# SOP: An Approach to Minimize Path Discovery Delay and Find Shortest Optimum Path

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----------**ABSTRACT**----------
**Mobile Ad hoc NETwork (MANETs) consists of mobile nodes which can move dynamically in a topology. MANET does not have any fixed infrastructure. In MANET, link is a communication path between two nodes to communicate each other. Link breakage between any two mobile nodes is the reason for communication failure in MANET. Frequent link breakage occurs due to high mobility of nodes. In this paper a new approach called Shortest Optimum Path (SOP) is proposed. The objectives of this approach are to minimize path discovery delay and to find Shortest Optimum Path (SOP).**

**Keywords - A Mobile ad hoc, AODV Routing Protocol, Delay, Routing Overhead, SaP Routing Protocol.**
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## 1.INTRODUCTION

A Mobile Ad hoc Network (MANETs) is a decentralized type of wireless network. It is a wireless network without having any infrastructure. There is no fixed route for each node to act both as a router and a host. Node mobility is the major problem in MANET. Most existing ad hoc routing protocols are easily affected by node mobility especially for large scale networks [1].

One of the features of MANET is that each node must be able to act as a router to find out the optimal path to forward a packet [2]. Nodes are part of the network only for the duration of communication session or being near in a distance of the network. Routing protocols can be classified into three categories as shown in the Fig.1. Proactive (Table-Driven), Reactive (On-demand) and Hybrid Routing Protocols.

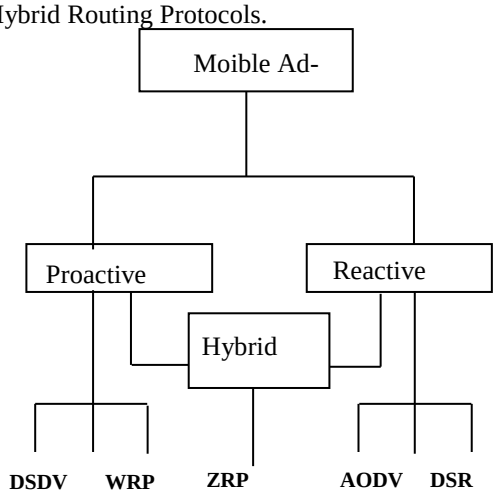


**Fig.1 Classification of Routing Protocols**

**Proactive Routing Protocols**

Proactive Routing Protocols are called table driven protocols in which, the route to all the nodes is maintained in routing table. Packets are transferred over the predefined route specified in the routing table. In this scheme, the packet forwarding is done faster but the routing overhead is greater because all the routes have to be defined before transferring the packets [3]. Proactive protocols have lower latency because all the routes are maintained at all the times. DSDV, WRP and OLSR (Optimized Link State Routing) are proactive routing Protocols.

**Reactive Routing Protocols**

Reactive Routing Protocols are also called as On Demand Routing Protocols where the routes are not predefined for routing. A Source node calls for the route discovery phase to determine a new route whenever a transmission is needed. This route discovery mechanism is based on flooding algorithm which employs on the technique that a node just broadcasts the packet to all of its neighbors and in turn the intermediate nodes just forward that packet to their neighbors. This is a repetitive technique until it reaches the destination [4]. Reactive techniques have smaller routing overheads but higher latency. AODV, DSR and DYMO are types of Reactive routing Protocols.

**Hybrid Routing Protocols:** Hybrid protocols are the combinations of reactive and proactive protocols. They take advantage of these two protocols and as a result, routes are found quickly in the routing zone [5]. Example: ZRP (Zone Routing Protocol). This paper is organized as follows. Section II describes the background and previous works. Section III explains the SOP approach. Section IV highlights the results and finally Section V concludes the paper.

## 2.PREVIOUS WORK

G.Rajkumar et al., [6] discussed the Short Alternate Path Protocol (SaP) for Mobile Ad hoc Networks for improving the working mechanism of Mobile Ad hoc Networks. The protocols available need various deployment processes from the one which is being adapted. Thus the possible ways already proposed are have good outcome but with a number of deployment difficulties. This previous work is based on the energy based transmission, but it takes more time delay to transfer the packet from the source to the destination.

