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Modified Distance Vector Routing Algorithm

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Abstract— ***Routing information protocol (rip) is one of the well-known implementation of distance vector routing protocol. One problem with distance vector routing protocol is instability. Any network using this protocol can become unstable. One solution to this problem is defining a short value to infinity. In rip the value of infinity is defined 16.this solution impose a limitation on network using rip, as they can use up to 15 nodes only. The proposed modification tries to solve instability problem of distance vector routing protocol other then defining a short value of infinity. The study will help in overcoming the limitation of using 15 nodes in a rip network. By using this modified version of dvr algorithm one can extend the limit of 5 nodes to any number of nodes in a rip network.***

Keywords— network, security, algorithm, count to infinity, simulation

I. INTRODUCTION

An Ad hoc wireless network is a collection of mobile devices equipped with interfaces and networking capability[1]. It is adaptive in nature and is self organizing. From a graph theory point of view, an ad hoc network is a graph *G(N, E(t))*, which composes of a set of nodes *N*, and a set of edges *E(t)[2]*,Each mobile host can be a node of the graph. Each edge of the set *E(t)* is formed by two nodes within the service range, it can be unidirectional or bi-directional. *E(t)* changes with time as the mobile nodes in the ad hoc network freely move around[2].

A community of adhoc network researchers has proposed, implemented, and measured a variety of routing algorithms for such networks[3]. These routing algorithms can be divided in two types according to the approach used for searching a new route and/or modifying a known route, when hosts move[4]. They are (a) Demand driven or (b) Table driven

In demand driven approach routes are created only when source node have a desire to create it. Once source wants to reach a destination then it started a route discovery process. This process end when one or more routes to the destination are examined. Once a best route is selected then this route is stabled and maintained until it is no longer required or the destination becomes unreachable.

In table driven approach each node maintains its table for keeping the information of nest possible route to destination. The node informs its direct neighbors periodically(periodic update) or if any change is noticed by this node(triggered update). Many table driven algorithms are presented and reviewed by researchers [4,6,8,9,10]. One of the table driven algorithm used is Distance Vector Routing (DVR) algorithm [2,7]. Routing Information Protocol (RIP) is one of the simplest implementation of DVR but there are some problems with RIP[5].one of them is count to infinity. Many solutions are provided for this problem like split horizon and poison reverse [11] but unfortunately they all creates some other problem.

A solution to Count- To- Infinity problem has been proposed here . The solution can overcome the limitation of RIP of having up to 15 nodes in network. Rest of the paper is organized as: Section 2 describes Distance Vector Routing Protocol, Section 3 explains problem of Count- To- Infinity of DVR protocol, Section 4 enlists some existing solutions to this problem, Section 5 introduces and explain Modified DVR algorithm, Section 6 explain how modified DVR algorithm solves problem of Count-To-Infinity and Section 7 concludes the paper by summarizing modified DVR algorithm.

II. DISTANCE VECTOR ROUTING PROTOCOL [2,7]

operates by having each node *i* maintains a table, which contains a set of distance or cost *{dij(x)}*, where *j* is a neighbor of *i*. Node *i* treats the neighbor *k* as the next hop for a data packet destined for node *x*, if $d_{ik}= \min\forall\ j\{d_{ij}\ (x)\}$. The routing table gives the best distance to each destination and which route to get there. To keep the distance set in the table up to date, each router exchanges information with all its neighbors periodically. If, as a result, a minimum distance to any neighbor of a node changes, this process will be repeated until all the nodes have updated the routing information. However, distance vector routing algorithm can cause both short-lived and long lived loops due to updating the routing table with stale information. Looping problem can be eliminated using inter-nodal coordination method. It requires the routers to coordinate themselves mutually by confirmation messages in relatively stable environment.

III. COUNT-TO -INFINITY PROBLEM

One problem with distance vector routing protocol is unstable [12]. Any network using this protocol can become unstable. Sometimes everything is working fine on network but still network is converged. The reason may be is count-to-infinity problem of DVR protocol.

