

## AODV BASED BACKUP NODE MECHANISM WITH QOS ENABLE ROUTING IN MOBILE AD-HOC NETWORKS

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**Abstract:** To manage the intrinsic properties of MANETs, a backup path algorithm for quick reconnection during link failures, is proposed. Also, proposed model reduces current recovery time by improving reliability of network. Backup path is further added in the existing AODV routing protocol, in which after link breakage, re-routing analysis is automatically accomplished to sustain reconnection. In this way, reliability in routing is assured. Proposed work shows improvement over standard AODV protocol in terms of various network performance parameters like throughput and packet loss.

**Keywords:** MANET, on-demand routing protocol, Backup Routes, Throughput, Packet Loss, Quality of service (QOS).

### 1. INTRODUCTION

A Mobile ad hoc network (MANET - Sadjadpour et al, 2010 and, Lajos et. al, 2007) is a collection of mobile nodes (MNs) sharing a wireless channel without the need of any centralized controller (see figure1).

For QOS routing, it is not sufficient to only find a route from source to destination, the route has to even satisfy the QOS constraints such as bandwidth, end-to-end delay and energy. QOS routing protocols can be classified either as proactive or reactive. Proactive protocols continuously learn the topology of the network by exchanging topological information among the nodes.

The family of Distance-vector protocols is an example of a proactive scheme. Example: DSDV, OLSR. Reactive protocols, invoke a route determination procedure on demand only. Example:

DSR, AODV. Routing protocols must incorporate the load balancing (Karaoglu & Hanzelman, 2013) to deal with congestion and ensure secure routing. The primary objectives of MANET routing protocols is to maximize throughput, minimize packet loss and to minimize recovery time.

Due to continuous node movement in Ad Hoc networks, radio links may get broken. This leads to increase in packet loss, reduction in throughput and degrade the efficiency of network.

To avoid these problems, efficient route repairing recovery techniques are provided (Kundu, 2014; Monga, 2016). The biggest challenge in routing is to provide reliable and short route in a network.

The routing (Monga, 2016; Mishra et al, 2009) involves two steps: first determining the optimal route and second transferring the information groups through an Ad Hoc networks. High mobility and

dynamic architecture of MANET make it vulnerable to security issues. This causes various types of attacks due to Lack of centralized management, Dynamic topology and link power supply.

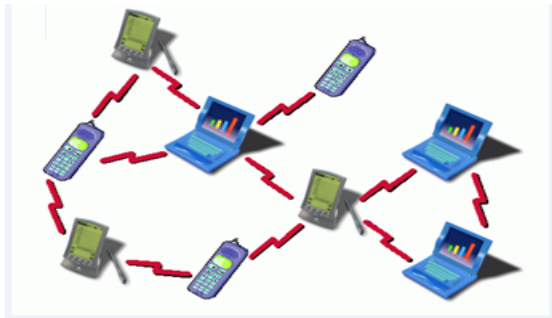


Fig.1. Mobile Ad Hoc Network

Trust (Manoj, 2012; Cho & al, 2011) has an important role for reliable and secured routing. Accurate trust values can be obtained by combining the Trust from direct observations and indirect observations.

## 2. AODV PROTOCOL

Ad-hoc on demand Distance Vector (AODV Singh & Jain, 2015) routing protocol is a reactive protocol that establishes the route only on demand and always search for the shortest path. The logic behind AODV is that the topology information is only transmitted by nodes on-demand. When a node wishes to transmit packets to destination to which it has no route, it will generate a route request (RREQ) message to other nodes. A route is found when the RREQ message reaches the destination node. Till effective route becomes available between two endpoint, AODV remains passive. AODV avoids the "Counting to infinity" problem by using sequence numbers for every route. It defines three types of control messages for route maintenance:

**RREQ** – A route request message is transmitted by a node requiring a route to a node.

**RREP** – A route reply message is unicasted back to the originator of a RREQ.

**RERR** – Nodes monitor the link status of next hopes in active routes. When a link break in an active route, a RERR message is delivered.

AODV keeps track of the following information for each route:

- Destination IP Address: IP address for the destination node.
- Destination Sequence Number: Sequence number for this destination.
- Hop Count: Number of hops to the destination.
- Next Hop: The neighbor, which has been designated to forward packets to destination.

- Lifetime: The time for which route is considered valid.

**Backup Routing:** In our proposed work, use of pre-computed backup path provides a solution to link failure and loss of connectivity. Pre-computed route give good performances in high-density conditions. Mobile nodes in the same range can exchange messages with their neighbors. Through these messages, the routing protocol will begin to construct the routing table between source and destination. The Backup mechanism computes a backup path after identifying the malicious nodes in primary path.

