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Performance Analysis of Manet Routing Protocols - DSDV, DSR, AODV, AOMDV using NS-2

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Here, in our paper we analyze the performances of Destination Sequenced Distance Vector Routing (DSDV), Dynamic Source Routing (DSR), Ad hoc On-demand Distance Vector (AODV), Ad hoc On-demand Multi-path Distance Vector (AOMDV) protocols based on the Quality of Service metrics i.e., Packet Delivery Ratio, Packet Loss, Delay, Control Packet Overhead and Throughput using the Network Simulator (ns-2).

In this paper we are presenting functionality, benefits, limitations and simulation results for the above mentioned routing protocols.

Keywords: Ad Hoc, MANET, DSDV, DSR, AODV, AOMDV, QoS, NS2.

GJCST-E Classification : C.2.2

PERFORMANCEANALYSISOFMANETROUTINGPROTOCOLSDSDVDSRAODVAOMDVUSINGNS2

Strictly as per the compliance and regulations of:

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G. Shankara Rao [α], E. Jagadeeswararao [σ], U. Jyothsna Priyanka [ρ] & T. Indira Priya Darsini [Ѡ]

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I. Introduction

There exist three types of mobile wireless networks: infrastructure networks, ad-hoc networks and hybrid networks which combine infrastructure and ad-hoc aspects.

An *infrastructure network* (Figure 1.1(a)) consists of wireless mobile nodes and one or more bridges, which connect the wireless network to the wired network. These bridges are called base stations. A mobile node within the network searches for the nearest base station (e.g. the one with the best signal strength), connects to it and communicates with it. The reality is all communication is taking place between the wireless node and the base station but not between different wireless nodes.

In contrary to this infrastructure networks, an ad-hoc network (Figure 1.1(b)) lacks any infrastructure. Ad-hoc is a Latin word, which means "for this or for this only." There are no base stations, no fixed routers and no centralized administration.

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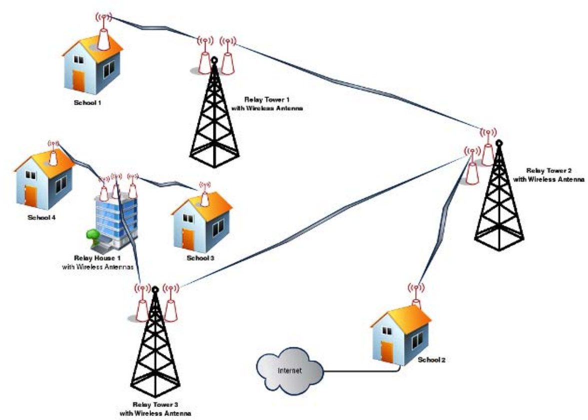
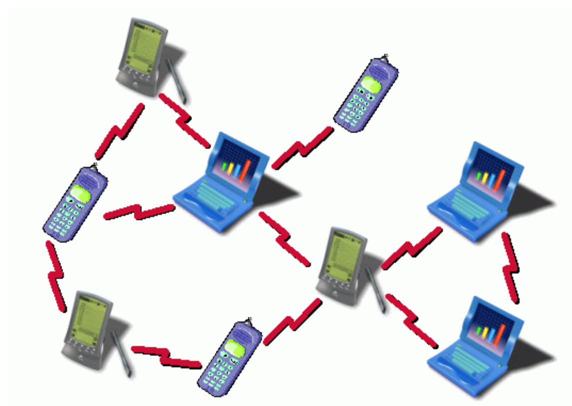


Figure 1.1 : (a) An Infrastructure network



1.1 (b) A Mobile Ad-hoc network

A Mobile ad hoc network (MANET) is a group of wireless mobile computers (or nodes); in which nodes collaborate by forwarding packets for each other to allow them to communicate outside range of direct wireless transmission. Ad hoc networks require no centralized administration or fixed network infrastructure such as base stations or access points, and can be quickly and inexpensively set up as needed.

Easy and fast deployment of wireless networks will be expected by the future generation wireless systems. This fast network deployment is not possible with the existing structure of present wireless systems. The recent advancements such as Bluetooth introduced a fresh type of wireless systems which is known as mobile ad-hoc networks. Mobile ad-hoc networks or "short live" networks control in the nonexistence of permanent infrastructure.

MANET is a kind of wireless ad-hoc network and it is a self-configuring network of mobile routers (and associated hosts) connected by wireless links – the union of which forms an arbitrary topology. The routers, the participating nodes act as router, are free to move randomly and manage themselves randomly; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger Internet.

Mobile ad hoc network is a collection of independent mobile nodes that can communicate to each other via radio waves. The mobile nodes can directly communicate to those nodes that are in radio range of each other, whereas others nodes need the help of intermediate nodes to route their packets. These networks are fully distributed, and can work at any place without the aid of any kind of infrastructure. This property makes these networks highly robust. In (Figure 1.2) nodes 1 and 3 must discover the route through 2 in order to communicate. The circles indicate the formal range of each node's radio transceiver. Nodes 1 and 3 are not in direct transmission range of each other, since 1's circle does not cover 3.