Samir R.Das et al., [7] discussed the AODV routing protocol is very similar to DSR routing protocol. AODV needs to initiate routing the source node sending a Route Request message to the destination node. It does not repair a broken path locally. When a link breaks, which is determined by observing the periodical hello messages or though ACK messages, the source node and the destination node are notified (end nodes).

E. Belding-Royer et al., [8] discussed the source node then re-establishes the route discovery process with the destination using higher layers. AODV is better than other routing protocols (DSR, TORA). But AODV performance decreases when the number of nodes increases. This is because of its poor route maintenance method in a network that has relatively static topology. It also makes the range very weak when the density increases with the number of nodes. In AODV routing protocol, the network delay is high and it is discussed but the number of link breaks, retransmission packets and control packets are not used in the parameter still now.

Calduwel Newton et al., [9][10] discussed that the QoS parameters are divided into two categories such as Qualitative QoS parameters (reliability, security, manageability, etc.) and Quantitative QoS parameters (bandwidth, delay, jitter, etc). The requirements of the above parameters will vary from one application to another application. They affect the performance of the network. Many factors contribute to improve the performance of the network. One such factor is finding the path quickly. QoS is a set of service requirements to be met by the network. Jitter means the delay variation in transferring packets.

## 3.SOP: A PROPOSED TECHNIQUE

MANETs is a collection of nodes without any infrastructure. The node can move dynamically in a topology. MANETs transfer the data from the source to the destination by using routing protocols. The routing protocols use various ways to find the optimised path from the source to the destination. SOP approach minimizes path discovery and finds Shortest Optimum Path.

### ALGORITHM

Step 1: For all Nodes (N) in the network do

Step 2: Broadcast RREQ to $A_N$

Step 3: for all $A_N$

Step 4: Calculate Delay (D) = $C_T$ -$R_T$

Step 5: $B_A = B_W (N_U)$

Step 6: If ($B_A > B_W (N_V)$)

Step 7: $B_A = B_W (N_V)$

Step 8: Optimum path is chose based on

MIN (D) and MAX ($B_A$)

Step 9: First Optimum path is chosen and data transferred.

Step7: If ACK ($N_V$) >TTL then link failure occurs

Step 8: $N_U$ calculates the next optimum path from the table and establish a new connection.

Where,

N - Nodes

$A_N$ - Adjacent Node

D - Delay

$R_T$ - RREQ initiated time

$C_T$ - Current time

$N_U$ - Current Node

$N_V$ - Next Node

$B_W (N_U)$ - Bandwidth of Current Node

$B_W (N_V)$ - Bandwidth of Next Node

$B_A$ - Available Bandwidth

MAX ($B_A$) - Maximum Available Bandwidth

MIN (D) - Minimum Time Delay

ACK - Acknowledgement

MANET nodes are in high mobility. So there is a link breakage between the nodes; it leads to loss of data and collision of data packets. To avoid these problems and to find optimal path, Shortest Optimum Path (SOP) follows a simple mechanism called SaP Protocol. In SaP, the request for the route is sent by the source to the destination.

The source node on receiving the reply from the destination node transfers the packets. Transmission is preceded in the usual way. When there is a link failure in the route to destination, SaP protocol finds the optimized path to transfer data to the destination "D" from Source S. When a node's link is about to fail, the sending node senses this problem and starts to save the packets in its buffer.. If there is link a breakage then the node fails to transfer the packets, then the sending node finds an alternate node to the failed node. It just seeks help from the alternate node to transmit it to the next node.

## IV. RESULT AND DISCUSSIONS

The network topology with 8 nodes, namely, S, 1, 2, 3, 4, 5, 6, D where S is the Source node and D is Destination node and the rest are intermediate nodes as shown in Fig.2.

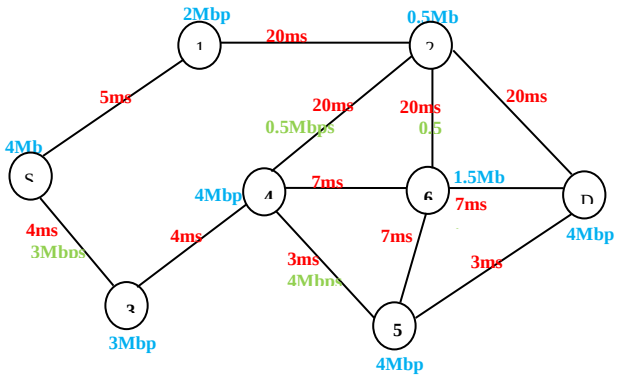


**Fig.2 Network Scenario**

Node S sends RREQ, finds the optimum path and maintains the table as in Table 1. Each and every node in the network maintains the information about the path to the destination.

