# COMPARISON OF DSDV, AODV AND AOMDV PROTOCOL

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***Abstract :*** There are various performance metrics to compare Ad hoc routing protocols. A Mobile Ad-Hoc Network (MANET) is a set of wireless mobile nodes which forms instant temporary network without using any central administration or network infrastructure. All the nodes in MANET's change their position frequently. Routing protocols are mainly classified in Proactive, Reactive and Hybrid. A proactive routing protocol is called as Table-driven routing class and a reactive known as On-Demand routing class. Performance is calculated by Quality of service (QoS) parameters.
In this paper, Packet delievery fraction, Average throughput and End to end delay are studied comparing with changing of nodes with the help of NS-2.35 (Network simulator – 2.35) software. Comparison of performance of three important protocols like destination sequenced distance vector (DSDV) adhoc on demand distance vector (AODV) and adhoc on demand multipath distance vector (AOMDV) for mobile ad hoc networks has been made in different scenarios.

***Keywords-*** **Wireless Mesh Network, DSDV, AODV, AOMDV, Nodes.**

## I. Introduction

A Mobile Adhoc Network (MANET) is a self-configuring network of wireless and hence mobile devices that constitute a network capable of dynamically changing topology. Nodes in a MANET don't act only as the ordinary nodes but also as the routers for other peer devices. A mobile ad hoc network is a collection of digital data terminals equipped with wireless Transceivers that can communicate with one another without using any fixed networking infrastructure. Communication is maintained by the transmission of data packets over a common wireless Channel. [6].

The absence of any fixed infrastructure, such as an array of base stations, makes ad hoc networks different from other wireless LANs. Whereas Communication from a mobile terminal in an infrastructure network, such as a cellular network, is always maintained with a fixed base station, a mobile terminal (node) in an ad hoc network can communicate directly with another node that is located within its radio transmission or communication range. In order to transmit to a node that is located outside its radio range, data packets are relayed over a sequence of intermediate nodes using a store-and-forward —multi hop transmission principle. Every node in an ad hoc network is required to relay packets on behalf of other nodes. A mobile ad hoc network is sometimes also known as multi hop wireless network. The design of adhoc network faces many challenges[3]. The first is that all nodes in an ad hoc network, including the source nodes, the corresponding destinations, as well as the routing nodes forwarding traffic between them, may be mobile. As the range of wireless transmission is limited, the (wireless) link between a pair of neighbouring nodes disconnects as soon as they move out of range. [5].

The design of ad hoc networks is complicated due to the absence of centralized control. All networking functions, such as determining the network topology, multiple accesses, and routing of data over the most appropriate multi hop paths, must be performed in a distributed way. These tasks are immense challenging due to the limited communication bandwidth available in the wireless channel. These challenges are resolved by different layers. The physical layer must tackle the fading, the path loss, and multi-user interference to maintain stable communication links between peers[5]. The data link layer (DLL) must make the physical link reliable and resolve contention among unsynchronized users transmitting packets on a shared channel. The next operation is performed by the medium access control (MAC) sub layer in the DLL. The network layer needs to detect changes in the network topology and appropriately determine the best route to any desired destination. The transport layer must match the delay and packet loss characteristics specific to such a dynamic wireless network. [3]

## II. Manet routing protocols

Manet routing protocols are mainly classified into three parts: (1) Proactive routing protocols, (2) Reactive routing protocols and (3) Hybrid routing protocols.

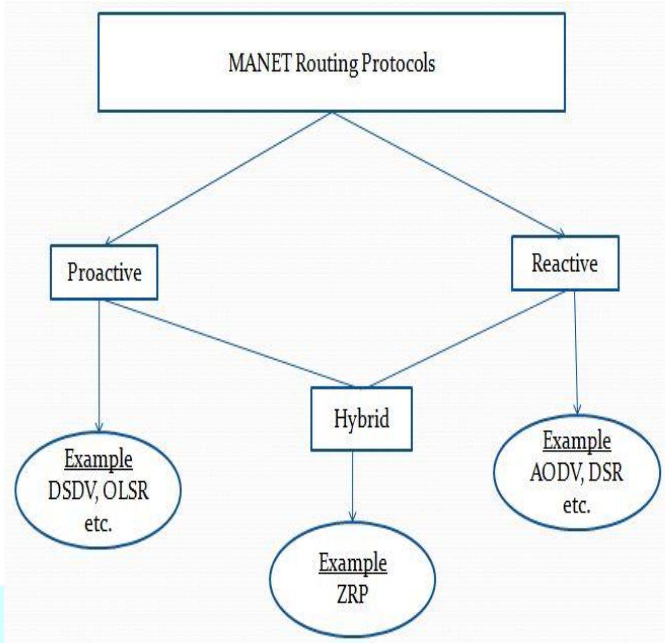


Fig. 1 Manet Routing Protocols

**2.1 Proactive routing protocol (DSDV)**

The proactive routing is also called as a table-driven routing protocol. In proactive routing protocol, mobile nodes periodically broadcast their routing information to the neighbors. Each node needs to maintain their routing table which not only records the adjacent nodes and reachable nodes but also records the number of hops. In other words, all of the nodes have to evaluate their neighborhoods as long as the network topology has changed. Therefore, the disadvantage is that the overhead rises as network size increases, a significant communication overhead within a larger network topology. However, the advantage is that network status can be immediately reflected if the malicious attacker joins. Most familiar types of the proactive type are destination sequenced distance vector (DSDV) routing protocol and optimized link state routing (OLSR) protocol.