## 3. SYSTEM MODEL

In this system model, shortest path is provided in AODV protocol. In normal AODV, routing is achieved using nearby nodes and whole network is travelled to reach the destination node thereby following longer path. In our proposed work routing mechanism is based on destination phenomenon adopting the shortest path, even in the situation of link failure or loss of connectivity shortest path is followed. To achieve this, a backup node mechanism for quick reconnection is proposed. The procedure of computing the shortest path is shown in figure 2.

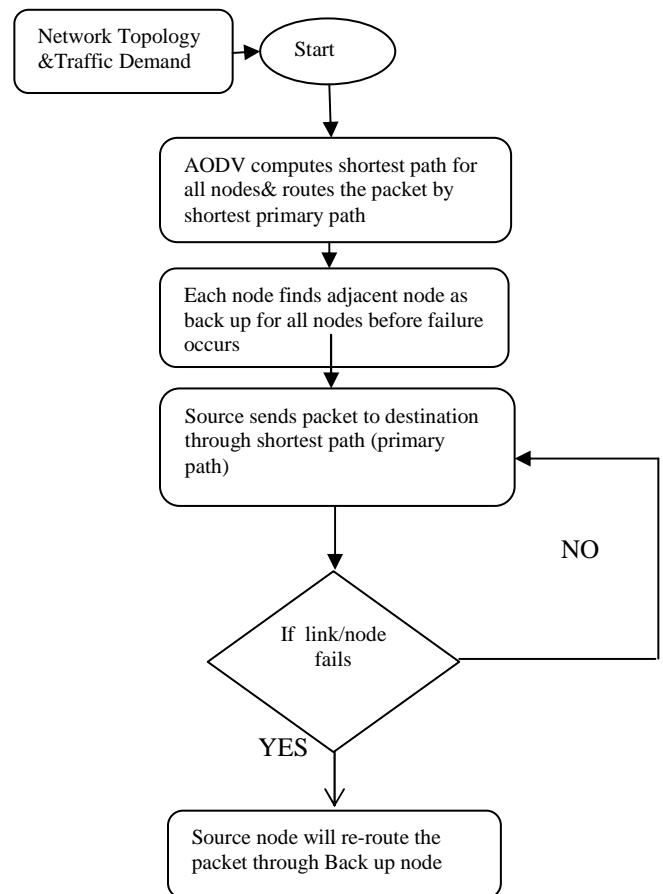


Fig.2. System Model of Proposed AODV

Routing in AODV protocol is using the following distance:

$$(1) \quad Dist = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Where

$x_2$  = x-coordinate of destination node

$x_1$  = x-coordinate of source node

$y_2$  = y-coordinate of destination node

$y_1$  = y-coordinate of source node

### 3.1. Proposed Algorithm

The following assumptions are made in the implementation of proposed work:

*Algorithm:*

1. Node Initialization
  - Generate the number of nodes (N)
  - Assign node ID to the new node by MANET protocol
  - The new node's initial local table is established by direct transactions.
2. AODV computes the shortest distance for all nodes.
3. Provide a routing from source to destination from shortest path (primary).
4. Each Node finds an adjacent node as a backup before failure occurs.
5. If route to destination via adjacent node then
  - Update routing table
  - Else
    - Choose a different adjacent node.
    - If it provide a disjoint path to destination then
      - Update routing table
      - Else
        - Choose a different adjacent node.
        - End
  - End
6. While source sends traffic to destination via shortest path
  - If node/link failure occurs in primary path then
    - Store the location of failures.
    - Provide the rerouting through backup node.
    - Select a set of path having minimum path length.
    - Choose available best path for Communication.
  - End
- End

## 4. SIMULATION, RESULTS AND ANALYSIS

Our proposed work is simulated on MATLAB. The simulation parameters used in this work are given in Table 1:

Table 1. Simulation Parameters

| Parameter        | Value  |
|------------------|--------|
| Simulation Tool  | MATLAB |
| Min no. of nodes | 10     |
| Max no. of nodes | 50     |
| Routing protocol | AODV   |
| Traffic type     | TCP    |
| Packet size      | 100    |

Routing in AODV is described in following graphs:

**1. Placement of nodes:** Figure 3 shows that the number of nodes is variable. We have considered 50 nodes. Nodes can be increased or decrease as per requirement.

