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An Efficient Approach for Routing In Mobile Adhoc Network

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ABSTRACT:Mobile Ad-Hoc Networks are becoming an emerging technology in mobile computing. The term "ad hoc" has different meanings "can take different forms" and "can be mobile, standalone, or networked".An Adhoc wireless network is self-organizing and adaptive network. There are different aspects which are taken for research like routing, synchronization, power consumption, bandwidth considerations etc.An important issue for MANET is routing protocol design that is a major technical challenges due to the dynamism of the network.Under a number of network scheme, such as network topology and size, it is difficult to figure out which routing protocol may perform well. The network topology in a MANET usually changes with time.In this thesis,"an efficient routing protocol for Mobile Adhoc Networks (MANET)" is proposed. The main focus is on finding a path delivers the packet following minimum number of intermediate nodes thus reducing the path count value to send a packet from source to destination. This thesis contributes an outline of broad range of the current routing approaches, with a special focus on their comparison, functionality and characteristics and study about the various routing protocols in MANET.

KEYWORDS: Routing protocols,Adhoc network,Broadcast,Gateway Node.

I. INTRODUCTION

An adhoc is a collection of wireless mobile hosts forming a temporary network without the aid of any stand alone infrastructure or centralized administration .In a MANET, there is no fixed infrastructure (Base Station) and since nodes are free to move, the network topology may dynamically change in an unpredictable manner. MANET is decentralized and self-organizing network where the functions from discovering the network topology to delivering the message are carried out by the nodes themselves. Routers may be move freely so wireless topology can be change rapidlyinto the mobile nodes. Basically, MANETs are multi hop peer-to-peer mobile networks of wirelessly connected nodes where transmission of information packets take place in a keep and forward way through intermediate nodes from source to a destination node. The main challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic.The objective of Manet is to support robust and efficient operation in mobile Adhoc network does not rely on any certain topology and coordination point. Routers may be move freely so wireless topology can be change rapidly, so it is a very difficult task to sending and receiving a packet to the destination node. Manet works on the dynamic topology ,it is having limited source of energy.

II.LITERATURE REVIEW

Routing in MANET is a challenge due to dynamic topology in network as mobile nodes can move in any direction in the MANET. Routing information of a node is maintained in a routing table.

