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# Efficient Energy Ad-Hoc Network Routing Using Energy Model and Link Stability in MANETs

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**ABSTRACT***:* An approach to improve the energy efficiency by using an 'Efficient Energy AODV' (EAODV) that increases the network lifetime of MANETS(Mobile Ad-Hoc network). For MANETS deployed in battlefield scenario/border management posture, reliability, survivability and self sustenance of the network. In such an environment there are two major reasons of a link breakage i.e. firstly, a node dying of energy exhaustion and secondly, a node moving out of the radio range of its neighboring node. The proposed energy efficient routing protocol for MANETS tries to reduce energy consumption by means of an energy efficient routing metric, used in routing table computation instead of the minimum-hop metric(Measurement). This way, a routing protocol can introduce energy efficiency while selection of routes. However, energy metric does not take a node moving out of radio range while making its calculation into consideration. Thus, it is further proposed to use an additional metric that takes stability/availability of a particular link in to account. The proposed approach in this paper adds two extra fields in the packet header as routing metrics which are 'Energy Model' and 'Link Stability Parameter' and both of these metrics are used in routing table computation.

**KEYWORDS:** AODV (Ad Hoc On-Demand Distance Vector), Residual energy (Remaining Energy), EAODV.

## I.INTRODUCTION

The energy model calculates the residual energy of a node by subtracting energy consumed by a node. There are various routing decisions for all packets sent, received, forwarded and dropped. while traversing from source to destination node. This residual energy of the node is added as a routing metric in the packet header and is used towards selection of an energy efficient path from the source to destination node. It is noted that this selected path may not be the minimum energy path but the path having maximum residual energy of the nodes since routing to maximize the lifetime of the network is different from minimum energy routing. Minimum energy routes attract more traffic flows, and the nodes along these routes suffer battery exhaustion and die very soon; hence causing a complete network failure. However, routes selected based on maximum residual energy results in increased network lifetime by balancing load through all the routes and nodes globally within a network.

## II. DESIGN OBJECTIVE AND PROPOSED ALGORITHM

While considering a design objective and a new approach it should be understood that the two objectives of routing i.e. minimum total energy consumption and lifetime of the network can be mutually contradictory. Consider, a case, when a common node lies on several paths from various nodes, then the battery power of this node quickly runs into depletion. As a result this particular node may die of battery exhaustion very soon, eventually shortening the network lifetime. When choosing a path, the existing routing protocol implementation chooses the path with the minimum number of hops. For EAODV, however, the path is chosen based on energy. First, we calculate the residual energy level for each node, and find the lowest residual energy of a node on a particular path. Then the selection is made by choosing the path with the maximum lowest residual energy.

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Where,
Ek (t) = residual energy of path     Ei (t) = residual energy of node i in path k

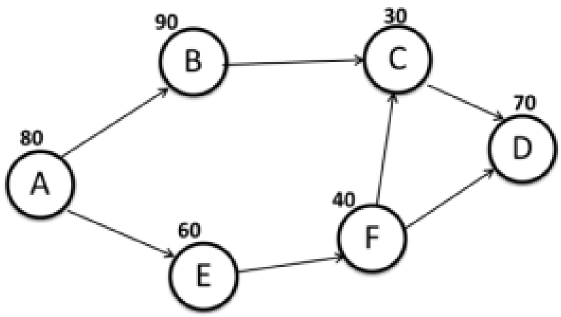


Figure 1. Route selection in EAODV

## III. SIMULATION LAYOUT

Simulation has been carried out for a typical MANET deployment along border areas/battlefield scenario, with sensor/source nodes deployed at the edge of network (border) sending information to a control headquarters through various mobile nodes (number of nodes ranging from 30 to 60) forming the MANET.

**Simulation Parameters:**

| **Parameter** | **Value** |
|---|---|
| Channel | Wireless Channel |
| Propagation | Two Ray Channel |
| Antenna | Omni directional Antenna |
| Terrain Area | 1500 m x 1500 m |
| Simulation Time | 60 s |
| MAC Type | 802.11 |
| Application Traffic | CBR |
| Routing Protocol | AODV |
| Data Pay load | 512 Bytes/Packet |
| Number of Nodes | 11 |
| No of Destination/Control Nodes | 1 |
| Initial Energy of Nodes | 100,00 Joules |
| Transmit Power | 2.0 Watts |
| Receive Power | 1.0 Watts |
| Idle Power | 0.5 Watts |

Table 1: Simulation parameters

The energy consumption evaluation during simulation using AODV and EAODV routing protocols was carried out for typical MANET deployed for scenario for 11 nodes.

