COMPARISON BETWEEN AODV PROTOCOL AND DSR PROTOCOL IN MANET

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ABSTRACT
The Ad hoc On-Demand Distance Vector (AODV) routing protocol is intended for use by mobile nodes in an ad hoc network and other wireless ad hoc network. AODV enables dynamic, multihop, self-starting routing for all participating mobile nodes on demand and maintain ad hoc network. AODV allows mobile nodes to find routes quickly for new destinations nodes, and does not require nodes to maintain routes to destinations that are not in active communication. AODV allows mobile nodes to respond to link breakages and changes in network topology in a timely manner. The operation of AODV is loop-free.

KEYWORDS: AODV, DSR, MANET, ad hoc network, wireless network.

1 INTRODUCTION
Routing is the key challenge in mobile ad hoc networks and challenge becomes more difficult and complicated when the size of network increase. Routing protocols are classified into different categories according to manner in which they are reacting to network when network topology changed. Routing protocol classified into proactive (table driven) protocol and reactive (on demand) and several protocols exist as hybrid protocol. AODV Ad hoc on-demand distance vector enables self starting, multihop, and dynamic routing for mobile wireless ad hoc networks. AODV discovers paths without source routing and maintains table instead of route cache. It is loop free using destination sequence numbers and mobile nodes to respond to link breakages, changes in network topology in a timely manner. DSR (Dynamic Source Routing) is on-demand, simple and efficient routing protocol for multi-hop wireless ad hoc networks of mobile nodes. DSR uses source routing and protocol composed of two main mechanisms- ‘Route Discovery’ and ‘Route Maintenance’, which works together entirely, on demand. The protocol allows multiple routes to destination, loop-free routing, support for unidirectional links, use of only ‘soft state’ In routing, rapid discovery when routes in the network change, designed for mobile ad hoc networks of up to about two hundred nodes and to work well even with high rates of mobility.

DSR and AODV both belong to the category of flat routing protocols, in which all nodes are assigned the same functionalities. Flat routing protocols work well for small networks containing a few hundred nodes; however, their performance degrades rapidly as the network grows because of the routing overhead. Proactive protocols propagate topology information periodically and find routes continuously, while reactive protocols find routes on demand. Performance analysis and simulation results [2] show that, generally, reactive protocols outperform proactive protocols in terms of packet delivery ratio, routing overhead, and energy efficiency. Therefore, research interests have been mainly focused on reactive protocols. Dynamic Source Routing protocol (DSR) [3] and Ad hoc on-demand Distance Vector routing protocol (AODV) [1] are two well-known reactive routing protocols.

Reactive (on-demand) vs. Proactive (table driven)

<table>
<thead>
<tr>
<th>Distinction</th>
<th>Functionality</th>
<th>Reactive</th>
<th>Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Discovery</td>
<td>As needed</td>
<td>Constantly discovers and maintains routes</td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Route Discovery Latency</td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Topology Change Detection</td>
<td>Route errors</td>
<td>Hello</td>
<td></td>
</tr>
<tr>
<td>Routing Method</td>
<td>Distance Routing</td>
<td>Link State</td>
<td></td>
</tr>
</tbody>
</table>

2 CONTROL MESSAGES
AODV protocol performs Route Discovery using control messages route request (RREQ) and route reply (RREP) whenever node wishes to send packet to destination. To control network wide broadcasts of RREQs, the source node use an expanding ring search technique. The forward path sets up in intermediate nodes in its route table with a lifetime association using RREP. When either destination or intermediate node moves, a route error (RERR) is sent to the affected source nodes. When source node receives the (RERR), it can reinitiate route discovery if the route is still needed. Neighborhood information is obtained from broadcast Hello packet.

DSR protocol has two mechanisms- Route Discovery and Route Maintenance. The source route is needed when some node originates a new packet destined for some node by searching its route cache or initiating route discovery using ROUTE REQUEST and ROUTE REPLY messages. On detecting link break, DSR sends ROUTE ERROR message to source for new route.

3 SIMULATION TOOL
We are using the Optimized Network Engineering Tool (OPNET) v14.5 software for our simulations. OPNET is a network simulator. OPNET 14.5 is designed for modeling communication devices, technologies, protocols and to simulate the performance of these technologies. The OPNET usability can be divided into four main steps. The OPNET first step is the modeling, it means to create network model. The sec step is to choose and select statistics. Third step is to simulate the network. Fourth and last step is to view and analyze results.
All these steps are shown schematically in the below figure 1. Run the OPNET modeler 14.5 to make a network model. The first step is to create a blank scenario by start-up wizard and the project editor workspace will be opened. Now we will design the network in this work space. The network design is done through two methods, one is automatically and the other is manually. The first method is automatically generating different topologies using rapid configuration. The sec method is by dragging different kind of objects from the object palette to the project editor workspace.