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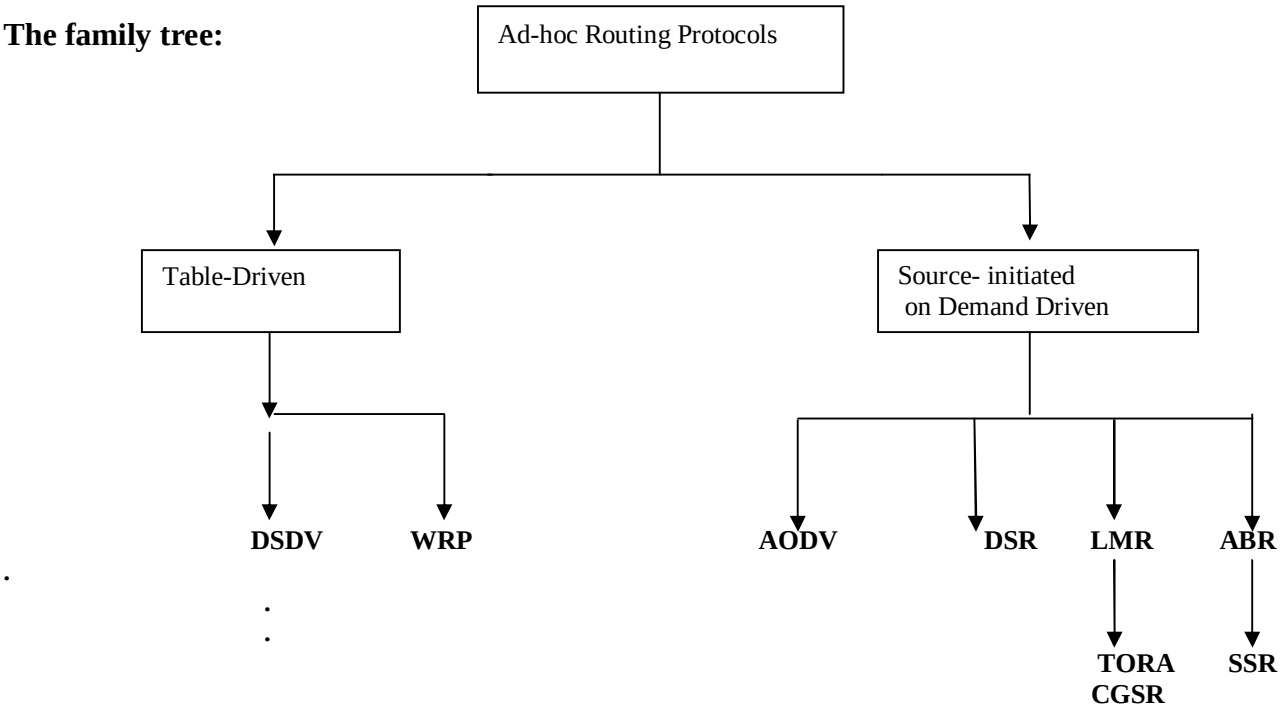
Maghsoudlou A. et al. [2001] surveyed on the unlike face routing algorithms as well as dissimilar face routing strategies and greedy routing algorithms under geographical routing protocol in MANET. Authors experiential the geographic routing protocols are based on the greedy forwarding in which the data is sent to the nearest node of the target, but sometimes the data could be tarnished. if there is no foreigner node near to the target. Authors also proposed to improve strategy to recuperate from this state and concluded that the most common strategy to recover from the state of the void is faced routing algorithm which uses the planner graphs [2].
Chaudhary P. et al; [2014] performed the assessment of AODV, DSR (reactive) and DSDV (proactive) routing protocols. These are based on Packet Delivery Ratio, standard end to end delay under the different mobility model with varying the speed of mobile. These routing protocols are measurable efficiently. Simulation is done using network simulator-2(NS-2). AODV performs better as compared to DSR and DSDV in mobility model. The packet delivery ratio is 0 high of AODV in random walk and random direction. But the end to end delay was also very high for AODV protocol. So the overall performance of DSR is better than the AODV and DSDV in random walk and random direction mobility model [1].
Khan J. et al. [2011] In this paper author not only evaluate the performance of ad-hoc routing protocols class in order to establish its accuracy, effectiveness, traffic load and the end to end delay in energetic intermediate nodes scenario but also to apply OPNET simulator in AODV and DSR routing classes. Opnet simulator is proposed by author to observe performance with respect to different parameters that changes mobility models have important impact on their performance of both AODV and DSR routing class could be the most excellent solution in MANET, instead of separate presentation of both AODV and DSR routing class and also in intermediate nodes data transport rate from source to target [4].
Mittal P. et al. [2013] presented the comparison of MANET routing protocols i.e. GRP, AODV, OLSR and DSR on the basis of end-to-end delay, network load, retransmission attempts, and throughput by using simulation tool OPNET modeler 14.5. Authors accomplished that AODV and DSR perform better than as compared to other protocols.The throughput of AODV and DSR is more than as compared to other protocols and delay of AODV is minor than as that of other protocols [3].
Menon V. G. et al. [2013] analyzed the performance of the different geographic routing protocols in high mobility. Authors had been compared the performance of different geographic routing protocols on the basis of performance metrics and listed the merits and demerits of these protocols on the basis of their performance metrics. Authors had been discussed the different parameters involved for scheming and choosing a routing protocol [5].
Wadhwa D. et al. [2014] compared different geographic routing protocol such as Location-aided routing, Greedy perimeter stateless routing, and Energy-aware geographic routing on the basis of performance metrics such as system lifetime, the end to end delay and packet delivery ratio and energy utilization by using simulation tool NS2. Authors concluded that the geographic routing gives high packet delivery ratio, better energy utilization and better network lifetime as compared to other protocols when the topology changes dynamically and when the mobility is high [6].

The family tree:



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COMPARISON BETWEEN THE THREE CATEGORIES OF ROUTING

Parameters Table-	**Driven (Proactive)**	**On-Demand (Reactive)**	**Hybrid**
Route Availability	Always Available	Computed As Per Need	Depends On Location Of Destination
Storage Requirements	Higher	Dependent on no. of routes maintained or needed	Depends on size of each zone or cluster
Periodic Route Updates	Required Always	Not Required	Used Inside Each Zone
Delay	Low	High	Low For Local Destinations And High For Inter zone
Control Traffic	High	Low	Lower That Other Two Types
Scalability	100 Nodes	> 100	> 100
Routing Philosophy	Mostly Flat	Flat	Hierarchical
Routing Information	Keep Stored In Table	Doesn't Store	Depends On Requirement

III. PROBLEMS IN EXISTING PROTOCOLS

DSR Protocol The Dynamic Source Routing algorithm is another innovative approach to ad hoc networking whereby nodes communicate along paths stored in source routes carried along with the packets. It has some disadvantage like it does not support multicasting, decreasing throughput, and increasing load of the network.

