result between of throughput of scending packets with respect to simulation time in seconds.

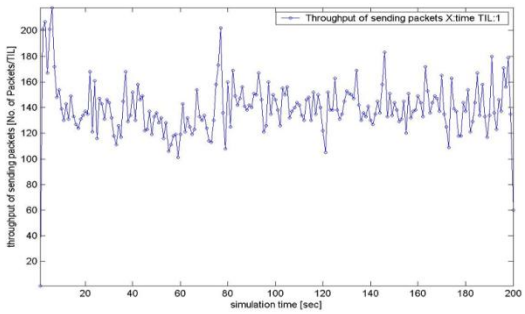


**Fig .3 Throughput of Sent packet in AODV**

**5.3.3.2) Receiving packets:** The graph shows the Simulation result between of throughput of receiving packets with respect to simulation time in seconds.

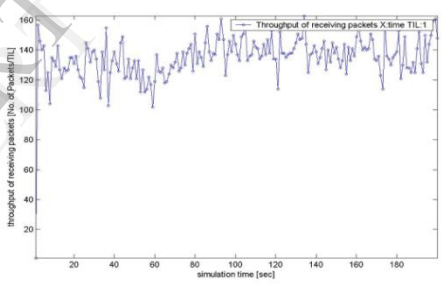


**Fig .4 Throughput of Received packet in AODV**

## 5.4 Simulation result of DSDV

**5.4.1) Sent received and dropped Packet:** The graph shows the Simulation result between no. of sent, received and dropped packets with the simulation time in seconds.

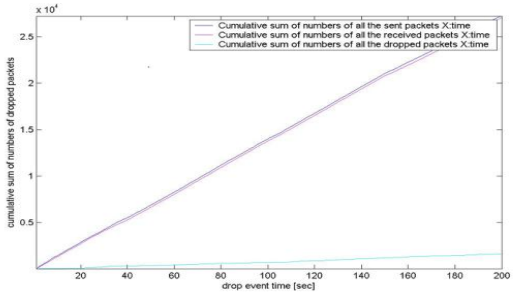


**Fig.5 Simulation of sent, received and dropped packet in DSDV**

**5.4.2) End to end delay:** The graph shows the Simulation result between end to end delays with respect to packet sent time at source node.

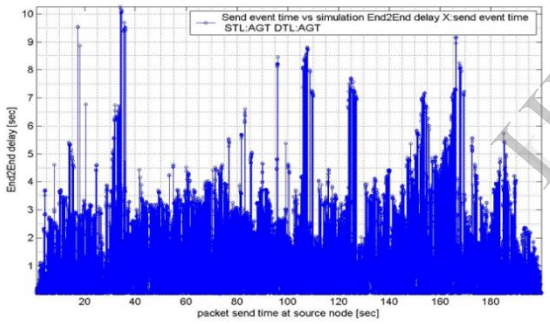


**Fig .6 Simulation of End to End delay in DSSDV**

**5.4.3) Throughput of**

**5.4.3.1) Sending packets:** The graph shows the Simulation result between throughputs of sending packets with respect to simulation time in seconds.

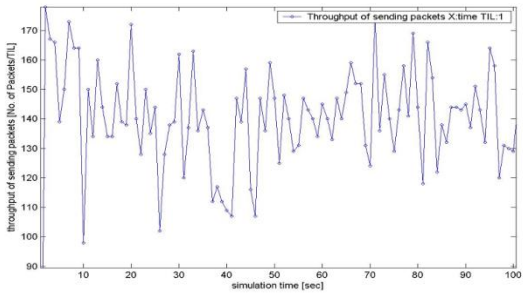


**Fig. 7 Throughput of Sent packet in DSDV**

**5.4.3.2) Receiving packets:** The graph shows the Simulation result between of throughput of receiving packets with respect to simulation time in seconds.

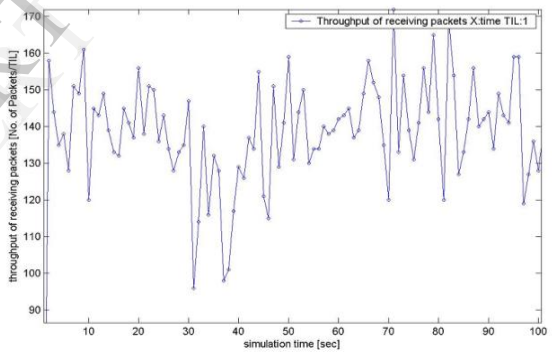


**Fig. 8 Throughput of Received packet in DSDV**

## 6. CONCLUSION

### 6.1 Comparison of Dropped Packets in AODV and DSDV

**Table. 2 Cumulative sum of all the Dropped Packets in AODV**

| Simulation time in sec | cumulative sum of all the sent packet | Cumulative sum of all the received packet | Dropped packet-(sent-received) |
|---|---|---|---|
| 10 | 1610 | 1190 | 420 |
| 20 | 2947 | 2497 | 450 |
| 30 | 4350 | 3825 | 525 |
| 40 | 5695 | 5100 | 595 |
| 50 | 7400 | 6410 | 990 |
| 60 | 8200 | 7550 | 650 |
| 70 | 9545 | 8855 | 690 |
| 80 | 11000 | 10200 | 800 |
| 90 | 12404 | 11600 | 804 |
| 100 | 13855 | 13041 | 814 |
| Total | - | - | 6738 |

