*2012 International Conference on Computer Networks and Communication Systems (CNCS 2012)*
*IPCSIT vol.35(2012) © (2012) IACSIT Press, Singapore*

# Performance Comparison of DSDV, AODV, DSR, Routing protocols for MANETs

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**Abstract.** Mobile ad hoc network is an autonomous system, where nodes/stations are connected with each other through wireless links. There is no restriction on the nodes to join or leave the network, therefore the nodes join or leave freely. Mobile ad hoc network topology is dynamic that can change rapidly because the nodes move freely and can organize themselves randomly. This property of the nodes makes the mobile ad hoc networks unpredictable from the point of view of scalability and topology.
This paper highlights routing protocols in MANETs (Mobile Ad Hoc Networks). In general, routing protocols for MANETs are designed based on the assumption that all participating nodes are fully cooperative. However, due to the open structure and scarcely available battery-based energy, node misbehaviors may exist.

In this paper, different routing algorithms are to be discussed and measure the performance in packet delivery ratio, throughput with constant mobility. For the implementation purpose we have used network simulator-2 (NS-2)

**Keywords:** Mobile Ad Hoc Networks (MANETs), routing misbehavior, Ad Hoc On Demand Routing Vector (AODV), Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV).

## 1. Introduction

An ad hoc network is a collection of nodes that do not need to rely on a predefined infrastructure to keep the network connected. Ad hoc networks can be formed, merged together or partitioned into separate networks on the fly, without necessarily relying on a fixed infrastructure to manage the operation. Nodes of ad hoc networks are often mobile, which also implicates that they apply wireless communication to maintain the connectivity, in which case the networks are called as mobile ad hoc networks (MANET). Mobility is not, however, a requirement for nodes in ad hoc networks, in ad hoc networks there may exist static and wired nodes, which may make use of services offered by fixed infrastructure. Ad hoc networks may be very different from each other, depending on the area of application: For instance in a computer science classroom an ad hoc network could be formed between students' PDAs and the workstation of the teacher. The performance of nodes in ad hoc networks is critical, since the amount of available power for excessive calculation and radio transmission are constrained. In addition, the available bandwidth and radio frequencies may be heavily restricted and may vary rapidly. Finally, as the amount of available memory and CPU power is typically small, the implementation of strong protection for ad hoc networks is non-trivial. The main objective of this paper is study of different routing protocols like DSDV, DSR, and AODV etc.

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## 2. Ad-Hoc routing Protocols

Figure 1 depicts broad classification of different routing Protocols. The characteristics of each are described in the sub sections.

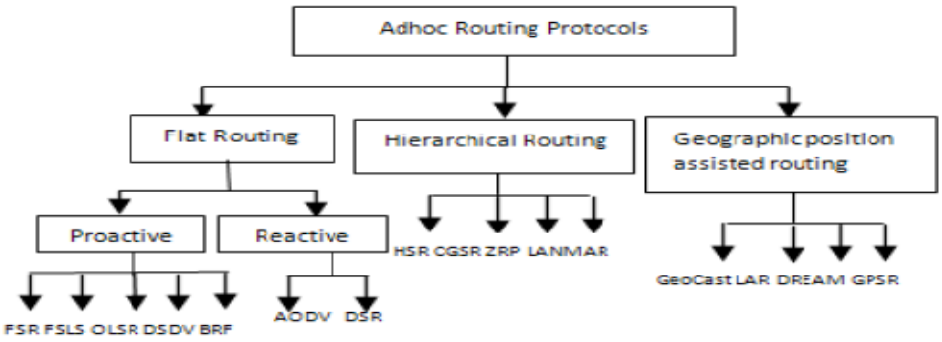


Figure: Routing Protocol

The routing protocols DSR, AODV and DSDV are often used as reference protocols when a new protocol shall be evaluated. To understand the characteristics of these protocols they are described in the sections below and their performance is evaluated in section 3.

### 1.1. DSDV

DSDV is a table driven routing protocol that is an enhanced version of the distributed Bellman-Ford algorithm. In all table driven protocols each node maintains a table that contains the next hop to reach all destinations. To keep the tables up to date they are exchanged between neighboring nodes at regular intervals or when a significant topology changes are observed.

