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Comparative Performance Evaluation of AODV and AOMDV in Vehicular ADHOC Network

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Abstract: *Vehicular Ad hoc Network (VANET) is a new way of communication which includes communication between vehicles moving at high speeds on the roads. VANET is subset of MANET. Vehicular Area Network providing emergency services and other information in both urban and rural setup. Vehicles can communicate with each through protocol. Protocols in VANET can classified as Topology Based ,Position Based , Geocast Based , Cluster Based ,Broadcast based , Infrastructure based . Reactive protocols Determine a route only when there is data to send. Each node forwards the request only once. Each node maintains a routing table that contains information about reaching destination nodes. In this paper Topology based reactive protocols AODV and AOMDV are presented.*
Keywords: *VANET, AODV, AOMDV, Reactive Protocol*

I. Introduction

1.1 AODV - Ad Hoc On-demand Distance Vector Protocol

Ad Hoc On-demand Distance Vector (AODV) is a packet routing topology based reactive protocol designed for use in Vehicular ad hoc networks. The AODV protocol is both an on-demand and Table driven protocol. AODV supports multicasting and unicasting within uniform networking. AODV is minimizes the number of required broadcasts by creating routes on demand. A source node initiates a discovery of path process to locate the other intermediate nodes and find the destination by broadcasting a Route Request (RREQ) packet to its neighbors. Every node has a routing table that contains information about reaching destination nodes .When a node know about route to the destination, it sends a route reply to the source node. Route is maintained only when it is used and hence expired routes are never used. AODV maintain only one route between source- destination pair. AODV deals with route management table. AODV uses the following fields with each route table entry:

- ✓ Destination IP Address
- ✓ Destination Sequence Number
- ✓ Valid Destination Sequence Number flag
- ✓ Other state and routing flags (e.g., valid, invalid, repairable,
- ✓ being repaired)
- ✓ Network Interface
- ✓ Hop Count (number of hops needed to reach destination)
- ✓ Next Hop
- ✓ List of Precursors
- ✓ Lifetime (expiration or deletion time of the route)

Advantages of AODV is Establish on demand ,Destination sequences are used to find the latest path to destination , connection setup delay is less in network.Disadvantage of AODV Intermediate node can lead to inconsistent route,Beacon-base,Heavy control overhead.AODV defines three types of control messages for route maintenance :

1. Route Requests(RREQs)
2. Route Replies(RREPs)
3. Route Errors(RERRs)

Route Request (RREQ)

A *route request* message is transmitted by a node requiring a route to a node.While communication routes between nodes are valid, AODV does not play any role.When a node needs to discover a route to a

destination then RREQ message is broadcasted.As a RREQ propagates through the network, intermediate nodes use it to update their routing tables from the direction of the source node.The RREQ contains the most recent sequence number for the destination.A valid destination route must have a sequence number at least as great as that contained in the RREQ.

Route Reply (RREP)

When a RREQ reache to destination node, the destination route is made avail by unicasting a RREP back to the source route.A node generates a RREP if It is itself the destination and It has an active route to the destination. For Example an intermediate node respond with an RREP if it has a "fresh enough" route to the destination.As the RREP propagates back to the source node, intermediate nodes update their routing tables (in the direction of the destination node).

Route Error (RERR)

This message is broadcast for broken links. If there any link breakage in an active route is detected, then RERR message is used to notify other nodes of the loss of the link