**AVERAGE=TOTAL DROPED PACKET/10**

**6738/10 = 673.8**

**Table. 3 Cumulative sum of all the Dropped Packets in DSDV**

| Simulation time in sec | cumulative sum of all the sent packet | Cumulative sum of all the received packet | Dropped packet-(sent-received) |
|---|---|---|---|
| 10 | 1400 | 1234 | 116 |
| 20 | 2855 | 2705 | 150 |
| 30 | 4225 | 4100 | 125 |
| 40 | 5510 | 5270 | 240 |
| 50 | 6870 | 6640 | 230 |
| 60 | 8252 | 8020 | 232 |
| 70 | 9680 | 9490 | 190 |
| 80 | 11150 | 10930 | 220 |
| 90 | 12575 | 12350 | 225 |
| 100 | 13950 | 13740 | 210 |
| Total | - | - | 1938 |

**AVERAGE=TOTAL DROPED PACKET/10**

**1938/10 = 193.8**

Table 2 and 3 conclusion shows that the number of dropped packets is less in DSDV.

## 6.2 Comparison of Throughput of sent and received packets in AODV and DSDV

**Table. 4 Throughput of sent and received packets in AODV**

| Simulation time in sec | Throughput of sent packet | Throughput of received packet |
|---|---|---|
| 10 | 139 | 133 |
| 20 | 137 | 131 |
| 30 | 144 | 140 |
| 40 | 152 | 138 |
| 50 | 136 | 132 |
| 60 | 119 | 118 |
| 70 | 134 | 131 |
| 80 | 160 | 151 |
| 90 | 140 | 137 |
| 100 | 146 | 137 |
| Total | 1407 | 1355 |

**AVERAGE=TOTAL/10**

**SENT = (1407/10)=140.7**

**RECEIVED=(1355/10)=135.5**

**Table.5 Throughput of sent and received packets in DSDV**

| Simulation time in sec | Throughput of sent packet | Throughput of received packet |
|---|---|---|
| 10 | 98 | 120 |
| 20 | 172 | 156 |
| 30 | 162 | 147 |
| 40 | 109 | 129 |
| 50 | 147 | 159 |
| 60 | 145 | 142 |
| 70 | 124 | 120 |
| 80 | 144 | 142 |
| 90 | 145 | 144 |
| 100 | 129 | 128 |
| Total | 1519 | 1387 |

**AVERAGE=TOTAL/10**

**SENT= (1519/10)=151.9**

**RECEIVED=(1387/10)=138.7**

Table 4 and 5 conclusion shows that the throughput of DSDV is good.

## 6.3 Comparison of End to end delay in AODV and DSDV

**Table. 6 Comparison End to end delays in AODV and DSDV**

| Simulation time in sec | End to End delay in AODV | End o End delay in DSDV |
|---|---|---|
| 10 | 0.2 | o.1 |
| 20 | 3.3 | 1.2 |
| 30 | 0.4 | 0.29 |
| 40 | 0.89 | 1.7 |
| 50 | 0.13 | 1.72 |
| 60 | 2.18 | 0.4 |
| 70 | 2.35 | 0.96 |
| 80 | 0.1 | 0.07 |
| 90 | 0.66 | 0.55 |
| 100 | 0.53 | 1.02 |
| Total | 10.74 | 8.01 |

**AVERAGE=TOTAL/10**

**AODV= (10.74/10)=1.07**

**DSDV= (8.01/10)=0.8**

Table 6 conclusion shows that the average of End to end delay in DSDV is lesser.



## REFERENCES

[1] V. Ramesh, D.Subbaiah,andN.Rao,"Performance Comparison and Analysis of DSDV and AODV for MANET," *) International Journal on,* vol. 02, no. 02, pp. 183-188, 2010.

[2] Schoch, E. Ulm Univ., Ulm Kargl, F.Weber, M. Leinmuller, T. "Communication patterns in VANETs" Volume: 46 , Issue: 11 Page(s): 119- 125,Dated on November 2008.

[3] Saleet, H. Dept. of Syst. Design Eng., Univ. of Waterloo, Waterloo, ON, Canada Basir,O., Langar,R., Boutaba, R."Region-Based Location Service-Management Protocol for VANETs" Volume: 59, Issue: 2 Page(s): 917- 931,Dated on Feb. 2010.

[4] Yan-Bo Wang Dept. of Electr. Eng., Tamkang Univ., Tamsui, Taiwan

[5]http://www.ehow.com/list_6670042_vanet-routing-protocols.html.Tin-Yu Wu, Wei-Tsong Lee, Chih-Heng Ke "A Novel Geographic Routing Strategy over VANET" Page(s): 873- 879.

[6] Perkins Charles E., Bhagwat Pravin: Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers, London, England UK, SIGCOMM 94-8/94.