Retrospection and Comparison of Dsdv and Aomdv Routing Protocols in Manet Using Ns-2

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***Abstract* -A mobile ad-hoc network is analysed as cooperative engagement of mobile wireless nodes without the required intervention of any centralised access point. These networks form an instant network without fixed topology, each node acting as a host and router simultaneously. In this paper the execution evaluation of routing protocol DSDV and AOMDV in the context of sensor networks with an assumption that all the node are static is acquainted. The protocol simulation is performed utilizing NS-2. The results brought forth understandably distinguish the routing performance under various scenarios and collate its performance with AOMDV in the discourse addressed. Moreover this paper reviews the DSDV and AOMDV protocol when it is used for mobile ad-hoc networks.**

Keywords- Ad-hoc networks, routing protocols, AOMDV, DSDV, Simulation, alternate paths.

I. INTRODUCTION

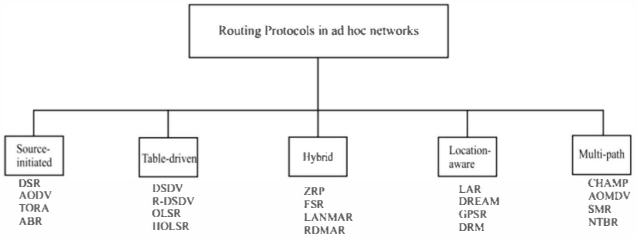
In the recent years the use of wireless networks has become very demotic. Ad-hoc networks have no fixed routers with all nodes capable of movement and arbitrarily dynamic. These nodes can act as both end systems and routers at the same time [5,6] When acting as routers, they discover and maintain routes to other nodes in the network. The main contribution of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. Routing information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently. Hence to improve the convergence of RIP, triggered updates and path hold-down mechanisms have been integrated into different RIP implementations. The main drawbacks of both link-state and distance-vector protocol are that they take too long to converge and have a high message complexity. Because of the limited bandwidth of wireless links in an ad hoc network, some problems are solved and some are introduced at the same time. The usefulness of RIP to ad hoc environments is restricted due to the rapid topology change. Thus the drawbacks of these protocols have to be fixed. DSDV is one of the proposed routing protocols for ad hoc networks [10, 13]. It targets to overcome the looping problem of RIP and also addresses the long lived loops and also count to infinity problem of conventional protocols. On the other hand AOMDV which develops multiple paths to reduce route discovery frequency between source and destination [14].Thus it lacks high inter-node communication and coordination.

II. OVERVIEW OF ROUTING PROTOCOLS

In Topology based approach, routing protocols are classified into three categories, based on the time at which the routes are discovered and updated.

a. Proactive Routing Protocol (Table Driven)
b. Reactive Routing Protocol (On-Demand)
c. Hybrid Routing Protocol

FIGURE 1
Various Routing Protocols



(a) Proactive Routing Protocol

In networks which exploit a Proactive routing protocol, these protocols maintain specific routes to all the destinations regardless of whether these routes are needed or not[1,4,8] Thus every node maintains tables representing the whole topology of the network. These tables are hence updated regularly in order to maintain a up-to-date routing information. The main advantage of this protocol is that hosts can obtain route information and can very well establish a session. Proactive routing protocol includes Destination-Sequenced Distance-Vector (DSDV) protocol, Wireless Routing Protocol (WRP), Optimized Link State Routing Protocol (OLSR) etc.

(b) Reactive Routing Protocol

Reactive protocols on the other hand finds a route on demand with the help of Route request packets. Also if communication is to be initiated by a node which has no route, then this routing protocol will try to establish the route. Thus this property which this protocol holds is very useful in resource–limited environment. These include Dynamic Source Routing (DSR) protocol, Ad hoc On-demand Distance Vector (AODV) protocol, Ad hoc on demand Multiple Distance Vector (AOMDV) protocol etc.

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(c) In Hybrid Routing protocol

Hybrid protocols combines the best efficient features of Proactive and Reactive approaches. An example of Hybrid Routing Protocol is the Zone Routing Protocol (ZRP).