### 1.2. DSR

DSR is an entirely on-demand ad hoc network routing protocol composed of two parts: Route Discovery and Route Maintenance. In DSR, when a node has a packet to send to some destination and does not currently have a route to that destination in its Route Cache, the node initiates Route Discovery to find a route; this node is known as the initiator of the Route Discovery, and the destination of the packet is known as the Discovery's target. The initiator transmits a ROUTE REQUEST packet as a local broadcast, specifying the target and a unique identifier from the initiator. Each node receiving the ROUTE REQUEST, if it has recently seen this request identifier from the initiator, discards the REQUEST. Otherwise, it appends its own node address to a list in the REQUEST and rebroadcasts the REQUEST. When the ROUTE REQUEST reaches its target node, the target sends a ROUTE REPLY back to the initiator of the REQUEST, including a copy of the accumulated list of addresses from the REQUEST. When the REPLY reaches the initiator of the REQUEST, it caches the new route in its Route Cache.

Route Maintenance is the mechanism by which a node sending a packet along a specified route to some destination detects if that route has broken, for example because two nodes in it have moved too far

apart. DSR is based on source routing: when sending a packet, the originator lists in the header of the packet the complete Sequence of nodes through which the packet is to be forwarded. Each node along the route forwards the packet to the next hop indicated in the packet's header, and attempts to confirm that the packet was received by that next node; a node may confirm this by means of a link-layer acknowledgment, passive acknowledgment, or network-layer acknowledgment. If, after a limited number of local retransmissions of the packet, a node in the route is unable to make this confirmation, it returns a ROUTE ERROR to the original source of the packet, identifying the link from itself to the next node as broken. The sender then removes this broken link from its Route Cache; for subsequent packets to this destination, the sender may use any other route to that destination in its Cache, or it may attempt a new Route Discovery for that target if necessary.

### 1.3. AODV

AODV is a reactive protocol that determines routes solely on-demand. It is based on the distance vector technology. The hosts only know the next hop to every destination. When a source host wants to send packets to the destination and cannot get the routes from its routing table, it will broadcast a Route Request (RREQ). The receivers may establish the routes back to the source host through the paths that they get the RREQ. If the receiver has an active route to the destination, it will be unicast a Route Reply (RREP) back to the source. Otherwise, the RREQ will be re-broadcast further. If a reply is sent, all hosts along that path may record the route to the destination through this packet. Because there may exist multiple exclusive paths between two hosts, a mobile host can receive the same RREQ more than once. To prevent the same request from being broadcast repeatedly, every request is uniquely identified by a _Host ID, Broadcast ID_ couple. Every host keeps a record for the RREQs that have been processed. The mobile hosts send out the Route Error (RERR) packets to their neighbours to report broken paths and activate the route re-discovery procedure. To avoid routing loop and identify the freshness of the route, destination sequence number is introduced. The sequence number of a mobile host can only be updated by itself in monotonically increasing mode. A larger sequence number denotes a fresher route. The sequence number is carried in both RREQ and RREP. The sequence number in RREP must be larger than or equal to the one carried in corresponding RREQ to avoid the source host to adopt a stale path. When more than one path represented by different RREPs is available, the one with the largest destination sequence number is used. If several paths have the same sequence number, the shortest one is chosen. AODV's desirable features are its low byte overhead in relatively static networks and loop free routing using the destination sequence numbers.

## 3. SIMULATION RSULTS AND OBSERVATIONS

In this section, we present our simulation efforts to evaluate our observations that compare the performance of the protocols that we described previously along with constant mobility and increasing number of nodes.

The simulation parameters are as follows:

Table 1

| Parameter | Value |
|---|---|
| Simulation Area | 500 x 500 sq. m. |
| Simulation Duration | 200 sec |
| No of mobile nodes | 20,30,40 |
| Transmission range | 250 m |
| Traffic type | CBR |
| Protocol | DSR, AODV and DSDV |

| | |
|---|---|
| Mobility | 20 m |

**Experimental Results:**

Following data is available after executing scripts for DSR, AODV and DSDV protocols. For writing the awk script following consideration is made.