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## IV. SIMULATION RESULTS

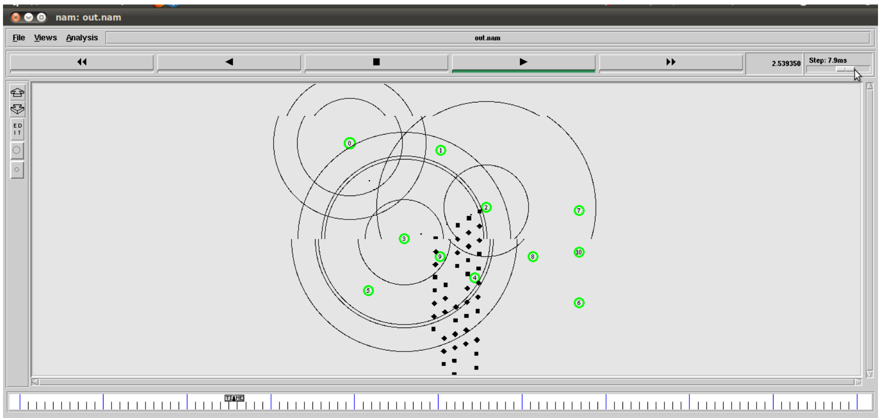

Fig-2: Scenario of 11 nodes packet delivery (node 0-3-2) with full energy in AODV

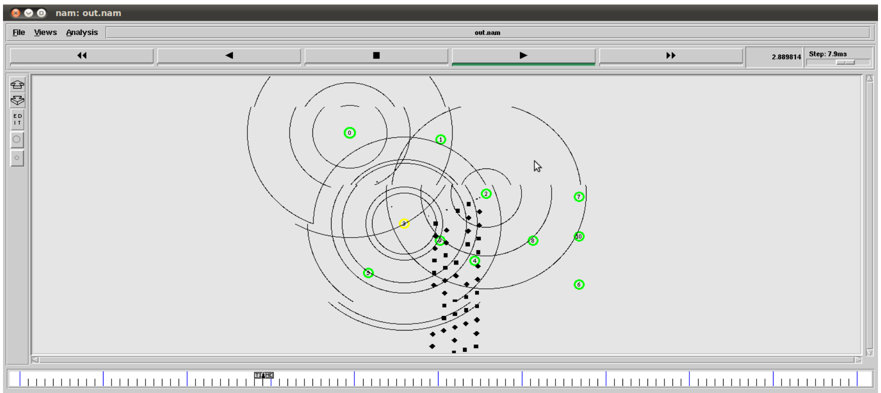

Fig-3: Scenario of 11 nodes packet delivery (node 0-3-2) with partial energy node 3 in AODV

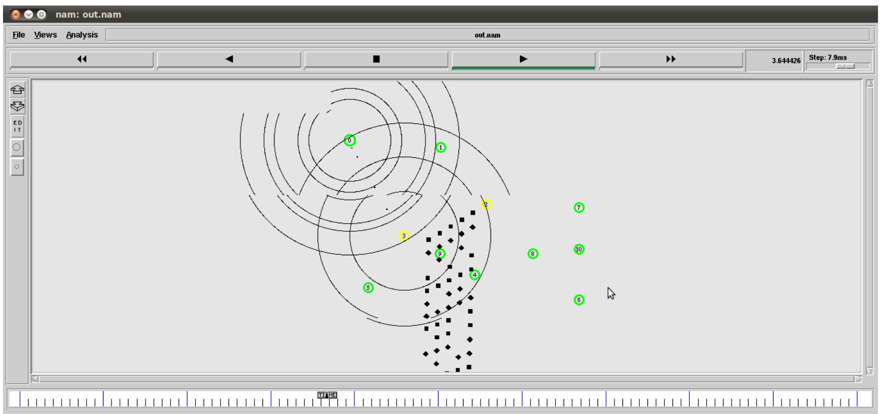

Fig-4: Scenario of 11 nodes delivery (node 0-3-2) with partial energy node 3 & node 2 in AODV