Consider a network having three nodes. Before failure everything is fine on network. Both node A and B knows how to reach node D. We are considering only the interested part of tables in figures not the full tables

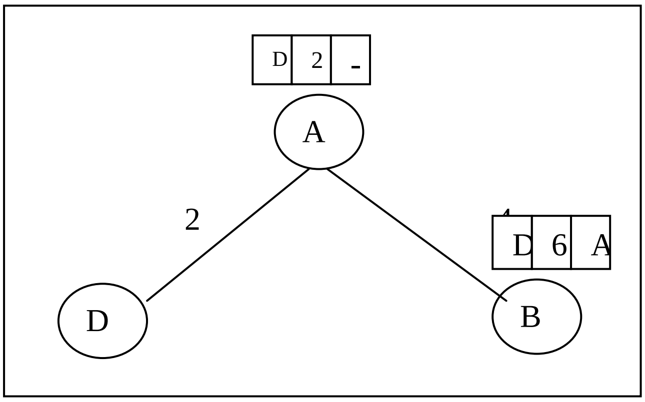

Fig 1: Network

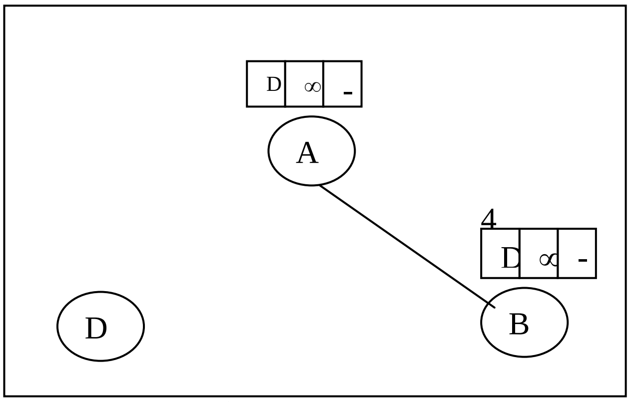

Fig 2:After A lost connection to D

If there is a failure at node D then if node A inform node B about the failures then also everything will be ok on network as shown in Figure 2

But what if before informing to node B(if packet of updation to node B is lost) ,the node A receive update from node B and misguided that there is a route to node D through node B. based on triggered update strategy , A sends update to B. now node b thinks that something has been changed around a and update its table. This cost of reaching to node D is increases gradually n reaches to infinity. At this moment both nodes A and B comes to know that D is unreachable. But during this time system becomes unstable

