Comparative Analysis for reduction of energy using various Routing Protocol in Mobile Adhoc Network

Suresh Kurumbanshi, Dr. Avichal Kapur, and Dr. Preeti Bajaj

Abstract—Although establishing correct & efficient route is an important design issue in mobile adhoc network, a more challenging goal is to provide energy efficient route. This paper classifies the energy aware routing protocols proposed for MANET. They minimize active communication energy required for transmitting or receiving packets. In this paper comparative analysis for energy reduction using various routing protocols is carried out. This paper is also based on how these different protocols help in minimizing energy level of a wireless node in a mobile adhoc network. Computation of residual energy of a node after communication task is over in mobile adhoc network is carried out & simulated in NS2 Software. The purpose of this paper is to facilitate the research effort in computing & analyzing the solution to offer energy efficient routing mechanism.

Keywords—DSDV, AODV, MANET, ENERGY.

I. INTRODUCTION

A. Mobile Adhoc Network:

MANET is a wireless network that operates independently of any fixed infrastructure or central administration. A node communicates directly with nodes within wireless range and indirectly with other nodes using dynamically computed routes through the nodes of Manet. In effect, all nodes are routers, participating in a protocol by which routes are discovered and maintained. A Manet is characterized by energy-constrained mobile nodes, bandwidth-constrained, variable-capacity links and unpredictable, dynamic topology.

B. Ad hoc On-Demand Distance Vector

The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile networks. AODV is capable of both unicast and multicast routing [1]. It is an on demand algorithm, meaning that it builds routes between nodes only as desired by source nodes.

It maintains these routes as long as they are needed by the sources. The AODV protocol uses route request (RREQ) messages flooded through the network in order to discover the paths required by a source node. An inter-mediate node that receives a RREQ replies to it using a route reply message only if it has a route to the destination whose corresponding destination sequence number is greater or equal to the one contained in the RREQ. The RREQ also contains the most recent sequence number for the destination of which the source node is aware.

A node receiving the RREQ may send a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater. If this is the case, it unicasts a RREP back to the source. Otherwise, it rebroadcasts the RREQ. Nodes keep track of the RREQ’s source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it. As the RREP propagates back to the source nodes set up forward pointers to the destination. Once the source node receives the RREP, it may begin to forward data packets to the destination. A route is considered active as long as there are data packets periodically traveling from the source to the destination along that path.

Once the source stops sending data packets, the links will time out and eventually be deleted from the intermediate node routing tables.

C. Destination-Sequenced Distance-Vector Routing

Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven routing scheme for ad hoc mobile networks based on the Bellman-Ford algorithm [4]. In DSDV, each node maintains a next-hop table, which it exchanges with its neighbors. In each data packet sent during a next-hop table broadcast or incremental updating, the source node appends a sequence number. This sequence number is propagated by all nodes receiving the corresponding distance-vector updates, and is stored in the next-hop table entry of these nodes. A node, after receiving a new next-hop table from its neighbor, updates its route to a destination only if the new sequence number is larger than the recorded one, or if the new sequence number is the same as the recorded one, but the new route is shorter.

D. Reactive routing protocols

On the Contrary of proactive protocols, reactive protocols calculate the route on request. If a source node needs to send a message to a destination node, then it sends a request to all members of the network. After receiving the request, the destination node sends a response back to the source.
However, the routing application generates a slow pace because of the research paths which can degrade application performance.

Such protocol has the disadvantage of being very costly in terms of energy and packets transmission when determining routes but has the advantage of not having to hold unused information in routing tables.

E. Energy consumption states

The network interface has four possible energy consumption states: transmit and receive are for transmitting and receiving data. In the idle mode, the interface can transmit or receive traffic. This is the default mode for ad hoc environment. The sleep mode has extremely low power consumption.

In an ad hoc environment, there are no base stations and nodes cannot predict when they will receive traffic. Therefore, the default state in an ad hoc network is the idle state, rather than the sleep state [12]. The cost for a node to send or receive a network-layer packet is modeled as linear. There is a fixed cost associated with channel acquisition and an incremental cost proportional to the size of the packet.

\[ \text{Cost} = m \times \text{size} + b \]

II. Table

<table>
<thead>
<tr>
<th>Simulation Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propagation</td>
<td>TwoRay Ground</td>
</tr>
<tr>
<td>Antenna</td>
<td>Omni Antenna</td>
</tr>
<tr>
<td>Packet Size</td>
<td>512 bytes</td>
</tr>
<tr>
<td>Packet interval</td>
<td>Variable</td>
</tr>
<tr>
<td>Total number of mobile nodes</td>
<td>Variable</td>
</tr>
<tr>
<td>Traffic Type</td>
<td>CBR</td>
</tr>
<tr>
<td>Simulation Time</td>
<td>10 ms</td>
</tr>
<tr>
<td>Area</td>
<td>1000*1000m²</td>
</tr>
</tbody>
</table>

III. Results

![Fig. 1 Nam Visualization of 6 mobile nodes](image1)

![Fig. 2 Nam Visualization of 15 mobile nodes](image2)

![Fig. 3 Nam visualization of 50 mobile nodes using DSDV Protocol](image3)

![Fig. 4 Nam visualization of 100 mobile nodes using AODV Protocol](image4)
Fig 5  Nam visualization of 200 mobile nodes using AODV Protocol

Fig. 6  Nam visualization of 300 mobile nodes using DSDV Protocol

Fig. 7 Energy graph of 15 mobile nodes using DSDV Protocol

Fig. 8  Energy graph of 15 mobile nodes using AODV Protocol

Fig. 9 Energy graph of 100 mobile nodes using DSDV Protocol

Fig. 10 Energy graph of 100 mobile nodes using AODV Protocol

Fig. 11 Energy graph of 200 mobile nodes using DSDV Protocol

Fig. 12 Energy graph of 200 mobile nodes using AODV Protocol
IV. CONCLUSION

A MANET consist of an Autonomous ,self-organizing and self-operating node ,each of which communicates directly with the nodes within its wireless range or indirectly with other nodes via a dynamically computed multi hope route. Due to its many advantages & different application area, the field of MANET is rapidly growing and changing. While there are many challenges that needs to meet.

In order to facilitate communication within the Manet, an efficient routing Protocol is required to discover route between mobile nodes. Energy efficiency is one of the main problems in MANET, especially in designing a routing Protocol. In many cases it is difficult to compare them directly since each method has a different goal with different assumption and employs different means to achieve the goal. In this paper we have suggested AODV routing protocol for reducing energy of a wireless mobile nodes.

Packet transmitted using DSDV protocol will lose energy 64% at the end of simulation time for small mobile adhoc network (In our case, network of 15 mobile nodes).Demand for energy required for transmission & reception increases as simulation time increases. Residual Energy with the wireless mobile node is more if AODV Protocol is used & less energy is wasted in transmission & reception of packets.

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REFERENCES


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