III. BACKGROUND AND RELATED WORK

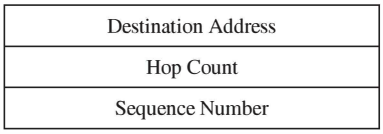
The DSDV described is a table-driven proactive protocol, based on the classical Bellman-Ford routing mechanism. The basic improvements made include freedom from loops in routing tables, more dynamic and less convergence time. Every node in the MANET maintains a routing table which contains list of all known destination nodes within the network along with number of hops required to reach to particular node.

- One of the examples is [2], where the authors have evaluated the performance of routing protocols in grid environment. Similarly, in a recent work [3], authors have analyzed a routing protocol for sensor networks.
- In another work [4] mobile adhoc network is simulated to review its performance with reference to QoS.
- In [5], authors review the routing protocols in the domain of wimax based networks.
- Another case is of [6], where parameters like speed and tract are considered for simulation.

IV. DSDV AND AOMDV MODULE FOR NS-2

We have used Network Simulator (NS)-2 in our evaluation. The NS-2 is a discrete event driven simulator. NS-2 is suitable for designing new protocols, comparing different protocols and traffic evaluations. It is an object oriented simulation written in C++, with an OTcl interpreter as a frontend. Simulation of protocols is performed on Linux operating system using ns-2.35.We have different simulations run in all over. Every simulation runs from 0s to 100s. Random waypoint mobility in a rectangular field of 500m *500m is used. Traffic and mobility files are imported in TCL script at the time of execution. AODV and DSDV maintain send buffer of packets. All the data packets waiting for route are kept in send buffer. Interface queue maximum size is 50 packets. IFQ holds all the routing packets until MAC layer transmit them.

Figure 2
DSDV message header



Dsdv is encapsulated in User datagram protocol (UDP) segments that are then encapsulated as shown in Figure 3.

Figure 3
DSDV header encapsulation

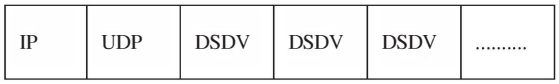
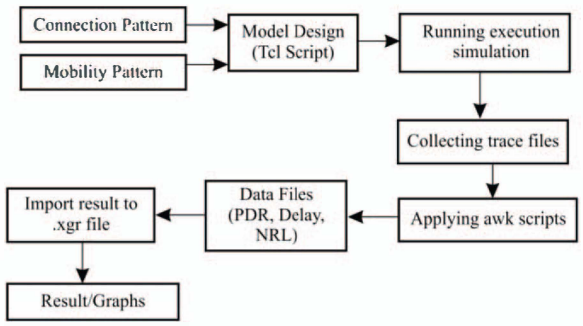


TABLE 1
DSDV attributes and default values

Attribute	Defaults	Summary
Enable WST	true	Enables Weighted Settling Time for the updates before advertisement
Settling Time	6s	Minimum time duration an update is stored before transmission
Periodic Update Interval	15s	Time interval between exchange of full routing tables among nodes
Weighted Factor	0.876	Weighted factor for the setting time if Enable WST is true
Enable Buffering	true	Enables buffering of date packets if no route to destination is available
Max Queue Len	100	Maximum number of packets that can be queued
Max Queue Time	30 s	Maximum time duration for which packets can be queued
Max Queued Packets Per Dst	5	Maximum number of packets that can be buffered per destination
Holdtimes	3	Number of times Periodic Update Interval to purge a route
Route Aggregation Time	1 s	Time over which DSDV updates are aggregated
Enable Route Aggregation	false	Enables aggregation of DSDV updates over a period of time

The steps of simulation for both DSDV and AOMDV are diagrammatically explained below:-

FIGURE 4
Steps of simulation



The following steps are performed to carry out simulation process of DSDV protocol.

Step 1 - Scenarios are generated using the setdest which uses random waypoint mobility model. Here in this simulation 30 scenarios are generated varying the pause time and maximum speed. Example to generate scenario is given as: Setdest -v1 -n 50 - p5 - m 4 -t 100 -x 500 -y 500 > scene5-5 Where -v : version 1 or 2 , -n: number of nodes , -p : pause time , -m : maximum speed , -x and - y : area of simulation, -t : simulation time , scene-5-5 : output file.

Step 2 - Traffic pattern is generated using the cbrgen.tcl file given in the indep utilities. In this simulation only one traffic pattern is generated using the following method: ns cbrgen.tcl - type cbr -nn 50 - seed 1 - mc 10 - rate 0.25 Where - type: type of traffic cbr or tcp, - nn: number of nodes, - seed: seed value, -mc: maximum connection sources, -rate: rate of sending packets.