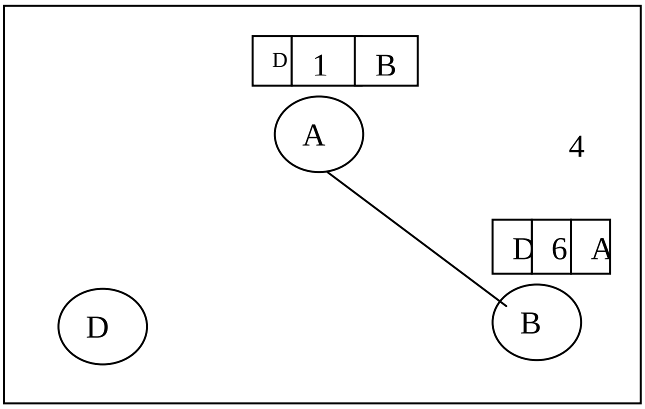

Fig 3: After failure

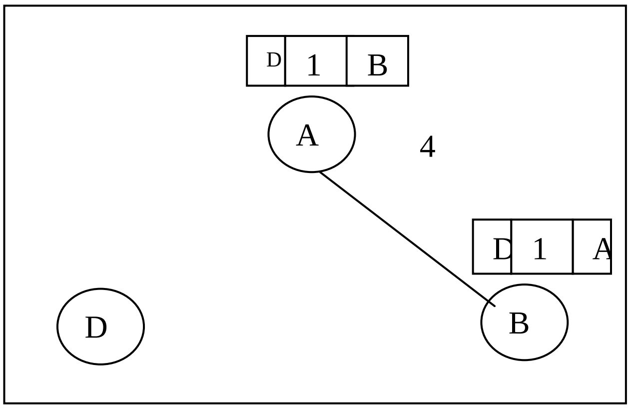

Fig 4: After A receives update from B

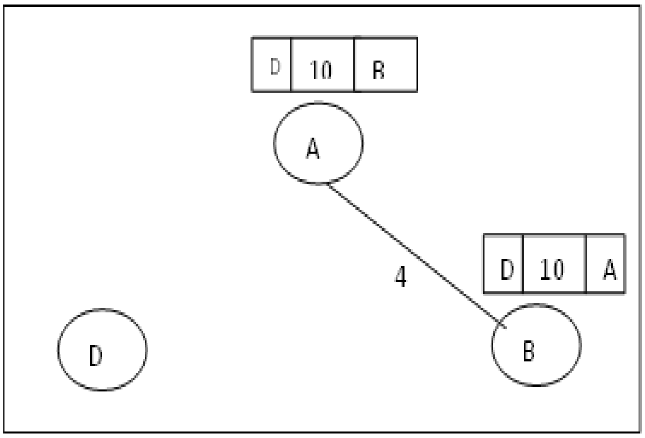

Fig 5: After B receives update from A

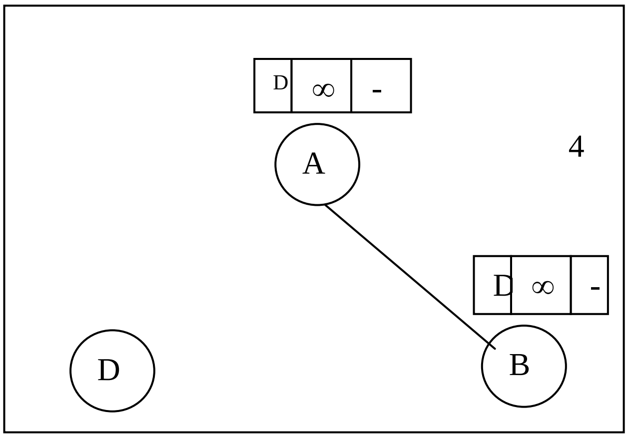

Fig 6: finally network is

The same problem can happen in network with four or more nodes.

IV. RECENT STUDIES

Some solutions to this problem are split horizon, poison reverse and path hold-down mechanisms. Unfortunately these solutions add some other problems to protocol. One other solution is defining a low value for infinity. Condition of not reachable occurs only in case of any failures and topological change. In RIP this value is defined as 16 which mean any network using RIP cannot extend beyond 15 nodes. We can see this solution as a limitation on RIP.

V. MODIFIED DVR ALGORITHM

This algorithm is modification to Distance Vector Routing algorithm. The modification tries to overcome the limitation of RIP network having 15 nodes. Using this modified version the network may overcome from count to infinity problem without defining a short value for infinity.

This algorithm adds an extra column to the routing table used by any node in DVR algorithm called

HN(NEXT NODE OF CURRENT NODE IN IMIDIEATE HISTORY TABLE).

As in DVR protocol every node informs its directly connected neighbor using triggered update strategy or periodic strategy. But the receiving node does not update its entry for any destination if following if condition is true

If node X sends its table to node Y as it is then Y does not update its table entry

IF NEXT(Y)= NULL && HN(Y)==NEXT(X)

If the above condition fails then only Y update his table entry according to modified DVR algorithm as explained below.

Algorithm has three parts as:

1. INTIALIZATION

In initialization every node have to initialize its table that contain mainly 4 columns and one row for each node of network

DESTINATION	COST	HN	N

The proposed work added an extra node to the table used in DVR algorithm. Here HN represent the next node to the current node in previous table entry before the current updation regarding to the destination. The node copies itself as HN for all destinations here. Rest of the table is same as used in DVR algorithm.

2. SHARING

On basis of triggered update or periodic update strategy each node informs all its direct neighbors about any change happened around it. The node sends its table to its direct neighbor. it adds the cost between it and the neighbor to each entry of cost column and then send the table to neighbor.

3. UPDATION

Consider the node i sends its table to node j then node j update its table entry for all destinations k if and only if following two conditions are false

1) If N[k(j)] == '-' && HN[k(j)]==N[k(i)]
2) If cost[k(j)]<= cost[k(i)]

Here N[k(j)] represent the next node entry for destination node k in table of node j.so as HN and cost.

