

# Performance Analysis of Vehicular Ad-hoc Network

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## ABSTRACT

Vehicular Ad-hoc Network is an infrastructure less network, which helps in creation of network due to road side units and vehicles as the communicating nodes. The wireless connections help in communication process among the nodes. It leads to a reduction in traffic congestion and vehicles crashes. Recently many research authorities and automotive industries have started exploring this area as new field of research and development. The challenges associated with this field are studied. In this paper, the factor being chosen is the routing protocols in these networks which are used for routing of data. The throughput and average end to end delay performance metrics are used for comparison of reactive and pro-active routing protocols.

## Keywords

VANET; MANET; NS2; AODV; DSDV; DSR; NS2.34.

## 1. INTRODUCTION

Wireless Networks refers to network of nodes which can be a laptop, mobile phone that uses radio waves to communicate. With increase in the use of small and portable devices/computers, the need of wireless network has also increased. Earlier it was believed that wired networks are more secure and fast as compared to wireless network. But due to continuous improvement in wireless network standard and technology have eroded that security and speed differences [1].

Vehicular Ad Hoc Network (VANET) is an enhanced class of Mobile Ad Hoc Network (MANET) that has emerged because of recent growth in wireless technology and sensors. It is an infrastructure less technology like MANET. By this we mean that the nodes can communicate among each other directly or between node and base station. The cost is reduced as a result as this technology does not require an access point for the transfer of information to other nodes. The use of VANET will reduce the traffic congestion and vehicles crashes throughout the world. In order to implement this technology many countries like USA has allotted 75 MHz of licensed spectrum at 5.9 GHz for VANET [2].

The roadway system touches the life of every person. With the deployment of VANET, the number of accidents will decrease and human lives will be saved. Along with the safety of public and road management numerous other applications have also been proposed, various applications of vehicular network have been discussed as follows:

- Vehicular communication will also help in improving the Police services; because of it vehicles of cop can coordinate in better way while following criminals.
- Vehicular communication will help in detecting the position of vehicle; it would be of great use

specially if vehicle has met with an accident at anonymous place.

The various challenges in the functioning of VANET are as follows:

- Due to inherent characteristics of radio channel, multiple reflecting objects can decrease the strength of the received signal due to the phenomenon of fading.
- High mobility, scalability requirements and excessive variation in environmental conditions presents a challenge in designing an optimized routing algorithm.
- The mechanism of using channel efficiently for broadcasting and multicasting.
- Priority scheduling and security of the data being transferred.

## 2. LITERATURE REVIEW

Chang et al. [3] investigated a design of suitable routing protocol for VANET with respect to inter vehicle communication application. The problem of routing of data in VANET, which is challenging as it has high topology changes, unstable connection environment & real road planning the routing of data in VANET.

Mohapatra and Kanungo [4] evaluated and compared the protocols of a Mobile Ad-Hoc Network. The protocols are analyzed to compare them by using Network Simulator 2(Ns2) considering parameters of delay, throughput, and control overhead. As every pro-active, reactive and on demand routing protocols, it required to find suitable protocol for an environment.

Chen et al. [5] provided the fact that there are different software's for simulation which are specific and expensive. So, the basic problem was to find cheap and efficient software for implementing VANET scenarios.

Singh et al. [6] detailed a comparison of protocols in two scenarios in VANET. To find the reliability of protocols and to get the results the use of NS2 for simulations and for mobility generation. Ad-hoc On-Demand Distance Vector (AODV), Distance Source Routing (DSR) are the protocols which are compared.

Rahem et al. [7] study to investigate about various ad hoc routing methods so as to select suitable method for different kinds of network in VANET. The routing protocol to be used is mainly selected on the basis of the kind of the network present.

Praba et al. [8] is widely finding application of VANET in areas such as traffic and road safety, payment collection, tourist guiding information and natural hazards. In VANET environment, routing should be focused, as it is essential for life safety applications. The information should be

broadcasted to all the entities in the network with the help of routing protocols .This paper gives a detailed overview of VANET applications and its characteristics.

### 3. SIMULATION PARAMETERS

The simulation was carried out using simulation area of 500m x500m, node density 20, 40, 60 and 80 nodes with constant maximum speed 20 m/s for AODV and DSDV routing protocols.