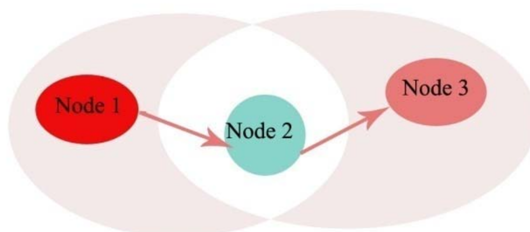


Figure 1.2 : Example of a simple Ad hoc network with three participating nodes

II. Existing System

The MANET routing protocols DSDV (Cluster Based Routing Protocol) and DSR, AODV (Ad-Hoc On-demand Distance Vector) of Proactive and Reactive will be described theoretically in all the books, but we don't know the practical scenario how they work. To know their behavior practically we have to simulate the protocols with certain parameters. From the existing system we have proposed a system to simulate the results and know the behavior of the protocols DSDV, DSR, AODV, AOMDV and make comparative analysis between them using the Network Simulator -2 (NS version 2).

III. Proposed System

The objective of this work is to evaluate the routing protocols namely DSDV, DSR, AODV, AOMDV based on their behavior. This evaluation is to be carried out through exhaustive literature review and simulation

IV. Classification of Routing Protocols

"Routing is the process of information exchange from one host to the other host in a network." Routing is the mechanism of forwarding packet towards its destination using most efficient path.
Routing protocols are classified as in fig 2.

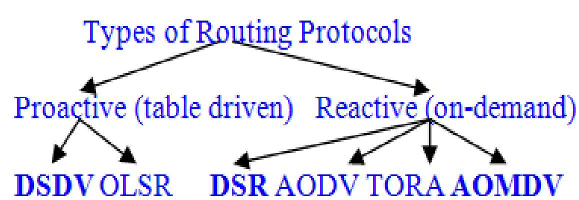


Figure 2 : Routing protocols classification

a) DSDV, DSR, AODV, AOMDV PROTOCOLS DESCRIPTON

i. *DSDV Description*

DSDV is an improved routing protocol of the distributed Bellman-Ford routing algorithm. In this protocol, a table consisting of the shortest distance and the starting node of the shortest path is maintained at every node. Table updates are done with the increasing sequence number provided so as to,

i. Prevent loops

ii. Provide a faster convergence

iii. Avoid the count-to-infinity problem.

Every node in the table-driven routing protocol has route to destination. The routing table is exchanged periodically between the neighboring nodes, so that an up-to-date view of the topology is maintained. If a node sees a change in the network topology, then also the table is forwarded to its neighbor. The table updates are classified into two types.

1. Incremental Updates
2. Full Dumps

DSDV solve the problem of routing *loops* and *count to infinity* by associating each route entry with a *sequence number* indicating its freshness.
The DSDV *routing table* contains the following:

(1) All available destinations IP addresses.
(2) Next hop IP address.
(3) Number of hops to reach the destination.
(4) Sequence number assigned by the destination node.
(5) Install time.

Fig.3 & Fig.4 shows the Example of DSDV *Operation* .Fig.4 shows DSDV '*message Header*' format. And Fig.5 shows the flowchart of DSDV operation.

