An Extensive Performance Analysis of AODV Routing Protocol in Manet

Abstract: Ad-hoc networks are highly vibrant, self configuring, and doesn’t have any centralized network. The node area hand held device and wide used. The MANET is dynamic scenery so it prominent role in setting up efficient route among pair of nodes. Many routing protocols have been proposed to increase efficient data transfer among different mobile appliances in ad-hoc network environment. These protocols are proactive, hybrid, reactive etc. This paper is mainly covenant with AODV; it is a reactive routing protocol. As, during the last many years many routing protocols of ad-hoc networks were simulated as a function of mobility, power consumption, number of nodes, and size of the network but not as a function of route discovery and route maintenance parameters; such as packet delivery ratio and pause period. So, main aim of this paper is simulating and analyzing the dynamic performance of the AODV routing protocol with IEEE 802.11b MAC protocol in random way point model for a fixed number of nodes using NS-2 in constant scenario. All the simulated Results have been analyzed based on packet delivery ratio and end to end delay for different nodes and constant in tabular form and graphical manner.

Keywords - MANET, Routing Protocol, AODV, NS2, end to end delay, packet Delivery Ratio;

I. INTRODUCTION

Last Many years a mobile ad hoc network is the collection of mobile node which is self configuring, self curative network. All the nodes are creating the active topology without choose any infrastructure. In the mobile ad hoc network each and every nodes may act as an end node or intermediate node like the router etc. these types of intermediate nodes are free to move in the network randomly and arrange itself. When a node forward the packet to the other [4, 5, 10] node then a node work as a intermediate node to forward the packet with movement of the node. The mobility of the node is the major issue. There are some other characteristic of the mobile ad hoc network is that dynamic topology, [12, 15] limited bandwidth, multihop behavior; there is requirement of the mobility management. The application of the mobile ad hoc network is battle field, disaster management, moving nodes, conferences in rooms, search and rescue in flood area. Last many years many routing protocols is working in mobile ad hoc network to improve the data rate and the efficiency in network. One routing protocols is the best for one network topology or the mobility location but not good to use in the other topology, in every topology in the network every protocols work differently. Some mobile ad hoc network calculates to satisfy commercial needs. The important attribute in this paper is that is dynamic performance of ADOV routing protocol, [1, 3] This dynamicity check on the network simulator 2 version 35 at the ubuntu 12.04 LTS platform. The performance based on the end to end delay of different nodes and packet delivery ration in the mobile ad hoc network, this parameter check the efficiency of the AODV routing protocol. [10, 16, 20]

II. OVERVIEW OF AODV ROUTING PROTOCOL

AODV is on demand routing protocol for uses route update with single access per destination. When a source want to communicate to destination node then it find the route for the destination so here it initiate the route discovery process to find the destination,[19] The source node generates the discovery packet for the destination to generate path for the destination, according to the packet the destination sent reply directly or by the some intermediate node. so using this find the path of the destination, on receiving the route request (RREQ) all the intermediate node update the routing table for the reverse route to the source. Same as the forward route is updated on in receipt of a route reply (RREP) packet. The AODV use the packet sequence number for prevents the loop and the time line in network. In this routing protocol the time line check the route entry. Link failure is generate by the route error (RERR) data from the link break from the source node. The route error message sends to all neighbors that are communicating the entire broken link with the destination. This type of process is recovering and erases the entire broken link, AODV routing protocol always choose the least congested path rather than shortest path. [10, 13, 20] AODV minimize the routing table information so it generates large number of route request. These protocols mainly intend for the MANET with vendor of mobile nodes and can be grip low, reasonable and comparatively soaring mobility tariff. It also design for the reduce the control congestion and purge overhead on data traffic. This protocol is support both multicast and the unicast routing. This protocol is take more time to setup a route is more delay than some other approaches.
a. Advantage and disadvantage of AODV
It is the on demand process when route is required then it discover route. It is more efficient in dynamic nature in mobile ad hoc network. The disadvantage is owing to on demand nature it doesn’t check the route periodically so data transmission in network increase the delay.[19, 20, 23, 24]