The Simulation was done for 300s with Constant Bit Rate (CBR) used to generate traffic. The connection type used for simulation is CBR/UDP. The parameters used for simulation purpose shown in the Table I.

**Table 1. Simulation parameters**

Simulation parameter	Value
Routing Protocol	DSDV,AODV
Connection Type	CBR/UDP
Simulation Area	500 m × 500 m
Simulation Time	300 s
No. of nodes	20,40,60,80
Network Simulator	NS 2.34

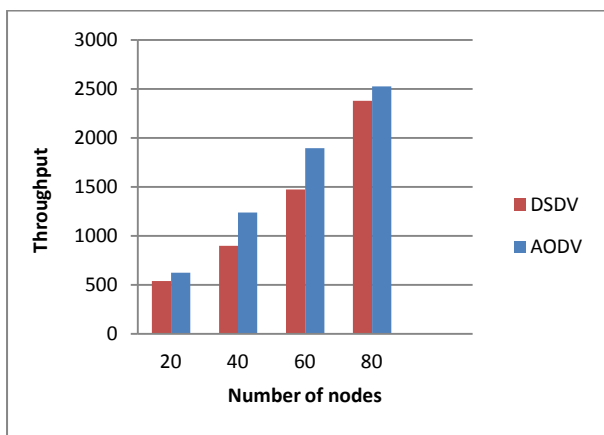
### 4. PERFORMANCE METRICS

The throughput and average end to end delay performance metrics are used to compare and analyze the values for AODV and Destination Sequenced Distance Vector (DSDV) protocols.

1) Throughput is defined as the number of successfully transmitted packets from sender to the receiver in the communication network. It is calculated or measured in Kilo bits per second. It is affected by other parameters like frequent topology changes.

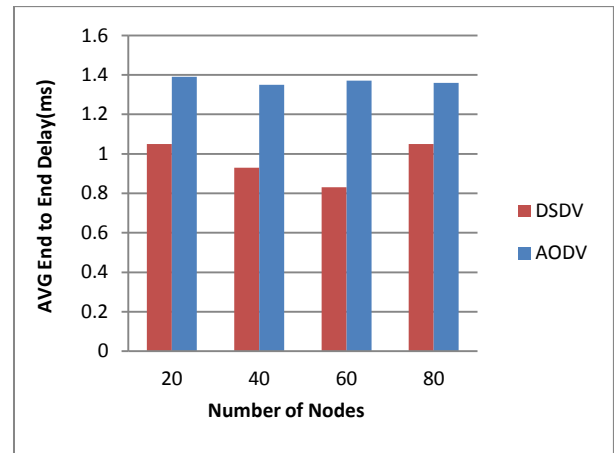
2) Average End to End delay is defined as the average time taken by data packet to propagate from source to destination across network. It is measured in milliseconds (ms). It includes various delays introduced because of route discovery, queuing, propagation and transfer time.

#### 4.1 Simulation Results



**Fig 1:Comparison of Throughput for simulation area**

It is shown interpreted from the Fig.1 that throughput of AODV protocol is more than DSDV protocol in all number of nodes in 500square meters. The throughput of DSDV decreases drastically as table driven approach is used to maintain route which introduces extra overhead.



**Fig 2:Average End to End Delay for simulation area**

Fig. 2 shows that end to end delay in DSDV routing protocol is less as compared to AODV routing protocol. The reason being DSDV is proactive routing protocol which maintains entire routing path to establish route at source. But AODV is reactive routing protocol which gives request for the path only when required, which introduce extra delay in AODV protocol.

### 5. CONCLUSION

This paper illustrates the differences between the reactive routing protocol (AODV) and proactive routing protocol (DSDV) which has been analyzed under the random mobility model. The evaluations made on these protocols bring out some important characteristics of these protocols when they are used in VANET.

From the obtained results, it is observed that as the node density increases the value of throughput increases in both reactive and proactive protocols, but AODV performed better than DSDV because mechanisms of route discovery, route maintenance and elimination of periodic broadcasting are used by AODV and by almost all reactive protocols.

But at same time as the node density increases the value of average end to end delay for DSDV protocol is lesser as compared to AODV protocol, which is one of the main requirements in real time system. The value is less because of table driven approach used by almost all proactive protocols.

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