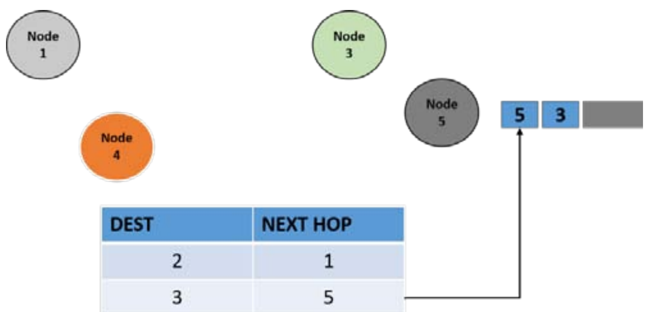


Figure 3 : Node 1 transmits packet to node 4, forwarding

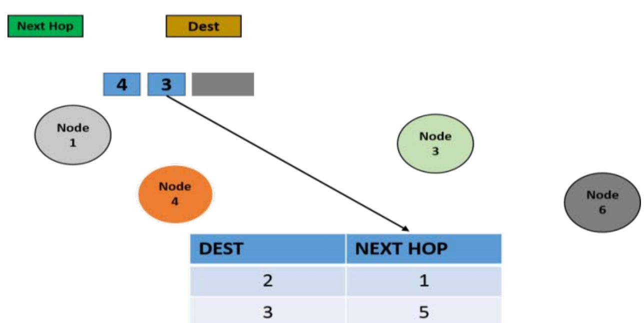


Figure 4 : Node 4 retransmits packet to the next hop

Destination Address
Hop Count
Sequence Number

Figure 4 : DSDV message header format

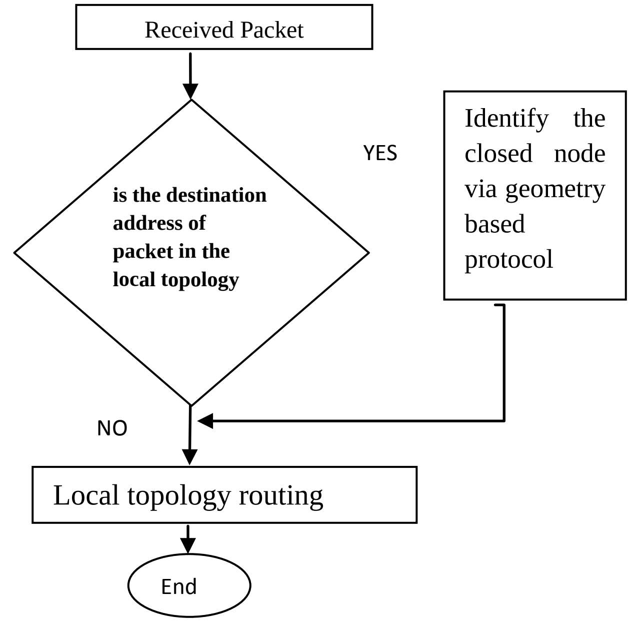


Figure 5 : Flowchart of DSDV

Advantages

a. Delays are smaller because the routing availability is always provided to all the destinations.
b. Because of the incremental updates in the routing table, the existing wired network Protocols are adaptive to the ad hoc wireless network.
c. All the nodes maintain an up-to-date view of the topology.

Disadvantages

a. The table updates due to broken links causes heavy control overhead during the high mobility.
b. The available bandwidth gets congested even if a small network contains high mobility or a large network contains low mobility. Thus, a large control overhead exists which increases with the number of nodes in the topology. Also, this protocol does not have the scalability factor in the ad hoc wireless networks which contain a high dynamic network topology and a limited bandwidth.
c. Some delay occurs in obtaining the information regarding a specific destination node.

V. DSR Description

DSR is an on-demand routing protocol. In ad hoc wireless networks, bandwidth is drained by control packets. Hence, regular table-update messages used in the previous table-driven routing protocols are removed, thereby controlling the bandwidth consumption. DSR is different from the on-demand routing protocols as it does not transmit the frequent beacon/hello packet (to identify its presence) to its neighbors.

During the construction phase of routing, the key feature of DSR is that, a route should be created

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with the help of flooding Route Request packets in the topology. A Route Request packet is sent by source to destination, which in turn sends a Route Reply packet back to the source. Here Source node creates a sequence number and traversing path which are sent along with every Route Request packet. The sequence number present on the Route Request packets helps in the prevention of the following.

i. Routing loop formations

ii. Retransmissions of the similar Route Request Packet which is done by an intermediate node through various routing paths.

Optimizations

The Basic DSR protocol consists of various optimization methods, in order to enhance the performance of the protocol. The Route Cache is used by the DSR protocol at the intermediate nodes. It contains the information about the routes which are retrieved from the information present in data packets that are to be transmitted. If a Route Request packet is received and a route to the respective destination is obtained, then the intermediate nodes use the information related to the route cache, so as to reply to the source node.

Advantages

a. A reactive approach is used in DSR protocol, So that frequent flooding in the network along With the table update message can be eliminated.

b. DSR does not need a path-finding approach, because the routes are established based upon the requirement.

c. The information related to the route cache is used by the intermediate nodes in an efficient way, there by consuming the control overhead.

Disadvantages

a. If a broken link is seen then it is not repaired, instead the route discovery process is initiated by the source node.

b. During the reconstruction phase or routing, the state route cache information may lead to inconstancy in the route paths.

c. The connection setup delay is more when compared to the table-driven routing protocols.

d. With an increase in the mobility of nodes, the performance of the protocol decreases.

e. DSR uses a source-routing mechanism and because of which a large routing overhead is required. This overhead entirely depends upon the length of the path.