III. DESCRIPTION OF MOBILITY MODEL
In mobile ad hoc network many routing protocols are proposed which use many mobility model that mobility model explain the movement pattern of the mobile nodes. The mobility model shows that the position of nodes, movement rate of the nodes, coverage area of the network and the topology of the system. The mobility model is emulate the movement pattern of the targeted the nodes. In this paper used mobility model for dynamic performance routing protocols in the ad hoc network. here some mobility model discussed.

a. Reference Point Group Mobility Model (RPGM):
This reference model is used for describe the group behaviour of the network. like the group leader determine the every location of the group same as the this mobility model check the location and the position of the nodes; because the in the mobile ad hoc network every nodes are distributed in the network, [19, 20, 21] each and every node may choose their own mobility model after that they added the reference mobility model in the network for route the group. In the group every node have own speed and the position in the network. Group mobility mainly used in the war and the major rescue operations. In the military number of soldiers are move in the group in the war or rescue operations.

b. Random Way point Mobility Model (RWP):
The random way point mobility model check the randomness in the network, [10, 11] it check the position, location and the average speed of the mobile nodes. This model firstly generates by the Johnson; now it is become in benchmark mobility model for the straight forwardness and the large and wide convenience. This mobility models same as the random walk way point mobility model if only and only the pause time in simulation is zero. The random way point mobility model used in the network simulator 2. This model assures that every mobile nodes are firstly randomly distributed in the network; then they are managed in the network area. According the network all the nodes are choose the frequency and the speed of the node. Every node have speed maximum to minimum. According to the speed the mobile nodes are move in the area. Every node may have different speed so they move in the selected location; it waiting at some position for some amount of the tie that called pause time. The above procedure of the choosing the position of the nodes with random speed.

c. Column Mobility Model (CMM):
The column mobility model mainly used of the penetrating; and the scan of the nodes in MANET. According to the model every mode may move in some average speed within the column it always move in the forward direction. In the columns every node has specific location in the columns.[8, 10, 16] Using this choose the speed and position of the mobile nodes. For the implementation of this mobility model it initial reference model grid for the columns. In the grid every location have a rows and columns; so in the network so every random node may always location in the grid.

IV. SIMULATION AND PERFORMANCE ANALYSIS
a. Analyzing the results:
The network simulator (NS-2.35) used for simulation of the network; the tool which worked on the Ubuntu 12.04 LTS. The linux platform provides the best programming platform for the network simulator. [8, 9, 11] We simulate the result with experiment contained in generate output using the AWK file which gives the graphical result. Here generate the mobility scenario for the Reference Point group model and the random way point model using the ns2 tool. Here generate the script to the supported NS2.35 format and the tcl script. Here also generate the random traffic contain the Constant Bit Rate (CBR) can be setup among mobile nodes using a traffic-scenario.
b. Simulation Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Nodes</td>
<td>20, 60, 100</td>
</tr>
<tr>
<td>Simulation time</td>
<td>200 sec</td>
</tr>
<tr>
<td>Pause time</td>
<td>10 sec</td>
</tr>
<tr>
<td>Simulation range</td>
<td>700m X 700m</td>
</tr>
<tr>
<td>Transmission range</td>
<td>250m</td>
</tr>
<tr>
<td>Traffic size</td>
<td>CBR</td>
</tr>
<tr>
<td>Packet size</td>
<td>512 bytes</td>
</tr>
<tr>
<td>Maximum Packet</td>
<td>50</td>
</tr>
<tr>
<td>Maximum movement speed</td>
<td>20 m/s</td>
</tr>
<tr>
<td>Queue length</td>
<td>50</td>
</tr>
<tr>
<td>Packets rate</td>
<td>10m/s</td>
</tr>
<tr>
<td>Simulator</td>
<td>NS-2.35</td>
</tr>
<tr>
<td>Mobility model</td>
<td>Random Waypoint</td>
</tr>
<tr>
<td>Antenna Type</td>
<td>Omni directional</td>
</tr>
</tbody>
</table>

This algorithm is applied for the mobility model. Node parameters are selecting through this algorithm and evolution of node results.

