A Relative Speed Based Route Selection in AODV to Reduce Packet Drop in MANET

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Abstract—Mobile Ad-hoc Network (MANET) contains wireless mobile devices which can communicate each other without any centralized control and the data is exchanged between the mobile devices. Due to the mobility of devices the routing topology changes frequently which may cause of link failure, this link failure may cause of packet loss. Packet loss is the cause of efficiency degradation in MANET. In this paper we proposed an approach which reduce packet loss in communication by selecting such path in which mobile node’s relative speed is minimum with respect to its neighbor nodes. In this way we can find more stable path for routing. This technique can enhance efficiency. Here we compared our approach with AODV protocol on the basis of throughput and packet loss in communication between source and destination.

Keywords—MANET, SINR, AODV, Relative speed.

I. INTRODUCTION

Mobile Ad-hoc network is a self-organized bunch of wireless mobile devices [1]. These devices can communicate to each other without any centralized control device. Mobile Ad-hoc network are established for temporary purpose. Once objective is fulfilled, network can be destroyed.

All devices are free to move randomly and communicate on the move which leads to dynamic topology. Each node or device can be sender, receiver or router for delivering packets to the destination [6]. So reliability of packet delivery becomes very important issue. Thus packet loss reduction is a major challenge. Packet loss or drop may occur due to the link failure between source and destination [5]. Whenever a packet is dropped, it leads to more bandwidth consumption due to packet resend. So it is desired to find a stable path for communication to be connected last longer. Our relative speed based model provide more stable path so that link failure can be minimized which may cause of packet loss.

II. RELATED WORK

Finding a stable route between source and sink in any dynamic network is a big task. To select a stable route there are so many techniques are being used.

A. SINR Based Multipath Route Selection

This technic calculate more than one path and select strongest link of them for communication. When sender node found the reply from destination. After that sender has to decide which route should be select on the basis of max signal strength. In case path failure secondary route is used [2].

B. Signal Strength Based Route Selection

Signal Strength based routing is somewhat different. In this approach node observe the signal strength of its neighbor’s node and send RREQ packet to its neighbors. Then all neighbor node which got RREQ packet compare the signal strength of available link with RREQ packet signal strength, if it found lower than packet value then it is updated with the minimum signal strength value and this process is repeated until RREQ packet reach to the destination. In this way weakest link of route is found, after receiving RREQ by destination, destination node reply back with the help of RREP packet having minimum signal strength of the route to source node. Then source select such path for communication which have strongest signal strength [3].

Figure 1: Mobile Ad-hoc Network

The advancement of wireless technology started a revolution in the wireless devices. Millions of devices are in the market for various purpose, like smartphone, tablet pc, walkie-talkie etc.
C. Mobility Based Link Management Protocol for Mobile Sensor Network

In the paper [4], In this protocol, RSSI table is maintained by every node, RSSI table contain the signal strength value of neighbor nodes, with the help of this RSSI table, when any changes is found in node table RSSI value node detect that his neighbor node is moving, after detecting the link failure it performs following steps:

1. Dropping
   If link is broken or we can say that signal lost then retransmission may occur that may cause of packet drop.

2. Relaying
   In this step, a node can be a forwarding node if both sender and receiver are in its neighbor table and forward the data source to destination, if the link fail between source and destination.

3. Selective Forwarding
   If any intermediate node has bad link then it will drops the packets.

III. PROPOSED WORK

In the Mobile Ad-hoc Network, reducing the link failure is one of the biggest challenge because all nodes are movable in the network. To overcome this problem, a more stable route is required. A signal strength based route selection might not be efficient enough for communication. So for this we proposed a relative speed based route selection parameter for routing. This process include two steps. In first step a node find out the total number of possible next hop for communication. If total number of hop found more than one then that node is selected for communication which have the minimum relative speed with respect to sender node, in this way that selected node will remain in contact for the maximum time. This is only reason which make this approach better than signal strength based approach. The stability of this approach is able to reduce the link failure that may cause of packet loss.

A. Route selection procedure

When a route is required, the source initiates sending RREQ packet to all its neighbor in the range after that if more than one possible hop available then that node is selected for next hop which have the minimum relative speed with respect to sender node.

B. Relative Speed calculation

Relative speed calculation itself is a challenging task. To calculate the relative speed some new parameter are added in to the beacon packets.

1. Current Position Coordinates with device time stamp
2. Previous Position Coordinates with device time stamp

With above information two things are calculated to obtain the information of a node having minimum relative speed.

C. Formulae

\[
\text{Speed of Node} = \frac{\text{Distance Covered Between both Time Stamp}}{\text{Current Time - Previous Time}}
\]

\[
\text{Distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}
\]

It is assumed that all nodes lie in 2D plane.

\[
\text{Slope of the path of a node} = \frac{y_2 - y_1}{x_2 - x_1}
\]
If (Slope of the path of Source ≡ Slope of the path of nearby node) AND (Speed of Source ≡ Speed of nearby node)
{
Select next node for communication because this node is having the minimum relative speed.
} else
{
Select next node for communication as per AODV
}

IV. PERFORMANCE EVALUATION

We tried to emulate scenarios to investigate the protocol performance under different network situations.

A. Parameters for Simulation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation Duration</td>
<td>80s</td>
</tr>
<tr>
<td>Topology Area</td>
<td>1000 m x 800 m</td>
</tr>
<tr>
<td>Number of nodes</td>
<td>100</td>
</tr>
<tr>
<td>Mobility Speed</td>
<td>2 to 16 (m/s)</td>
</tr>
<tr>
<td>Mobility Model</td>
<td>Random way point</td>
</tr>
<tr>
<td>Transmission Range</td>
<td>250m</td>
</tr>
<tr>
<td>Packet rate</td>
<td>4 packets/s</td>
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<tr>
<td>Packet size</td>
<td>512 byte</td>
</tr>
<tr>
<td>Traffic Type</td>
<td>Constant Bit Rate</td>
</tr>
</tbody>
</table>

B. Simulation Results

We evaluated our approach with AODV with the help of NS2 (2.35) simulator. Here we have shown the results and compared our approach with AODV protocol. We calculated throughput and packet loss in both AODV and our approach.

1. Throughput

![Throughput comparison between AODV and Our approach.](image)

Figure 3: Throughput comparison between AODV and Our approach.

2. Packet loss

![Packet loss comparison between AODV and Our approach.](image)

Figure 4: Packet loss comparison between AODV and Our approach.

V. CONCLUSION

In this paper we have compared AODV routing protocol with our updated functionality the basis of different performance metrics such as packet loss, throughput. From the analysis, for our scenario our approach performed better. As time is increase it perform well all the time.
REFERENCES