Mechanisms

i. Route Discovery

ii. Route Maintenance

a) Route Discovery

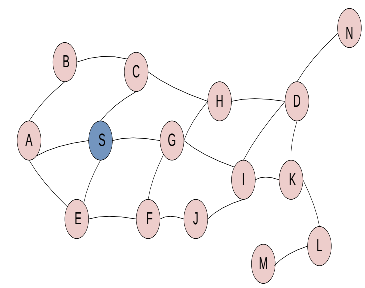

Figure 6 : Source node S

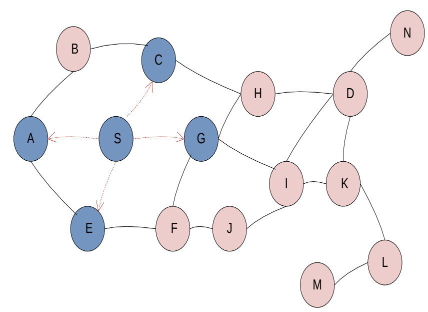

Figure 7 : Broadcasting Data from S to D

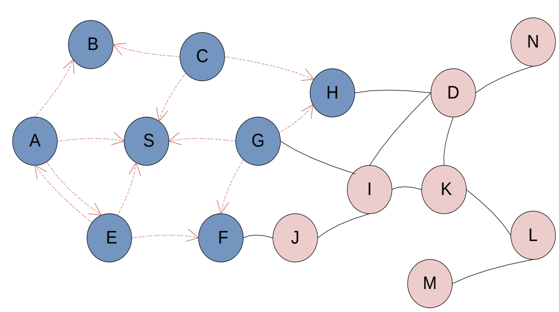

Figure 8 : Route Request (RREQ) from two neighbors

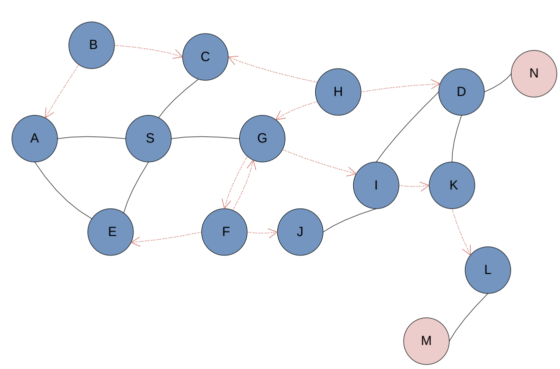

Figure 9 : Request reached to Destination D

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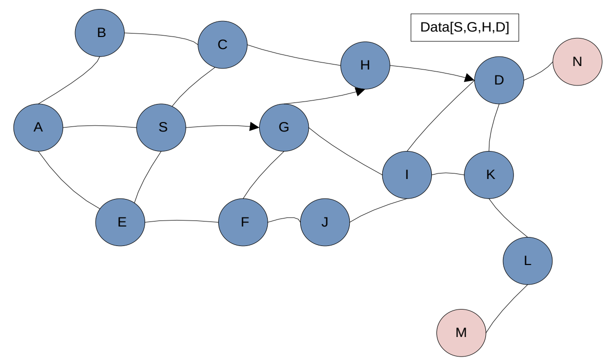

Figure 10 : Data packet Delivery to the destination Link

b) Route Maintenance

Route Maintenance is used to handle route break/failures.

Fig. 14. Shows the flowchart of DSR operation

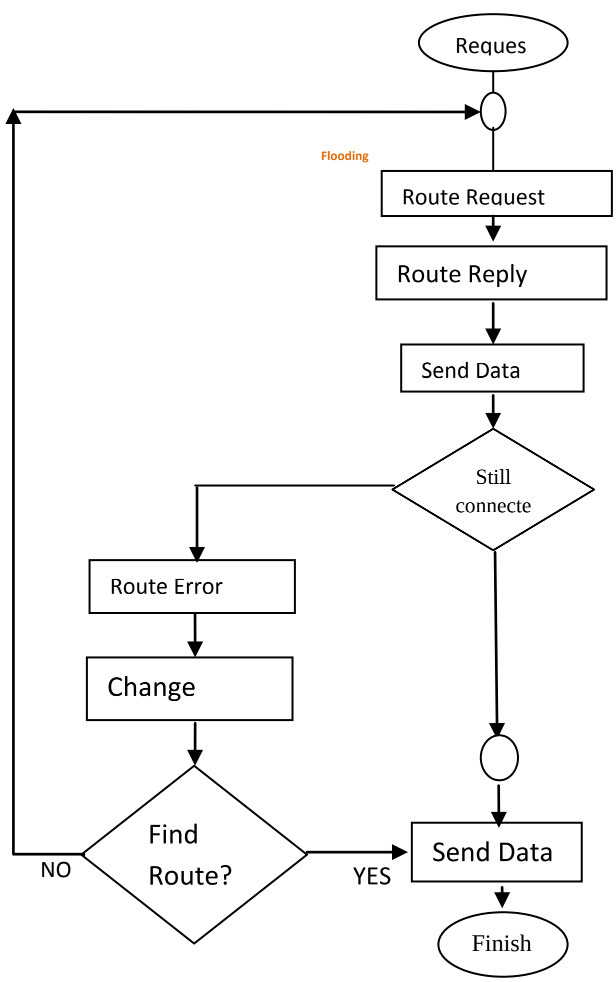

Figure 14 : DSR Flowchart

VI. AODV Description

AODV is based on on-demand routing approach for locating routes. Whenever, a source node needs a path for forwarding data packets, and then only a route is established. The packet consists of the sequence numbers of the destination node so as to identify the most recent path. The difference between AODV & DSR routing protocols is that the latter employs source routing wherein the data packets itself maintains the entire path from source to destination, whereas in the former the source node source node and all the intermediate nodes maintain the information about the next hop taken for transmitting data packets. When no route is established for reaching the destination, then source node broadcasts the Route Request packet throughout the network.