Algorithm 1
Step 1: Initially we selecting the destination directory
Step 2: Go to ns directory and configure for run, create make file for setdest.
Step 3: Go to directory and run make file which first create a standalone object file for ns/rng.cc and then create the executable file for setdest.
Step 4: Run setdest with following arguments are provide below
Step 5: Produced output in file scen-20-test or run make-scen.csh to generate multiple scenario file
Step 6: Call to traffic model algorithm go to below
Step 7: exit

This algorithm is applied for the traffic model. Node parameters are selecting through this algorithm and evolution of node results.

Algorithm 1
Step 1: Generate connections two pattern file
Step 2: select the directory ns/indep-utils/cmu-scen-gen and generating two types of connection for cbrgen.tcl file
a. CBR connection
b. TCP connection
Step 3: Run the above file through these connection format
Ns cbrgen.tcl [-type cbr|tcp] [-nn node] [-seed seed] [-mc connection] [-rate rate]
Example: ns cbrgen.tcl –type tcp –nn 20 –seed 0 –mc 20
Step 4: then output produced on terminal as figure number 4.
Step 5: exit

c. Performance Analysis

The AODV routing protocols are used some following important (QoS) Quality of Service matrices:-

1. Packet Delivery Ratio (PDR): - it is the very important metrics that is show that how many packets are delivered to the destination node which is send by the source node using by the transport layer which is worked on the top of the layer. The packet ratio calculated as the source node sends some data to the destination using the constant bit rate (CBR). The receiving node receiving packet that is divided to the source packets. The calculation using this formula; Packet delivery Ratio = (Receiving Packets/Sending Packets)*100.
2. End to end Delay: this is the all delay which is generating by the route discovery process or route latency; all interfaces; retransmission of the data; data transmission time and the propagation. It is mainly total time of packet transmission source to destination if the network. End to end delay = Packet Receiving time – packets Sending time.

V. SIMULATION RESULT AND ANALYSIS

In the simulation of AODV routing protocol use the three mobility model and check the dynamic performance in the mobile ad hoc network. for the simulation there are some parameter is used like antenna range with 250m, movement scenario pause time is 400s, and the simulation area 700m X 700m. In the simulation used the some parameter as the packet delivery ratio, end to end delay.

a. Packet delivery ratio: - The packet delivery ratio show that average packets transmission in the mobile ad hoc network. Using the AODV routing protocols in mobile ad hoc network the dynamic performance is evaluate in different mobile nodes. As we increase the node then packet delivery ratio increase but after more nodes are increase so packet delivery in decrease but continually increase the node packet delivery is increase in the mobile ad hoc network.
Table: 2 Packet Delivery Ratios in Different Node

<table>
<thead>
<tr>
<th>Parameter/ Nodes</th>
<th>20</th>
<th>60</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packet Delivery ratio</td>
<td>99.09</td>
<td>79.31</td>
<td>99.34</td>
</tr>
</tbody>
</table>

Figure 4: Packet delivery ratio in AODV in different node

b. End to end delay: The end to end delay is calculated as the total average time in the mobile ad hoc network. In the simulation there calculate end to end delay in different nodes. AODV give the dynamic changing in the end to end delay that is as the increase the nodes in the network then increase the end to end delay after that it will decrease end to end delay.

Table: 3 End to End delay in Different nodes

<table>
<thead>
<tr>
<th>Parameter/ Nodes</th>
<th>20</th>
<th>60</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>End to end delay</td>
<td>31.20</td>
<td>235.69</td>
<td>134.75</td>
</tr>
</tbody>
</table>

Figure 5: End to end delay in AODV in different nodes.

VI. CONCLUSION AND THE FUTURE SCOPE

This research paper is mainly focus on AODV routing protocol and its dynamic performance in mobile ad hoc network. To measure the dynamicity of the AODV routing protocol take two parameter that is packet delivery ratio and end to end delay in the network. The experiment result of the ADOV routing protocol using these parameter that is in small ad hoc network it work more effectively but when increasing the node firstly decrease the packet delivery ration but more mobile nodes are increase then it also increase the packet delivery to the destination it due to some reason that is AODV generate the sequence number for all packets to destination so it decrease packets. Same as when in small network the end to end delay is less but when nodes are increase so delay also increase but the after some time route discover in the network then more nodes increase end to end delay also decrease that is dynamicity of AODV routing protocol. In future work can take other parameter like power conservation, throughput, standard deviation etc.
REFERENCES