Fig. 1 Flow Chart of OPNET

4 EFFECT OF RANDOM MOBILITY ON PERFORMANCE OF MANET

4.1 Simulation Environment

We have done the comprehensive comparison of a wireless LAN with different random mobility. In this practical we had compared AODV with DSR protocol. Network has 20 nodes. At first nodes are configured to AODV protocol and then after nodes are configured to DSR protocol. All nodes in the network are configured to manage TCP traffic. We had created two scenarios. In scenario1 all nodes are mobile nodes. In scenario2 only 50% are mobile nodes. We had defined the same domain (wdomain1) for both the scenarios within both the protocols. The results show the amount of routing traffic received, routing traffic sent, total route requests and total route replies.

Fig. 2 Simulation scenario 1

Fig. 3 Simulation scenario 2

All nodes in the network are configured to run FTP sessions. TCP traffic is generated by configuring the Standard FTP Applications (Application Config object)

We have created two scenarios scenario1 and scenario2 with the above configuration. In these scenarios We used the default AODV parameters and we used the random way point mobility. The node moves from one point to another point, wait for defined time and then move to the next point. Mobility Parameters: Domain – wdomain1, position – 500x500 meters, speed-uniform (0, 10) meters/second, pause time-100 second, start time-10 second, stop time-end of simulation. After completing AODV Protocol, the nodes are configured with DSR Protocol with same configurations.

4.2 Simulation Results

Simulation was run for 30minutes on the 20 node network for both scenarios for both the protocols and the following results have been obtained to compare the AODV performance and also for DSR performance, when using standard FTP traffic.

Results for AODV protocol

Fig. 4 Comparison of total route request sent

Fig. 5 Comparison of total route replies sent
4.3 Conclusion from the Results

In high mobile network nodes move randomly in the network. So topology changes frequently. Also the link between the nodes breakages frequently, so node has to re-establish the connection. So total route request and route replies are increased compared to less mobile network.

In high mobile network routing traffic sent and routing traffic received are reduced as compared to the less mobile network.

5 EFFECT OF QUEUE SIZE ON PERFORMANCE OF MANET

5.1 Simulation Environment

We have done the comprehensive comparison of a wireless LAN with different Queue sizes. The Queue Size defines Number of data packets the AODV/DSR buffer can hold at any point while waiting for a route to be discovered to the destination. In this work we had used both the AODV and DSR protocols. At the end the simulation will show the effect of different queue lengths on both the AODV and DSR protocol.

In this work, the Network has 11 nodes, configured with AODV Protocol. All nodes in the network are configured to manage TCP traffic. I had created two scenarios with different Queue Size. In both the scenarios all nodes are mobile nodes. We had defined the same domain (wdomain1) for both the scenarios within which mobile nodes can move. The results show the amount of routing traffic received, routing traffic sent, total route requests and total route replies. The same configuration is applied to the nodes when network is configured with the DSR protocol.

The Queue Size is the Number of data packets the AODV/DSR buffer can hold at any point while waiting for a route to be discovered to the destination. By default, the packet queue size is infinity in AODV/DSR Parameters. Size "Infinity" does not mean that there will be no packet drops. Packets are stored on nodes attempting a route discovery. If no route is found with specified retries, all the packets for that destination are dropped. Queue size specifies the max number of packets a node can store while performing a route discovery.

For a highly mobile network, high value of packet queue size is suitable. We have created two scenarios scenario2 and scenario3 with the above configuration. In these scenarios we used the default AODV/DSR parameters and we used the different Queue size. The Queue size for scenario2 is 7 and for scenario3 is 1.

5.2 Simulation Results

Simulation was run for 30 minutes on the 5 node AODV/DSR network for both scenarios and the following results have been obtained to compare the AODV performance and DSR performance, when using standard FTP traffic.

5.3 Conclusion from the Results

For a highly mobile network, when Queue size is very less, the packets are dropped and buffer overflows for both AODV and DSR protocol. Also the network load increases and through will also increases as compared to the high queue size for high mobile network.

This work is an attempt towards a comprehensive performance evaluation of commonly used mobile ad hoc routing protocols (DSR and AODV). Over the past few years, new standards have been introduced to enhance the capabilities of ad hoc routing protocols. As a result, ad hoc networking has been receiving much attention from the wireless research community. In this paper, we evaluated the performance of widely used ad hoc network routing protocols. We can summarize our final conclusion from our experimental results as increase in the number of nodes will cause increase in the mean time for loop detection. In short, AODV has the best all round performance. DSR is suitable for networks with moderate mobility rate. It has low overhead that makes it suitable for low bandwidth and low power network.
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