**2.2Reactive routing protocol**

The reactive routing is called as on-demand routing protocol. Unlike the proactive routing, the reactive routing is simply started when nodes desire to transmit data packets. The advantage is that the wasted bandwidth induced from the cyclically broadcast can be reduced. Nevertheless, this might also be the fatal wound when there are any malicious nodes in the network environment. The disadvantage is that passive routing method leads to some packet loss. Here we briefly describe two prevalent on-demand routing protocols which known as ad hoc on-demand distance vector (AODV) and ad hoc on-demand multipath distance vector (AOMDV) protocol.

**2.2.1 Ad hoc on-demand distance vector (AODV):**

In AODV, each node only records the next hop information in its routing table but maintains it for sustaining a routing path from source to destination node. If the destination node can't be reached from the source node, the route discovery process will be executed immediately. In the route discovery phase, the source node broadcasts the route request (RREQ) packet first. Then all intermediate nodes receive the RREQ packets, but parts of them send the route reply (RREP) packet to the source node if the destination node information is occurred in their routing table. On the other Side, the route maintenance process is started when the network topology has changed or the connection has failed [8]. Source node is informed by a route error (RRER) packet first. Then it utilizes the present routing information to decide a new routing path or restart the route discovery process for updating the information in routing table.

**2.2.2 Ad hoc on-demand multipath distance vector (AOMDV):**

Ad-hoc On-demand Multipath Distance Vector Routing (AOMDV) protocol is an extension to the AODV protocol for computing multiple loop-free and link disjoint paths. The routing entries for each destination contain a list of the next hops along with the corresponding hop counts[2]. All the next hops have the same sequence number. This helps in keeping track of a route. For each destination, a node maintains the advertised hop count, which is defined as the maximum hop count for all the paths, which is used for sending route advertisements of the destination. AOMDV can be used to find node-disjoint or link-disjoint routes. The advantage of using AOMDV is that it allows intermediate nodes to reply to RREQs, while still selecting disjoint paths. But, AOMDV 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 are in longer overhead. [7]

### 2.3 Hybrid routing protocols

Zone Routing Protocol (ZRP) is hybrid routing protocol in adhoc network. The Zone Routing Protocol (ZRP) integrates both proactive and reactive routing components into a single protocol to maintain valid routing tables without too much overhead. Around each node, ZRP defines a zone whose radius is measured in terms of hops. Each node utilizes proactive routing within its zone and reactive routing outside of its zone. Hence, a given node knows the identity of and a route to all nodes within its zone. When the node has data packets for a particular destination, then it checks its routing table for a route. If the destination lies within the zone, a route will exist in the route table. Otherwise, if the destination is not within the zone, a search to find a route to that destination is needed.

For intrazone routing, ZRP defines the Intrazone Routing Protocol (IARP). IARP is a proactive protocol that maintains up-to-date information about all nodes within the zone. For any given node, its peripheral nodes are defined to be those nodes whose minimum distance to that node is the zone radius. ZRP utilizes the Interzone Routing Protocol (IERP) for discovering routes to destinations outside of the zone. For route discovery, the notion of bordercasting is introduced. [9]

## II. SIMULATION TOOL

All simulations have been carried out using the NS simulator program version 2.35 under Linux platform. NS2 is an open source simulator software and used by a lot of institutes and researchers. The main goal of the NS2 simulator is to provide support to education and research in networking. It is one of the best programmed in terms of comparing different routing protocols and designing new ones. NS2 has been written in two languages: Object oriented variant of Tool Command Language (OTCL) and object oriented language C++.

### 3.1 Simulation Environment

For the simulations, we use NS-2(NS-2.35) network simulator. NS-2 provides faithful implementations of the different network protocols. The channel used is Wireless Channel with Two Ray Ground radio propagation model. At the network layer, we use AODV as the routing algorithm. UDP is used at the transport layer. All the data packets are CBR (continuous bit rate) packets. To evaluate the packet delivery fraction, End-to-End Delay and Throughput simulation is done from varying nodes with the source node transmitting maximum 1000 packets to the destination node. The size of the packet is 512 bytes.

The movement models are characterized based on nodes. The connection pattern is generated using cbrgen and the node model is generated using setdest utility. Setdest generates random positions of the nodes in the network with specified mobility and pause time. The terrain area is 1000m X 1000m with number of nodes varying from minimum 10 to 70. In this movement model simulation time is 100 seconds and traffic sources are CBR (Constant Bit Rate). The simulation parameters are summarized in table.