AODV differs from the other on-demand routing protocols, because the data packets in AODV use the destination sequence numbers in order to identify up-to-date path for reaching destination. Every Route Request packet consists of the following information.

i. Source identifier

ii. Destination identifier

iii. Source Sequence number

iv. Destination Sequence number

v. Broadcast identifier

vi. Time to Live

Advantages

a. Routes are established on demand basis.

b. The recent path towards the destination is identified using the destination sequence number.

c. The delay time for establishing connection is very less.

Disadvantages

a. Incorrect routes are identified by the intermediate nodes when the destination sequence number of intermediate node is higher than the sequence number of the source node.

b. If multiple Route Reply packets are generated as a reply to a single Route Request packet, then a greater control overhead may occur.

c. High amount of bandwidth is consumed because of the periodic beaconing.

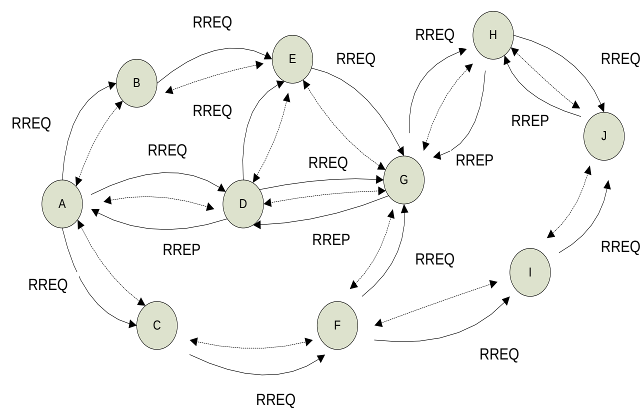

Figure 16 : AODV operation

VII. AOMDV Description

Ad hoc On-demand Multipath Distance Vector Routing (AOMDV) shares several characteristics with AODV. It is based on the distance vector concept and uses hop-by-hop routing approach. Moreover, AOMDV also finds routes on demand using a route discovery procedure. The main difference lies in the number of routes found in each route discovery. In AOMDV, RREQ propagation from the source towards the destination establishes multiple reverse paths both at intermediate nodes as well as the destination. Multiple RREPs traverse these reverse paths back to form multiple forward paths to the destination at the source and intermediate nodes. Note that AOMDV also provides intermediate nodes with alternate paths as they are found to be useful in reducing route discovery frequency. The core of the AOMDV protocol lies in ensuring that multiple paths discovered are loop-free and disjoint, and in efficiently finding such paths using a flood-based route discovery. AOMDV route update rules, applied locally at each node, play a key role in maintaining loop freedom and disjointness properties. Here we discuss the main ideas to achieve these two desired properties. Next subsection deals with incorporating those ideas into the AOMDV protocol including detailed description of route update rules used at each node and the multipath route discovery procedure. AOMDV relies as much as possible on the routing information already available in the underlying AODV protocol, thereby limiting the overhead incurred in discovering multiple paths. In particular, it does not employ any special control packets. In fact, extra RREPs and RERRs for multipath discovery and maintenance along with a few extra fields in routing control packets (i.e., RREQs, RREPs, and RERRs) constitute the only additional overhead in AOMDV relative to AODV.

AOMDV Mechanisms

i. Route Discovery

ii. Route Maintenance

Advantages

- AOMDV is Loop free because loops are overcome by using sequence number.
- Reduce Route discovery time and limit the control messages in Route discover.

Disadvantages

- 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.
- Congestion may occur due more RREQ and RREP messages.

VIII. Performance Metrics Used

The main goal of this paper is to compare the performance of the above four protocols under different scenario. Comparing the different methods is done by simulating them and examining their behavior. In comparing the four protocols, the evaluation could be done by using the following simulation metrics.

1) *Throughput* is the average rate of successful message delivery over a communication channel. The system throughput or aggregate throughput is the sum of the data rates that are delivered to all terminals in a network.

*Throughput = (total no. of bytes received/Simulation time) * (8/1000)*

Kbps

2) *Packet loss or delivery* is defined as the number of packets sent and number of packets lost while transmitting in a network.

Packet loss = total no. of packets sent- Total no. of packets received

3) Overhead is defined as the excess traffic generated while transmitting the packet over a network. This leads to dropping of packets before reaching the destination.

Overhead = total no. of routing packets Sent / total no. of data packets Received

4) *Delay* is defined as the overall time taken from the moment the data.

Delay = end time – start time

5) *Packet loss* is the number of packets lost while transmitting in a network.