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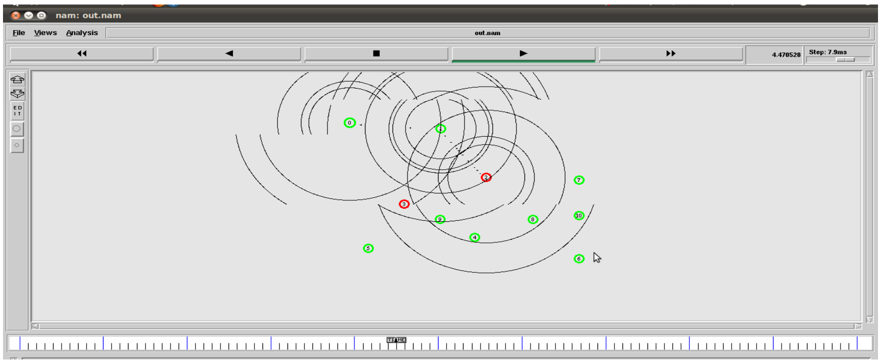

In above results that life time of network is less because if energy of any node which participate in packet sending is lost than overall network get fail. So to overcome these problem we now apply new approach which shows the energy consumption for the protocols EAODV We want to send data from source node0 to node2 destination, firstly we apply algorithm to find minimum and maximum energy in between link of nodes. According to algorithm link from node (0-10-2) having maximum energy to deliver data as compare to other links.

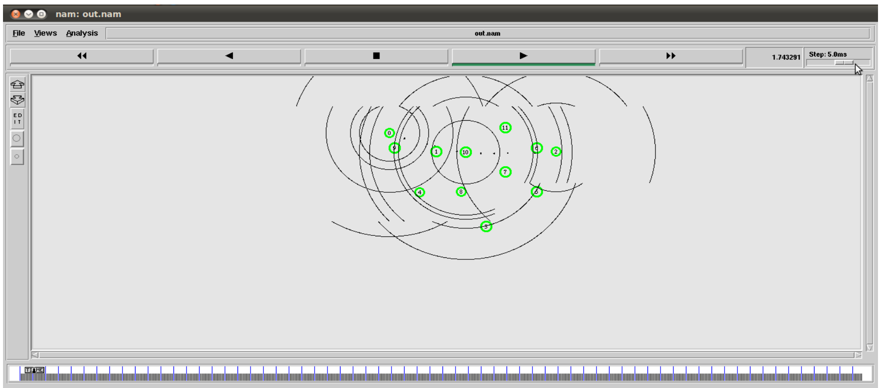

Fig-5: Scenario of 11 nodes packet delivery (node 0-10-2) with full energy in EAODV

Now destination node 2 dynamically starts change position. But whenever node 2 lie in cluster range link will not change to transfer data.

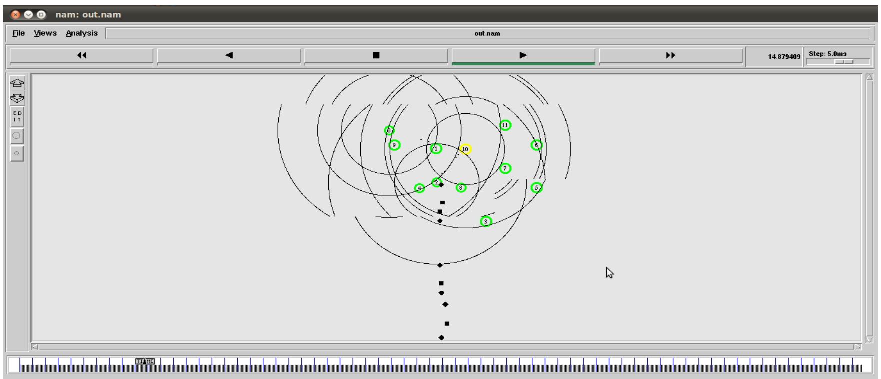

Fig-6: Scenario of 11 nodes packet delivery (node 0-10-2) with node10 start discharging in EAODV