**Table 3.1: Simulation parameters**

| Parameters | Values |
|---|---|
| Simulator | NS-2.35 |
| Channel | Channel/Wireless channel |
| Radio Propagation Model | Propagation Two Ray model |
| Network Interface | Physical/Wirelessphy |
| MAC | MAC802_11 |
| Antenna | Antenna/Omniantenna |
| Interface Queue Type | Drop Tail priority |
| Routing Protocols | AODV, AOMDV, DSDV |
| Packet Type | CBR |
| Nodes | 10,20,30,40,50,60,70 |
| Mobility | 60 m/s |
| Pause time | 10 s |
| Terrain Area | 1000 m × 1000 m |
| Simulation Time | 100 s |

### 3.2 METRICS USED FOR SIMULATION

To analyze the performance of our solution, various contexts are created by varying the number of nodes. The metrics used to evaluate the performance of these contexts are given below. [4]

- **Packet Delivery Fraction:** The fraction of packets sent by the application that are received by the receivers.
- **Average 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, retransmission delays at the MAC layer, etc. It is measured in milliseconds. [4]

- **Throughput:** It is the average rate of successful message delivery over a communication channel. These data can be delivered over a physical or logical link. It is measured in bits per second.

### 3.3 Simulation Results and analysis

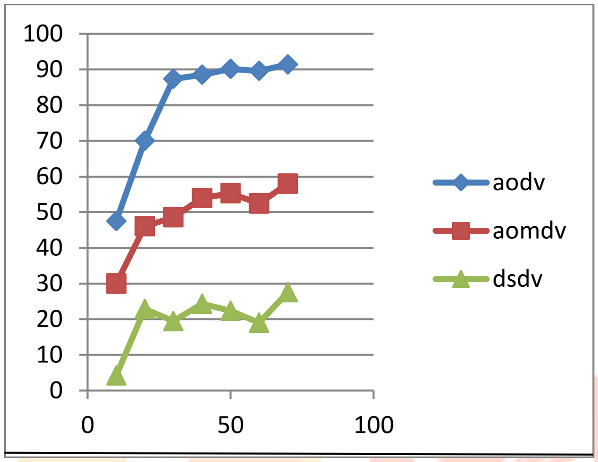


Fig. 2PDF (Packet Delivery Fraction)

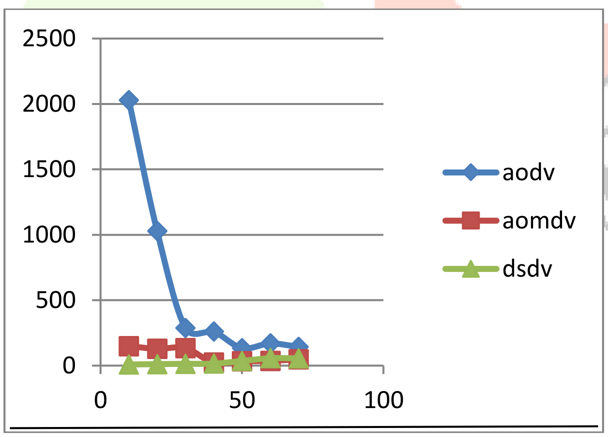


Fig. 3 E2Edelay (End to End Delay)

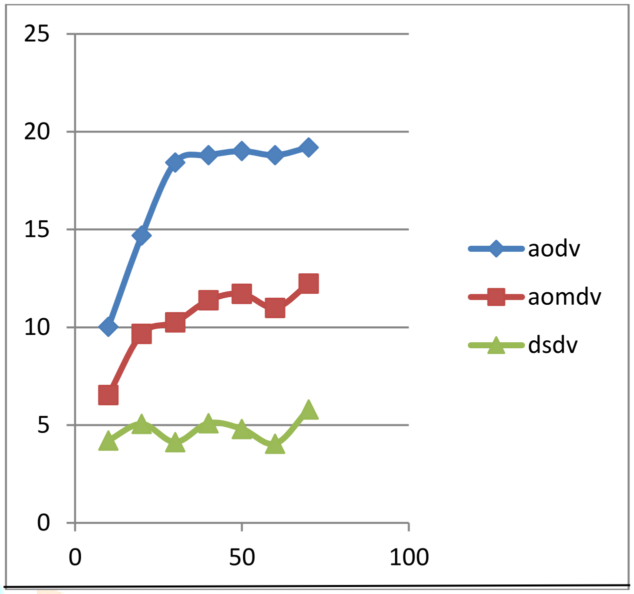

Fig.4 Throughput

## III. Conclusion

We notice that the data packet delivery fraction of AODV is the best as compared to AOMDV and DSDV. DSDV is a proactive protocol and the advantage of these protocols is that a path to a destination is immediately available, so no delay for route discovery is experienced when an application needs to send a packet. Furthermore in reactive protocols, AODV is a hop by hop initiate protocol. From figure, we notice that DSDV has lowest end2end delay, AOMDV is medium and AODV has highest delay in all. From figure, we notice that AODV gives best throughput, AOMDV has lower performance then AODV, DSDV has lowest performance in all.

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