| | NODES 50 (DSR) | NODES 60 (DSR) | NODES 70 (DSR) | NODES 50 (AODV) | NODES 60 (AODV) | NODES 70 (AODV) | NODES 50 (DSDV) | NODES 50 (DSDV) | NODES 50 (DSDV) |
|---|---|---|---|---|---|---|---|---|---|
| No of pkts send | 5334 | 5334 | 5334 | 5334 | 5334 | 5334 | 5334 | 5334 | 5334 |
| No of pkts recv | 5334 | 5334 | 3903 | 2764 | 5334 | 5334 | 666 | 5289 | 3870 |
| Pkt delivery ratio | 100 | 100 | 73.1721 | 51.8185 | 100 | 100 | 12.4859 | 99.1564 | 72.5534 |
| Control overhead : | 2 | 2 | 39 | 50 | 60 | 70 | 1266 | 1437 | 1672 |
| Normalized routing overheads | 0.000374953 | 0.000374953 | 0.00999231 | 0.0180897 | 0.0112486 | 0.0131234 | 1.9009 | 0.271696 | 0.432041 |
| Delay: | 0.00315396 | 0.00315503 | 0.0113366 | 20.2093 | 20.0046 | 20.0058 | 11.2556 | 20.068 | 17.4381 |
| Through put | 448084 | 448084 | 327872 | 254304 | 490759 | 490759 | 61275.8 | 486618 | 356062 |

# 4. Graphs:

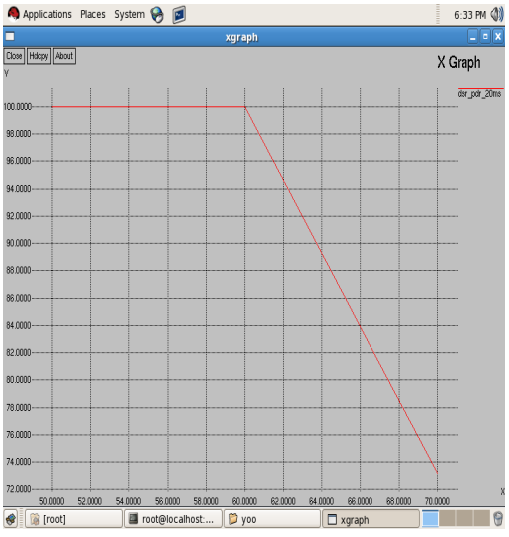


Fig 1. DSR Protocol


Fig 2. AODV Protocol

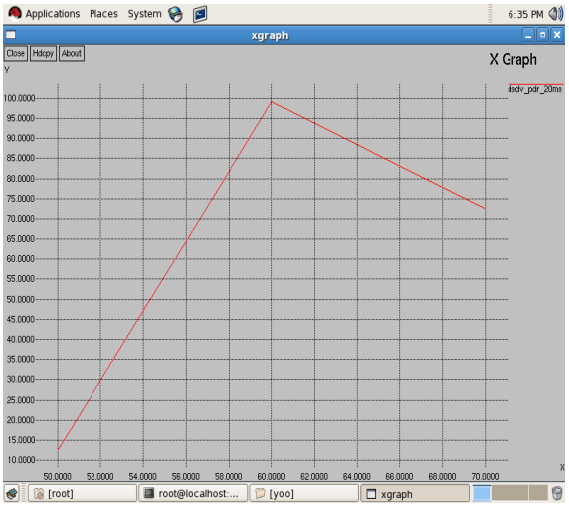


Fig 3. DSDV Protocol

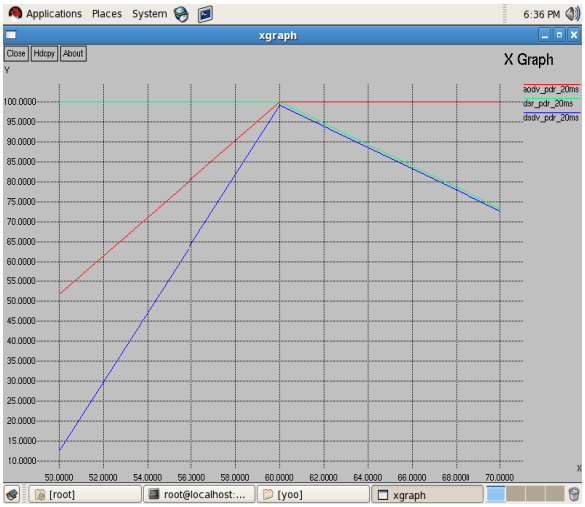


Fig 4.comparision of all protocols

## 5. Conclusion:

Here we find out the performance of different routing protocol like DSR, DSDV, and AODV with constant mobility and increasing numbers of nodes.

The next step is to find the performance after malicious attacks on network and propose the secure scheme to deal with attacks on Ad-hoc network and again compare the performance under different factors.

## 6. Acknowledgements

We would like to sincerely thank Prof. R. A. Kanai and Prof. Dr. J. A. Tamboli for their sincere support and guidance also we would like to thanks to Department of computer Science and Engineering of Annasaheb Dange college of Engineering & Technology, Ashta.

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