If both of the conditions fail then j updated its table as:

N in current table of receiving node j becomes HN in new table of j and the sending node becomes N in new table for each updating entry in node j.

Consider the network given below

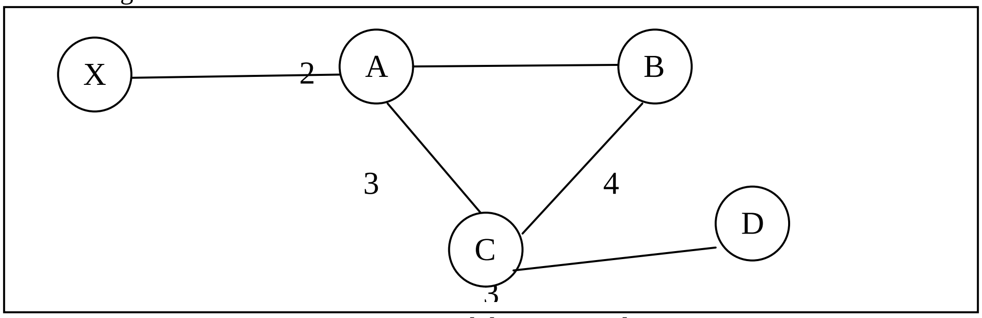

Fig. 7:Network having 5 nodes

Table 1 Starting table of node A is :

DEST.	COST	HN	N
X	2	A	-
A	0	A	-
B	3	A	-
C	3	A	-
D	∞	A	-

Here " – " means null value. Similarly nodes X,B,C,D,E also initializes their tables as A do according to DVR algorithm having extra column HN.

A don't know how to reach at D but C knows. So when C shares its table with A the resultant table of A is shown in figure 8.

A now knows how to reach at each node of network. It can inform all of its neighbor X ,B,C about this update. After that node C can update D about how to reach at B,A AND X.

This process continues and at each triggered update or periodic update each node updated its table as according the table send by its neighbor.

DEST.	COST	HN	N
X	∞	C	-
A	6	C	-
B	7	C	-
C	3	C	-
D	6	C	-

MODIFIED TABLE FROM C

DEST.	COST	HN	N
X	2	A	-
A	0	A	-
B	3	A	-
C	3	A	-
D	∞	A	-

ORIGINAL TABLE OF A

Check both condition 1,2 and if they are false then update table

DEST.	COST	HN	N
X	2	A	-
A	0	A	-
B	3	A	-
C	3	A	-
D	6	-	C

AFTER UPDATION NEW TABLE OF A

Fig. 8

VI. PROPOSED SOLUTION

Whenever there are any failures on any neighbor of a node j in network then j generate a special packet and send it to all its neighbors and inform them about this failure. Receiving nodes have to update their table immediately.

The packet generated looks like

DEST	COST	N
x	∞	-

Node j informs all its neighbors that node X is unreachable. This packet does not contain HN column.

Consider a network having three nodes .Before any failure the network is as shown in figure 9.