Packet loss= total no of packets sent-Total no of packets received

IX. Simulation Environment

Table 1 : Simulation Environment (parameters)

Parameter	Value
Simulator	NS-2 (Version 2.35)
Channel type	Channel/Wireless channel
Radio-propagation model	Propagation/Two ray round wave
Network interface type	Phy/WirelessPhy
MAC Type	Mac /802.11
Interface queue Type	Queue/Drop Tail or CMUPriQueue
Link Layer Type	LL
Antenna	Antenna/Omni Antenna
Maximum packet in ifq	50
Area (M*M)	900 * 900
Number of mobile node	20 ,30 ,40,50 nodes
Source Type	UDP, TCP
Simulation Time	200 sec
Routing Protocols used	DSDV, DSR,AODV,AOMDV

a) *Simulation Setup*

STEPS for simulation:

Step 1: Tcl Script file

```
#Parameter Initialization
set val(chan)           Channel/WirelessChannel
set val(prop)           Propagation/Shadowing
set val(netif)          Phy/WirelessPhy
set val(mac)            Mac/802_11
set val(ifq)            CMUPriQueue OR Queue/DropTail
set val(ll)             LL
set val(ant)            Antenna/OmniAntenna
set val(x)              450
set val(y)              450
set val(ifqlen)         100
set val(nn)             30
set val(stop)           600.0
set val(rp)             DSR  OR AODV OR DSDV
#Physical Layer
# Shadowing propagation model
Propagation/Shadowing set pathlossExp_ 3.0
Propagation/Shadowing set std_db_ 6.0
Propagation/Shadowing set dist0_ 1.0
Propagation/Shadowing set seed_ 0
# Antenna Model
Antenna/OmniAntenna set X_ 0
Antenna/OmniAntenna set Y_ 0
Antenna/OmniAntenna set Z_ 1.5
Antenna/OmniAntenna set Gt_ 1.0
Antenna/OmniAntenna set Gr_ 1.0
# Cisco Aironet 350 Series Client Adapter Specifications
Phy/WirelessPhy set CPThresh_ 10.0
Phy/WirelessPhy set CSThresh_ 1.559e-11
Phy/WirelessPhy set RXThresh_ 3.17e-10
Phy/WirelessPhy set bandwidth_ 11.0e6
Phy/WirelessPhy set Pt_ 2.25
Phy/WirelessPhy set freq_ 2.4e+9
Phy/WirelessPhy set L_ 1.0
# Data Link Layer
# Mac Layer (IEEE 802.11 b)
# Mac Layer (IEEE 802.11 b)
Mac/802_11 set SlotTime_    0.000020            ;# 20us
Mac/802_11 set SIFS_        0.000010            ;# 10us
Mac/802_11 set PreambleLength_ 144              ;# 144 bit
Mac/802_11 set PLCPHeaderLength_ 48         ;# 48 bits
Mac/802_11 set PLCPDataRate_ 1.0e6              ;# 1Mbps
Mac/802_11 set dataRate_    11.0e6          ;# 11Mbps
Mac/802_11 set basicRate_   1.0e6               ;# 1Mbps
# LLC
LL set mindelay_            50us
LL set delay_               25us
LL set bandwidth_           0                   ;# not used
LL set debug_ false
LL set avoidReordering_ false               ;#not used
# Sheduler Creation
set ns          [new Simulator]
set tracefd     [open dsr30.tr w]
$ns trace-all $tracefd
set namtrace [open dsr30.nam w]
$ns namtrace-all-wireless $namtrace $val(x) $val(y)
# Topography
set prop        [new $val(prop)]
set topo        [new Topography]
$topo load_flatgrid $val(x) $val(y)
create-god $val(nn)
#Node Configuration
$ns node-config -adhocRouting $val(rp) \
                -llType $val(ll) \
                -macType $val(mac) \
                -ifqType $val(ifq) \
                -ifqLen $val(ifqlen) \
                -antType $val(ant) \
                -propType $val(prop) \
                -phyType $val(netif) \
                -channelType $val(chan) \
```

```
                   -propType $val(prop) \
                   -phyType $val(netif) \
                   -channelType $val(chan) \
                   -topoInstance $topo \
                   -agentTrace ON \
                   -routerTrace ON \
                   -macTrace ON \
                   -movementTrace ON
# Energy Model
      $ns node-config  -energyModel EnergyModel \
                        -initialEnergy 100 \
                        -txPower 2.25 \
                        -rxPower 1.35 \
                        -idlePower 0.0015 \
                       -transitionTime 0.005 \
                       -sleepPower 0.075
## Creating node objects..
      for {set i 0} {$i < $val(nn) } { incr i } {
            set node_($i) [$ns node]
      }
for {set i 0} {$i < $val(nn)} {incr i} {
      $node_($i) color darkgreen
      $ns at 0.0 "$node_($i) color darkgreen"
      }
## Provide Initial Location of Wireless Nodes
# Nodes: 15, Pause Time: 25.00, Max Speed: 3.00, Max X: 100.00, Max Y: 100.00
#waypoints 19
$node_(0) set X_ 70.34156472693905
$node_(0) set Y_ 110.0
$ns at 0.0 "$node_(0) setdest 70.0 110.0 0.605738919631732"
$ns at 0.5638810977288813 "$node_(0) setdest 70.0 101.26315566241293 0.6057389196317728