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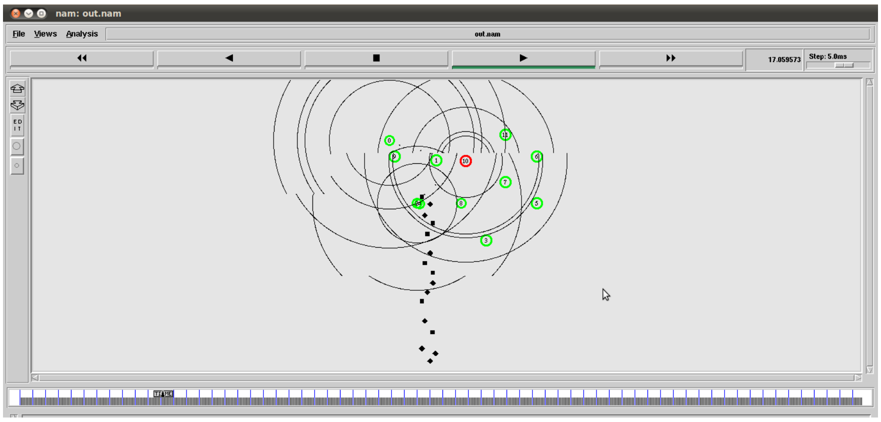

Fig-7: Scenario of 11 nodes packet delivery (node 0-3-2) with node 10 gets fully discharge in EAODV

Now, node 10 get fully discharge but our network will not fail. Here, by using algorithm, new link is established automatically to transfer data. If destination node is in range of source node than it can transfer data directly as we can see in figure below.

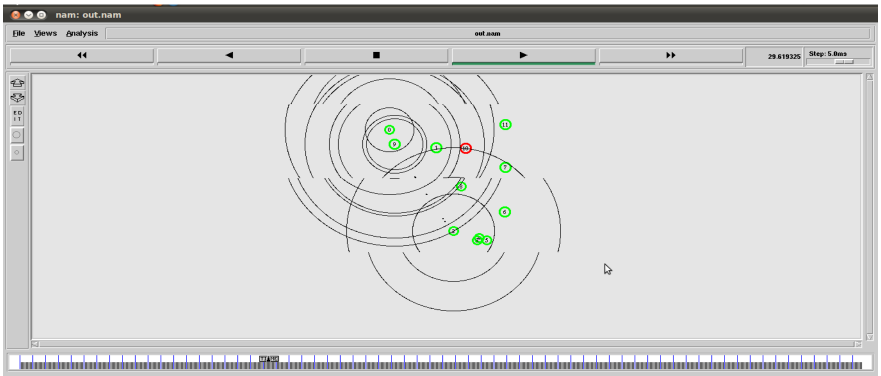

Fig-8: Scenario of 11 nodes packet delivery (node 0-9-2) with full energy in EAODV

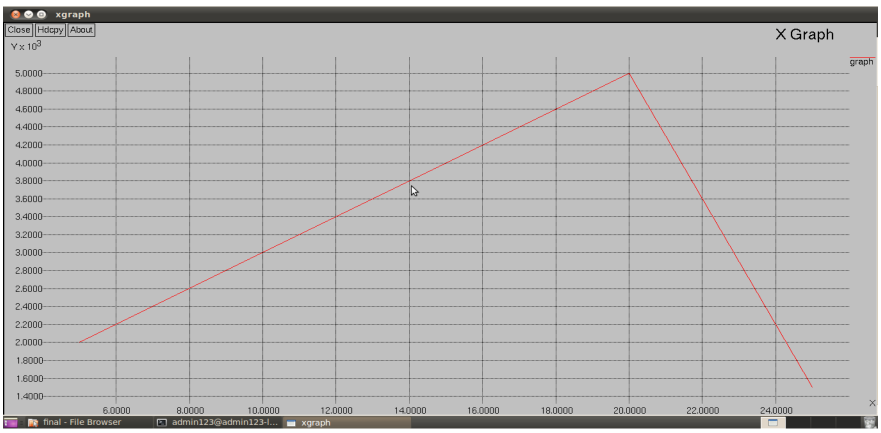

Fig-9: Xgraph in EAODV

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| S.No | Parameter | EAODV | AODV |
|---|---|---|---|
| 1 | Number of Packet Sent | 27720 | 2592 |
| 2 | Number of Packet Receive | 14805 | 566 |
| 3 | Number of Packet Drop | 12834 | 1777 |
| 4 | Throughput | 53.41% | 42.385% |
| 5 | Life time of Network | More | Less |
| 6 | Packet delivery capacity | High | Low |

Table 1: Comparison between EAODV and AODV

## VI.CONCLUSION

The results indicate that the technique provides robustness to mobility and enhances protocol performance. Its performance has been found much better than other existing protocols in dense medium as probability of finding active routes increases. In the discussed algorithm, the end to end delay is slightly increasing. Further improvement may be made to minimize this. The work includes simulation on only reactive AODV routing protocol.

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