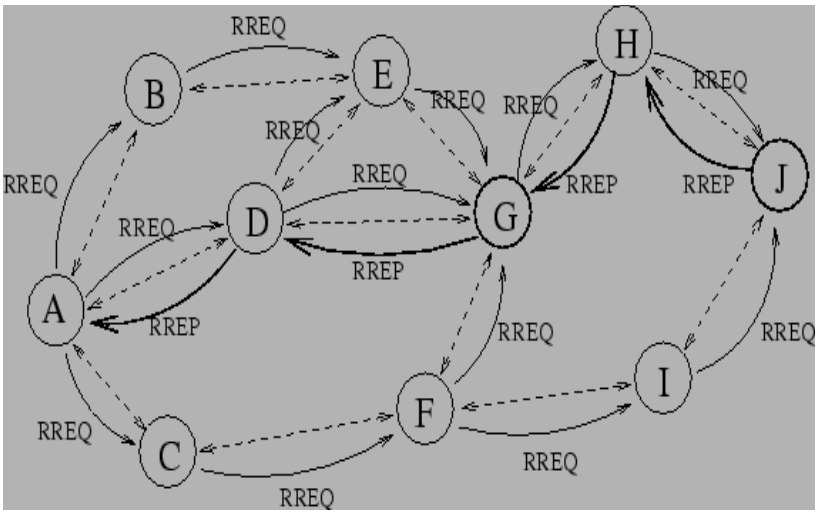

Figure 1. Message Types in AODV

1.2 AOMDV - Ad-hoc On-demand Multipath Distance Vector Routing protocol

AOMDV is a multipath extension to the AODV protocol. In AOMDV protocols multiple routes are founded between the source and destination.It uses alternate routes on a route failure. New route discovery is needed when all the routes fail. . In AOMDV protocols multipath routing is the enhancement of unipath routing in which advantage is to handle the load in network and avoid the possibility of congestion and increases reliability. Main advantage of AOMDV protocol is establishes route on demand , create loop free nodes, Fast and efficient recovery from failures, maintains connectivity.The disadvantage of using AOMDV is that it has more message overheads during route discovery due to increased flooding and since it is a multipath routing protocol, the destination replies to the multiple RREQs those results in a longer overhead packets in response to single RREQ packet may lead to heavy control overhead.

II. Performance Evaluation

A number of network simulators are available and practiced.Some of the more popular ones are NS-2, GloMoSim , CSIM , QUALNET and OPNET.NS-2 simulator developed as collaborativeenvironment of networks is distributed as open source softwarethat has proven useful in studying the dynamic nature of communication networks. A simulation study was carried out to study and evaluate the performance of routing protocols in VANET such as AODV, AOMDV based on Average throughput, End to End delay , Number of Delivered packets. Scenario of VANET is designed NS2 simulation tool.

2.1 Simulation Parameters

In this Network employed NS2 for simulation. A network was modeled with in an area of 2 km. All mobile nodes are spread within the area. Each scenario was run for 20 Seconds. Vehicle speed is 3 Meter/Second. Under each simulation check the behavior and performance of AODV and AOMDV protocol with in constructed network.

Parameters	Values
Simulation area	2 KM
Number of nodes	500
Number of streets	250
Vehicle speed	3 meter/second
Transmission range	150 meters
Minimum data rate	6 Mbps
Simulation time	20 seconds

Table 1. Simulation Setting

2.2 Performance Metrics

In order to study the protocol performance evaluation in VANET three performance metrics are selected.

Throughput

Throughput describes as the total number of received packets at the destination out of total transmitted packets .Throughput is calculated in bytes/sec or data packets per second. T = Total number of received packets at destination* packet size/Total simulation time.

Packet Loss

It shows total number of data packets that could not reach destination successfully.The reason for packet drop may arise due to congestion, faulty hardware and queue overflow etc.

End to End Delay

End to End Delay is the average time that packets take to traverse in the network.

III. Results

After studying the various aspects of AOMDV we have concluded that AOMDV has many advantages than AODV to improve the performance of VANET. Allof our Graph results shows AOMDV protocol performance is better than AODV in Vehicular Adhoc Netwok.