$ns at 14.98732997055049 "$node_(0) setdest 70.0 100.0 0.5000000000000394"
$ns at 17.513641295376146 "$node_(0) setdest 100.0 100.0 0.5"
$ns at 157.51364129537615 "$node_(0) setdest 100.0 110.0 0.5"
$ns at 177.51364129537615 "$node_(0) setdest 110.0 110.0 0.5"
$ns at 197.51364129537615 "$node_(0) setdest 110.0 100.0 0.5"
$ns at 217.51364129537615 "$node_(0) setdest 100.0 100.0 0.5"
$ns at 237.51364129537615 "$node_(0) setdest 100.0 96.26315566241293 0.4999999999999867"
$ns at 244.9873299705505 "$node_(0) setdest 100.0 86.26315566241293 0.5273077128565068"
$ns at 263.951588896005 "$node_(0) setdest 100.0 80.0 0.500000000000008"
$ns at 276.47790022083063 "$node_(0) setdest 90.0 80.0 0.5"
$ns at 296.47790022083063 "$node_(0) setdest 90.0 78.23895011041536 0.4999999999999879"
#waypoints 14
$node_(1) set X_ 80.0
$node_(1) set Y_ 29.333722108754355
$ns at 0.0 "$node_(1) setdest 80.0 25.86260489769858 0.4999999999999964"
$ns at 6.942234422111596 "$node_(1) setdest 80.0 20.0 0.5000000000000091"
$ns at 18.667444217508546 "$node_(1) setdest 90.0 20.0 0.5"
$ns at 38.667444217508546 "$node_(1) setdest 90.0 10.0 0.5"
$ns at 58.667444217508546 "$node_(1) setdest 80.0 10.0 0.5"
$ns at 78.66744421750855 "$node_(1) setdest 80.0 34.13739510230142 0.4999999999999978"
$ns at 126.9422344221116 "$node_(1) setdest 80.0 40.0 0.5000000000000091"
$ns at 138.66744421750855 "$node_(1) setdest 84.13739510230143 40.0 0.49999999999998795"
$ns at 146.9422344221116 "$node_(1) setdest 99.13739510230143 40.0 0.5"
$ns at 176.9422344221116 "$node_(1) setdest 110.0 40.0 0.5000000000000046"
$ns at 198.66744421750855 "$node_(1) setdest 110.0 60.0 0.5"
$ns at 238.66744421750855 "$node_(1) setdest 100.0 60.0 0.5"
$ns at 258.66744421750855 "$node_(1) setdest 100.0 39.333722108754365 0.4999999999999978"
#waypoints 17
$node_(2) set X_ 105.54077893578798
$node_(2) set Y_ 80.0
$ns at 0.0 "$node_(2) setdest 102.42732396071227 80.0 0.5000000000000046"
$ns at 6.2269099501513665 "$node_(2) setdest 100.0 80.0 0.4999999999999883"
$ns at 11.081557871576024 "$node_(2) setdest 100.0 87.57267603928773 0.5000000000000038"
$ns at 26.226909950151367 "$node_(2) setdest 100.0 92.57267603928773 0.5"
$ns at 36.22690995015137 "$node_(2) setdest 100.0 107.57267603928773 0.5"
$ns at 66.22690995015137 "$node_(2) setdest 100.0 110.0 0.4999999999999883"
$ns at 71.08155787157602 "$node_(2) setdest 90.0 110.0 0.5"
$ns at 91.08155787157602 "$node_(2) setdest 90.0 90.0 0.5"
# Assigning Traffic -TCP
# Wireless Nodes: 15, Max connection: 5, Send Rate: 0.0, seed: 0
# 0 connecting to 1 at time 133.846688742678
set tcp_(0) [$ns create-connection  TCP $node_(0) TCPSink $node_(1) 0]
$tcp_(0) set window_ 32
$tcp_(0) set packetSize_ 512
set ftp_(0) [$tcp_(0) attach-source FTP]
$ns at 133.846688742678 "$ftp_(0) start"
# 0 connecting to 2 at time 37.351687381673457
set tcp_(1) [$ns create-connection  TCP $node_(0) TCPSink $node_(2) 0]
$tcp_(1) set window_ 32
$tcp_(1) set packetSize_ 512
set ftp_(1) [$tcp_(1) attach-source FTP]
$ns at 37.351687381673457 "$ftp_(1) start"
# 1 connecting to 2 at time 71.036675931437259
set tcp_(2) [$ns create-connection  TCP $node_(1) TCPSink $node_(2) 0]
$tcp_(2) set window_ 32
$tcp_(2) set packetSize_ 512
set ftp_(2) [$tcp_(2) attach-source FTP]
$ns at 71.036675931437259 "$ftp_(2) start"
# 1 connecting to 3 at time 153.31936032200201
set tcp_(3) [$ns create-connection  TCP $node_(1) TCPSink $node_(3) 0]
$tcp_(3) set window_ 32
$tcp_(3) set packetSize_ 512
set ftp_(3) [$tcp_(3) attach-source FTP]
$ns at 153.31936032200201 "$ftp_(3) start"
# 2 connecting to 3 at time 22.127986923851068
set tcp_(4) [$ns create-connection  TCP $node_(2) TCPSink $node_(3) 0]
$tcp_(4) set window_ 32
$tcp_(4) set packetSize_ 512
set ftp_(4) [$tcp_(4) attach-source FTP]
$ns at 22.127986923851068 "$ftp_(4) start"
#Total sources/connections: 3/5
## Define node initial position in nam..
      for {set i 0} {$i < $val(nn)} { incr i } {
      # 30 defines the node size for nam..
```

```
## Telling nodes when the simulation ends..
for {set i 0} {$i < $val(nn) } { incr i } {
    $ns at $val(stop) "$node_($i) reset";
}

## Ending nam and the simulation..
$ns at $val(stop) "$ns nam-end-wireless $val(stop)"
$ns at $val(stop) "stop"
$ns at 299.01 "puts \"end simulation\" " ;# $ns halt

## Stop procedure..
proc stop {} {
    global ns tracefd namtrace
    $ns flush-trace
    close $tracefd
   close $namtrace
    exec nam dsr30.nam &
    exit 0
}

$ns run
```