**Table 1: Possible Paths from Node S to Node D**

| S.No. | Available Paths | Available Bandwidth in Mbps | Time in Milliseconds |
|---|---|---|---|
| 1 | S-3-4-5-D | 3 | 18 |
| 2 | S-3-4-6-D | 1.5 | 22 |
| 3 | S-3-4-5-6-d | 1.5 | 25 |
| 4 | S-1-2-D | 0.5 | 45 |
| 5 | S-3-4-2-D | 0.5 | 48 |
| 6 | S-1-2-6-D | 0.5 | 52 |
| 7 | S-3-4-2-6-D | 0.5 | 55 |

The first optimum path S-3-4-5-D is chosen and the packets are transferred is shown in the Fig. 3.

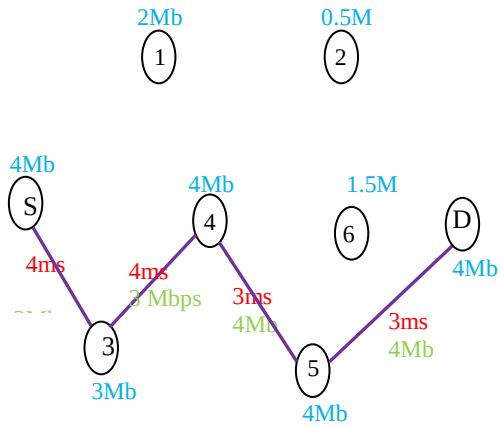


**Fig. 3 Optimum path from Node S to Node D**

### Network Scenario 1

In the established path link failure may occur, due to the mobility, less consumption of the power and other factors. When the node 5 exits from the network, due to dynamic nature the link failure occurs between nodes 4 and 5, 5 and 6, 5 and D. If the Node 4 does not receive Ack, then it will store the packets in its buffer. Instead of sending Ack to the source, SOP makes node 4 to find the next optimum path and establish a new connection based upon its own Table 2. Then the node 4 transfers the packets to node D. By executing SOP the repetition of path discovery is avoided and total transmission time is minimized.

**Table 2: Possible Paths from Node 4 to Node D**

| S.No. | Available Paths | Available Bandwidth in Mbps | Time in Milliseconds |
|---|---|---|---|
| 1 | 4-6-D | 1.5 | 14 |
| 2 | 4-2-D | 0.5 | 40 |
| 3 | 4-2-6-D | 0.5 | 47 |

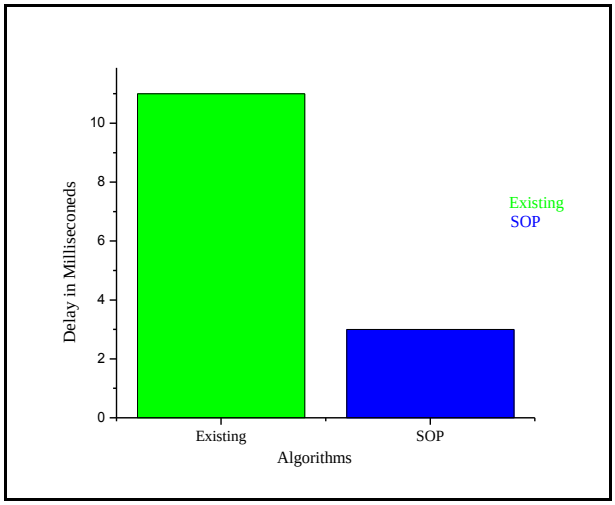


**Fig. 4 Path Discovery Time after Link Breakage**

The Fig. 4 Shows by using SOP approach, to reduce the time delay done the existing algorithm.

## V. CONCLUSION

This SOP approach improves the existing routing mechanism into an efficient one. SOP ensures packet delivery by effectively and addressing link failure issues. In SOP approach every node in MANET contains the path discovery information to reach the destination. Using this approach the path discovery delay is reduced. Ultimately SOP enhances the QoS in MANET.

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