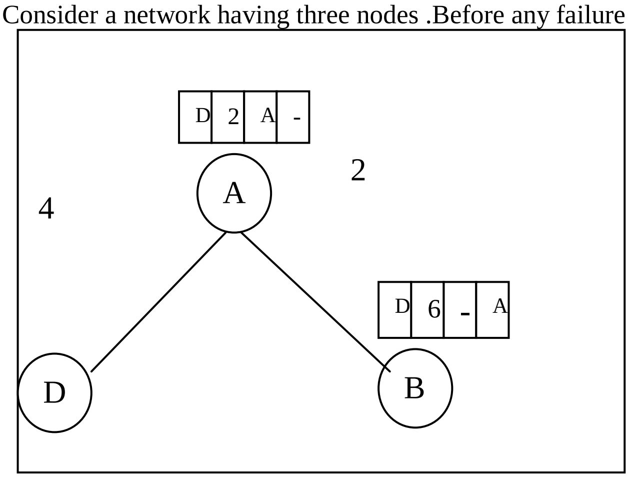

Fig. 9:Before failure

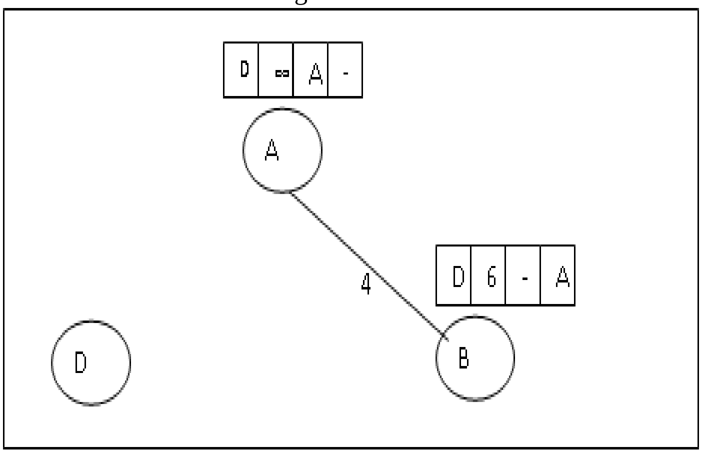

Fig 10:After failure

After failure the network is:as shown in fig 10.

Now the node generate a failure packet and inform to B about this failure

Dest	Cost	N
D	∞	-

Node B updates its table as shown in fig 11. But if this packet is lost and B sends update to A then A does not update its table at all as first condition of updation part of algorithm becomes true

N[A]== "-"and HN[A]== N[B] corresponding to destination node x. So the problem of counting to infinity is avoided and the network prevents from becoming unstable as shown in figure 12

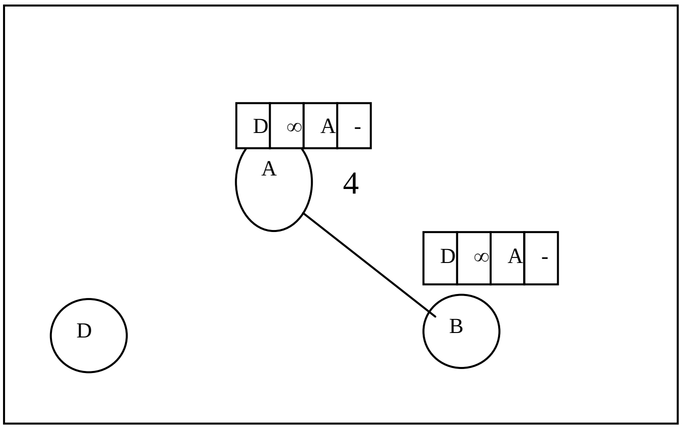

Fig .11

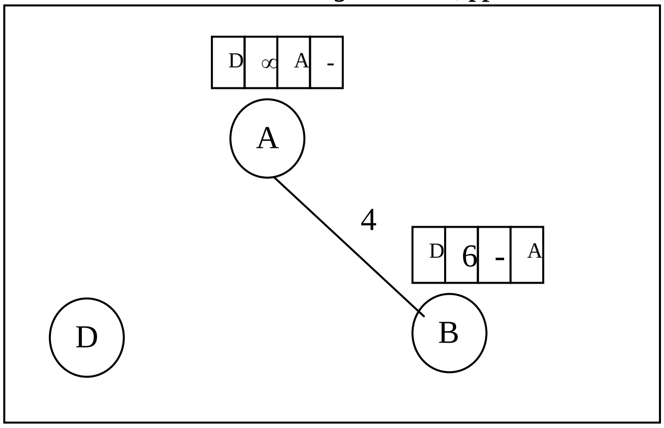

Fig .12

Node A again tries to send the failure packet to node B and may be this time B got the packet and update its table as

D	∞	A	-

VI. CONCLUSION

This paper presents a modification to the most widely used table driven routing algorithm-distance vector routing algorithm. Many solutions to this problem have been introduced but unfortunately they introduced some other problems. The RIP protocol is the simplest implementation of distance vector routing protocol but due to count to infinity problem the network using RIP can have up to 15 nodes as the value of infinity in RIP is defined 16. The modification proposed in this paper tries to overcome the problem of count to infinity and so as the limitation of having 15 nodes in a network using RIP.

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