Step 3- After generating traffic patterns and scenarios a tcl script is written for generation of trace files. These generated traffic patterns and scenarios are fed in to the tcl script and then executed. On the execution of tcl script trace files are generated. In this simulation two protocols namely AOMDV and DSDV are used to generate trace files which are saved with the extension *.tr which are old trace file formats. There are two trace file formats available one is old trace file format and other is new trace file format. With the generation of trace file a *.nam file is also generated which shows the animation of the moving nodes and routing of packets. Routing of packets and movement of nodes can be easily depicted by *.nam files.

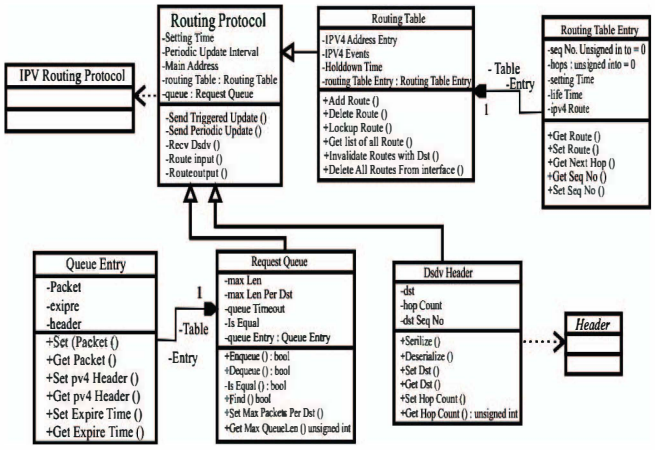
Step 4 – When trace files are generated then it is needed to analyse these files using the awk or perl script. To analyse the files awk or perl scripts are written according to the performance metrics which are to be used in the performance evaluation. This simulation is performed to evaluate the performance based on the three metrics namely Packet delivery ratio, Average and to end delay and Normalized routing load. So three awk files are used for this Simulation.

Step 5 – After analysis of trace files the obtained results are stored in a text file or excel file then presented by the graphs using Matlab or Xgraph utility of ns-2. Here analysed result is stored in a text file and then graphs are plotted between both models and performance metrics which are packet delivery ratio, end to end delay and normalized routing load using Matlab.

4.1 DSDV routing table management

Figure 5

Class diagram for DSDV



Each node receiving an RREQ rebroadcasts it, unless it is the destination or it has a route to the destination in its route cache [1,5,8]. Such a node replies to the RREQ with a route reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. Thus elements in the routing table of each mobile node change dynamically to keep consistency with dynamically changing topology of an ad hoc network.

For simulating:-

```
# Define options
set val(chan)           Channel/WirelessChannel
;# channel type
set val(prop)           Propagation/TwoRayGround
;# radio-propagation model
set val(netif)          Phy/WirelessPhy
;# network interface type
set val(mac)            Mac/802_11
;# MAC type
set val(ifq)            Queue/DropTail/PriQueue
;# interface queue type
set val(ll)             LL
;# link layer type
set val(ant)            Antenna/OmniAntenna
;# antenna model
set val(ifqlen)         50
;# max packet in ifq
set val(nn)             3
;# number of mobilenodes
set val(rp)             DSDV
;# routing protocol
set val(x)              500
;# X dimension of topography
set val(y)              400
;# Y dimension of topography
set val(stop)           150
;# time of simulation end.
```