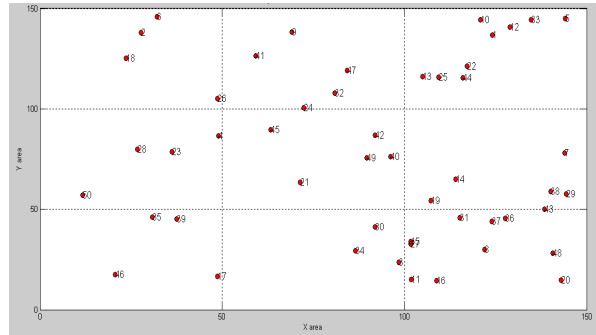


Fig.3. Sample placement of nodes

**2. Proposed Routing in AODV:** Figure [4] shows that Routing takes place using shortest path which is destination based. If node/link failure occurs in primary path then it provide the rerouting through backup node and Select a set of path having minimum path length which Choose available best path for Communication.

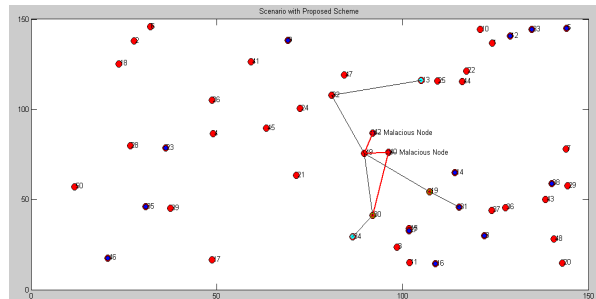


Fig.4. Proposed Routing in AODV

4.1. 4.1 Simulation results:

For this work the comparison of performance matrices i.e. throughput and Packet loss is shown in the Table 2:

Table 2 - Parameter values for each case

| Parameter   | Normal AODV   | Trust and load AODV | Proposed AODV |
|-------------|---------------|---------------------|---------------|
| Throughput  | 10 nodes=1    | 10 nodes=1.4        | 10 nodes=1.8  |
|             | 20nodes=1.09  | 20 nodes=1.4        | 20 nodes=1.9  |
|             | 30 nodes=1.09 | 30 nodes=1.42       | 30 nodes=1.94 |
|             | 40 nodes=1.48 | 40 nodes=1.43       | 40 nodes=1.96 |
| Packet loss | 10 nodes=22   | 10 nodes=17         | 10 nodes=10   |
|             | 20 nodes=22   | 20 nodes=17         | 20 nodes=5    |
|             | 30 nodes=40   | 30 nodes=35         | 30 nodes=4    |
|             | 40 nodes=40   | 40 nodes=35         | 40 nodes=3    |

Graphical comparison of throughput (bps) and packet loss is shown in figures 5 and 6 below:

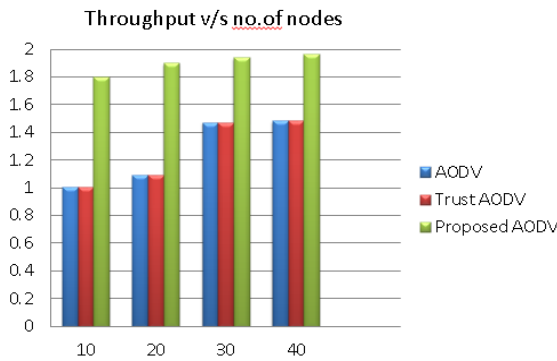


Fig.5. Graph of Throughput

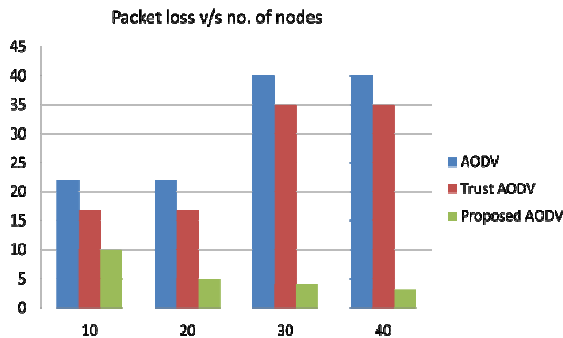


Fig.6. Graph of Packet Loss

For the proposed work, a graph shows exceptional improvement.

5. CONCLUSION

In this paper, protocol AODV is proposed. It could provide backup node mechanism for quick reconnection. When a link failure occurs due to faulty nodes, it sets up another route to destination by indicating faulty nodes as a malicious node. Additionally, the proposed scheme selects the shortest path containing the largest number of backup paths to provide efficient recovery from route failure and maintain an adequate routing length. Moreover, we have compared the proposed AODV with normal AODV in terms of Throughput and Packet loss.

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