Step 2# now Extract the data from resultant trace file using awk scripts

Step 3#record the values & run the x-graphs.

The obtained values for each protocol &the results are given below

a) Simulation Results

i. *AOMDV Results*

	20 nodes	30 nodes	50nodes
Delivery Ratio	99.51	99.60	97.90
Throughput	271.33	282.64	111.75
Overhead	38.38	44.82	103.7
Delay	112.92	44.85	124.10
Packet loss	165	144	379

ii. *AODV Results*

	20 nodes	30 nodes	50nodes
Delivery Ratio	99.167	99.396	96.357
Throughput	279.66	293.98	75.55
Overhead	5.723	8.84	38.74
Delay	102.302	57.032	82.354
Packet loss	308	244	801

iii. *DSR Results*

	20 nodes	30 nodes	50nodes
Delivery Ratio	64.8085	95.7513	28.152
Throughput	268.26	261.87	42.47
Overhead	1.476	13.01	137.52
Delay	129.515	55.782	255.57
Packet loss	265	11	44

iv. *DSDV Results*

	20 nodes	30 nodes	50nodes
Delivery Ratio	97.08	97.71	76.10
Throughput	279.47	286.62	135.54
Overhead	3.04	4.88	20.52
Delay	118.91	61.48	85.38
Packet loss	184	160	297

v. *Summarized Results*

Table 2 : Comparison of Protocols AOMDV, AODV, DSR, DSDV

Parameters ↓	AOMDV	AODV	DSR	DSDV
Packet Delivery ratio	Higher than AODV	High	Medium	low
Throughput	Slightly similar to DSDV	High	Medium	low
Overhead	Higher than DSDV and AODV	Medium	Low	High
Delay	Slightly similar to AODV and DSDV	Low	Medium	High
Packet loss	low	High	Medium	Low

X. Conclusion

In this paper we have evaluated the performance of Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR), Ad hoc On Demand Distance Vector Routing (AODV) and Ad hoc On Demand Multipath Distance Vector (AOMDV) protocols using (TCL) Tool command language in the NS-2 Simulator. The performance of the protocols was measured with respect to metrics Packet delivery ratio, packet loss, throughput, overhead, delay. The obtained results of this simulation indicate that each protocol has its own significance on a particular QoS metric. It is observed that AOMDV protocol gives better performance as compared to AODV & DSR in terms of packet delivery fraction and throughput, delay. It is also observed that the DSDV has better throughput value. And it is observed that DSR protocol overhead is less. And AODV has higher packet loss. AOMDV incurs more routing overhead than AODV. AODV gives less delay with respect to pause time. The main conclusion of this paper is that the choice of which protocol to use, depends on the properties of the network.

References Références Referencias

1. http://cds.unibe.ch/research/pub_files/Joe04.pdf
2. http://skirubame.ucoz.com/_ld/0/29_Topic_1 - MANET_v.pdf
3. http://dspace.thapar.edu:8080/dspace/bitstream/10266/845/3/845+Vivek+Kumar+
4. http://www.ijarcsse.com/docs/papers/Volume_4/12_December2014/V4I12-0395.pdf
5. https://www.ietf.org/proceedings/44/slides/manet-thesis-99mar.pdf

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