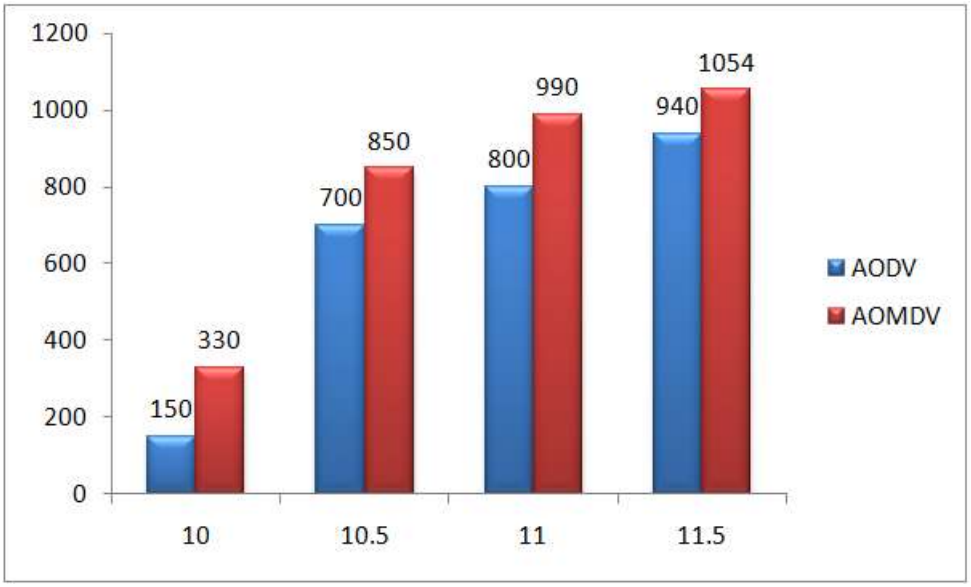

Figure 2. Throughput :AODVVs AOMDV

End to End Delay

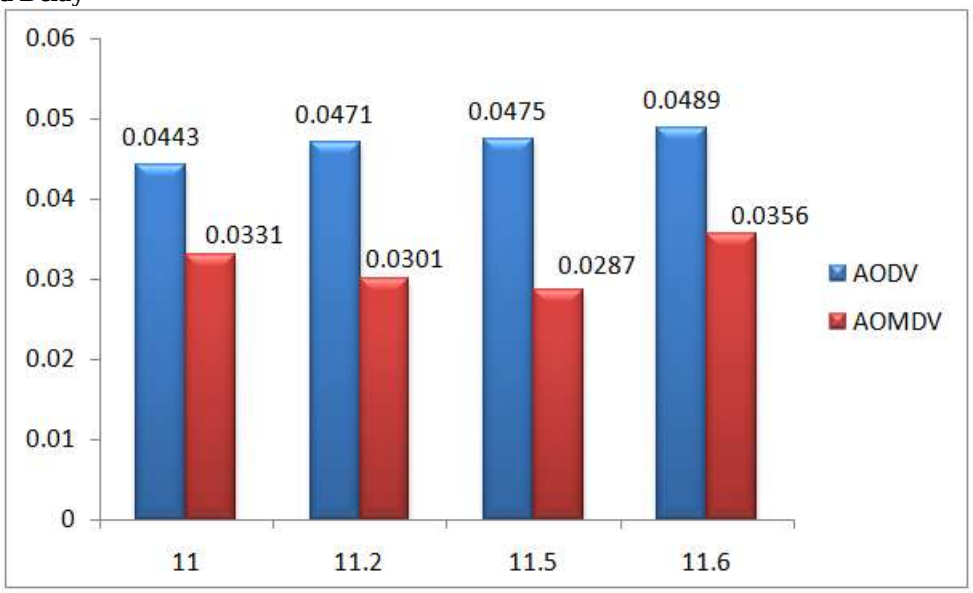

Figure 3. End to End Delay :AODVVs AOMDV

Packet Loss

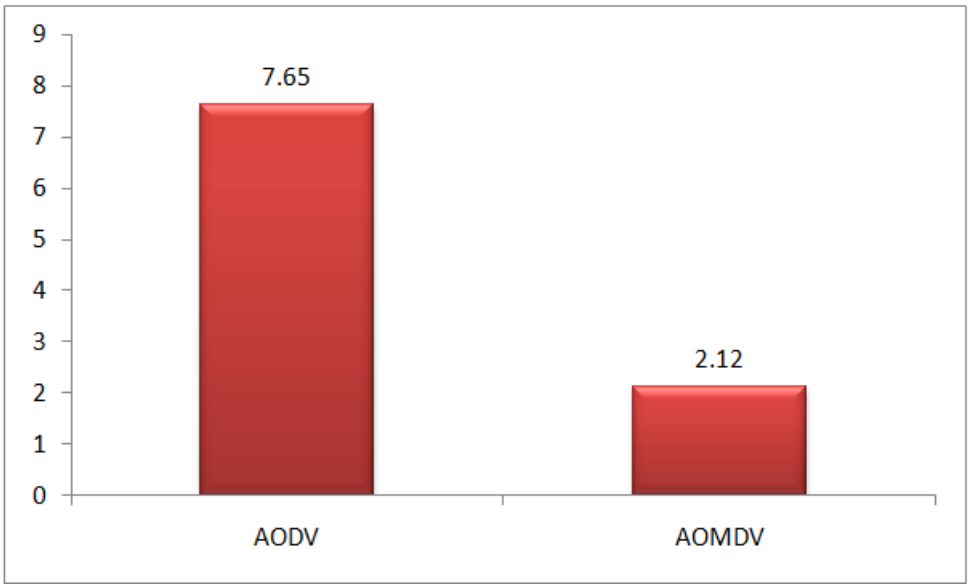

Figure 4. Packet Loss :AODVVs AOMDV

IV. Conclusion

In this paper we have analyzed, that AOMDV routing protocol is better as compare to AODV routing protocols in VANETs.AOMDV attained better throughput than AODV. Figure 2 shows total number of successful packet reached more than AODV by AOMDV protocol.AOMDV End to End Delay is better than AODV.Figure.3 shows that AOMDV takes less average time to travel in network than AODV.Packet loss in AOMDV is less than AODV.Figure 4. Shows packet drop is less than AODV.Further work we can evaluate the AOMDV performance in Multimedia Video transmission in VANET.

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