General Steps for simulation of AOMDV IN NS-2

```
# General definition
# ----------------------
;#Instantiate the simulator
set ns [new Simulator]
;#Define topology
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)
;#Create channel
set chan [new $val(chan)]
$prop topography $topo
;#Create God
create-god $val(n)
;#Global node setting
$ns node-config -adhocRouting $val(rp) \
                -llType $val(ll) \
                -macType $val(mac) \
                -ifqType $val(ifq) \
                -ifqLen $val(ifqlen) \
                -antType $val(ant) \
                -propInstance
# Nodes definition
#-------------------------------------------------------------
;#   Create the specified number of nodes [$val(n)] and "attach" them to the channel.
for {set i 0} {$i < $val(n) } {incr i} {
                set node($i) [$ns node]
                $node($i) random-motion 0
                ;# disable random motion
}
# Nodes mobility
```

```
#parameters for trace Inspect
puts $scenarioTrc "# nodes: $val(n), max time: $val(end)"
puts $scenarioTrc "# nominal range: 250"
if {$val(mobility) == "Static"} {
        for {set i 0} {$i < $val(n)} {incr i} {
        set X [expr [$randomNodeX value] ]
        $node($i) set X_ $X
        set Y [expr [$randomNodeY value] ]
        $node($i) set Y_ $Y
        $node($i) set Z_ 0.0
        $ns initial_node_pos $node($i) 20
        puts $scenarioTrc "\$node_($i) set X_ $X"
        puts $scenarioTrc "\$node_($i) set Y_ $Y"
        puts $scenarioTrc "\$node_($i) set Z_ 0.0"
        }
}
```

V. RESULT AND COLLATION OF DSDV AND OTHER RELATED PROTOCOLS

The significant comparison between the three categories of routing protocols has been addressed in tabular form. Firstly lets discuss in brief the comparison between three main catogories of routing protocols in Manets which are stated in Table 2.

TABLE 2
DSDV attributes and default values

Parameters	Table Driven (Proactive)	On-Demand (Reactive)	Hybrid
Storage Requirements	Higher	Dependent on no of routes maintained or needed	Depends oon size of each zone or cluster
Route Availability	Always available	Computed as per need	Depends on location of destination
Periodic route Updates	Required always	Not required	Used inside each zone
Delay	Low	High	Low for local destinations and high for Inter zone
Scalability	100 nodes	>100	>100
Control Traffic	High	Low	Lower that other two types
Routing Information	Keep stored in table	Doesn't store	Depends on requirement
Routing Philosophy	Mostly flat	Flat	Hierarchical

The Table 3 hence compares DSDV,AOMDV and other related routing protocols as well in terms of various parameters as listed in the table.The spectrum sensing and route discovery is performed by both AOMDV and DSDV but they perform different for statistics like Packet Delay and Delivery rate.

TABLE 3
Comparison of Protocols

Protocol	Spectrum Sensing	Route Recovery	Delivery Rate	Channel Assignment	Packet Delay
AODV	Yes	Yes	Good	Yes	Medium
DSDV	Yes	Yes	Very Good	Yes	Less
AOMDV	Yes	Yes	Excellent	Yes	Less
DSR	No	No	Poor	Yes	More
CPR	Yes	No	Good	Yes	Medium

VI. IMPROVEMENT OF DSDV, AOMDV AND ITS CURRENT STATUS

DSDV is a very well-known routing protocol used for ad-hoc networks.The problems addressed by DSDV are such as count to infinity problems. Currently, there are no such specifications and commercial implementation available yet for DSDV, but one DSDV simulator has been implemented with C++ at UC Berkeley [13]. Research work on improvement of DSDV is still active. Many improved protocols based on DSDV have been developed. These improvements of DSDV include Global State Routing (GSR) described in [4], Fisheye State Routing (FSR) described in [6], Ad Hoc On- Demand Distance Vector Routing (AODV) [1,19] etc. On the other hand AOMDV supports disjointness of equivalent and alternate routes [23,30]. AOMDV inhibits alternate paths by exploiting with minimal overheads. Thus AOMDV is protocol under study as it can very well cope with mobility-induced route failures and issue like route cut-off problems can be resolved [26]. In Broad terms, it will be substituted with its improvements in real applications in the future.

VII. CONCLUSION

In this paper, the simulation analysis of DSDV and AOMDV ad hoc network routing protocol, which has contributed in twofold manner is presented. Firstly, a short brief of how the simulations steps are followed for the DSDV and AOMDV routing protocol and secondly a brief comparison of various routing protocols especially AOMDV and DSDV which help in better understanding of other protocols as well. AOMDV ensures the property of loop freedom. DSDV also helps in damping fluctuations where last and average settling time can be recorded (stable data) in separate table. It has no sleeping nodes and is simple and hence loop free through destination sequence numbers. It has no latency caused by route discovery. Many improvements in DSDV and AOMDV have been proposed but hopefully newly introduced parameters and features will be used in reality as well.

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