MTPR Protocol In existing power aware methodology(MTPR), the next hop to be transmitted only chosen based on the residual energy of the next hop. Whenever the source finds next hop based on residual energy, the high residual energy nodes might not be nearer by sufficient energy nodes. This makes that high energy node to transmit the received packets to maximum energy node of available nodes. It may leads to unsuccessful delivery of packets on this path. However, if many minimum energy routes all go through a specific node, the battery of this node is drained quickly and eventually the node dies. Therefore, the remaining battery capacity of a node should be used to define a routing metric that captures the expected lifetime of a node, and so, the lifetime of the network. The limitations of this approach can be summarized are the network will be congested as the packets has to route from multiple nodes, more number of nodes has to participate in forming a routing path and it will always select its nearest neighbouring node. This protocol

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is that, it is not scalable to large networks and even requires significantly more processing resources than most other protocols[16].

IV.PROPOSED WORK

In this paper, an efficient routing protocol for Mobile Adhoc Networks is proposed . The main focus is on finding a path that delivers the data packet by following the minimum number of intermediate nodes thus reducing the path count value to send a packet from source to destination .

SPCR (SHORTEST PATH COUNT ROUTING)

Algorithm:

Step 1 The source node broadcasts the Data Packet(DP) to all its neighbouring nodes .

Step 2 Each neighbouring node which receives the DP Packet then sends the Data Reply (DR) packet as response to the source node which contains a Reply bit field (0 or 1)indicating whether it is destination or not.

2.1 For a reply bit 1, the algorithm stops as the destination is found in the same adhoc and path count value is incremented by 1.

2.2 For a reply bit 0, its node type is checked. DR packet also contains the Node Type field (Normal or Gateway).

2.3 If the neighbouring node is normal node then it becomes the passive not and will not participate in further processing.

Step 3 If the neighbouring node is Gateway node ,then

3.1 For each Gateway Node ,the path count value is incremented by 1.

3.2 It will further broadcast the DP to the neighbouring nodes in its own adhoc network.

Step 4 Repeat steps 2 and 3 until the destination is reached.

Step 5 If destination is reached ,check the Path-Count value for each path.

Step 6 Select the path with least Path-Count value as the best Routing path.

Step 7 If the value of path count is same for two different paths, then use the formula as given in eq(1) to calculate the ***Pval*** for each path.

$$P_{val} = \frac{\text{Total distance covered from source to destination}}{\text{Number of nodes}} \quad (1)$$

Step 8 The path with higher ***Pval*** is considered as the best routing path.

Step 9 Stop.

Data Packet (DP)Format :

Sender	Receiver	Data (Message)

The DP packet shown in Figure contains the following three fields:

- **Sender** : This field contains the node which wants to send the message.
- **Receiver:**It is a node to which the message is to be delivered.
- **Data** :The data field contains the data to be sent.

Data Reply (DR) Packet Format:

DR packet is sent by each neighbouring node to its source node and the format of DR packet is shown in Figure.

Sender	Receiver	Node Type(Normal or Gateway)	Reply (0 or 1)

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Vol. 4, Issue 6, June 2016

The DR packet shown in Figure contains the following four fields:

- **Sender** :The recipient of DP packet now becomes the sender which sends the DR Packet as response to the source node.
- **Receiver:** For DR packet, the source node becomes the recipient node which receives the DR packet.
- **Node Type:** It is the type of the node i.e N or G.

N: Represents Normal Node.

G : Represents Gateway Node.

- **Reply:**This fields represents the destination

0: Destination is not found.

1: Destination is found.

In this paper an algorithm is proposed which calculates the shortest route on the basis of path count value . Consider the two paths, [1,4,13,17,20]and [1,5,9,20]named as path AX and AY respectively.In the figure, the source node broadcasts a datapacket(DP) to all its neighbouring nodes .

Each receiving node then sends a DR packet to the source node indicating its node type (i.e gateway or normal node).If the receiving node is normal node then it does not perform any processing ,but ifit is the Gateway node then it further broadcasts the message to the other nodes until the destination is reached .For each broadcast the algorithmincrements the path count value by 1 .When destination is reached ,the path with minimum Path-Count value is considered as the best Routing path. If path count value is same for two different paths, then use the formula in (eq1) to calculate the Pval for each path.

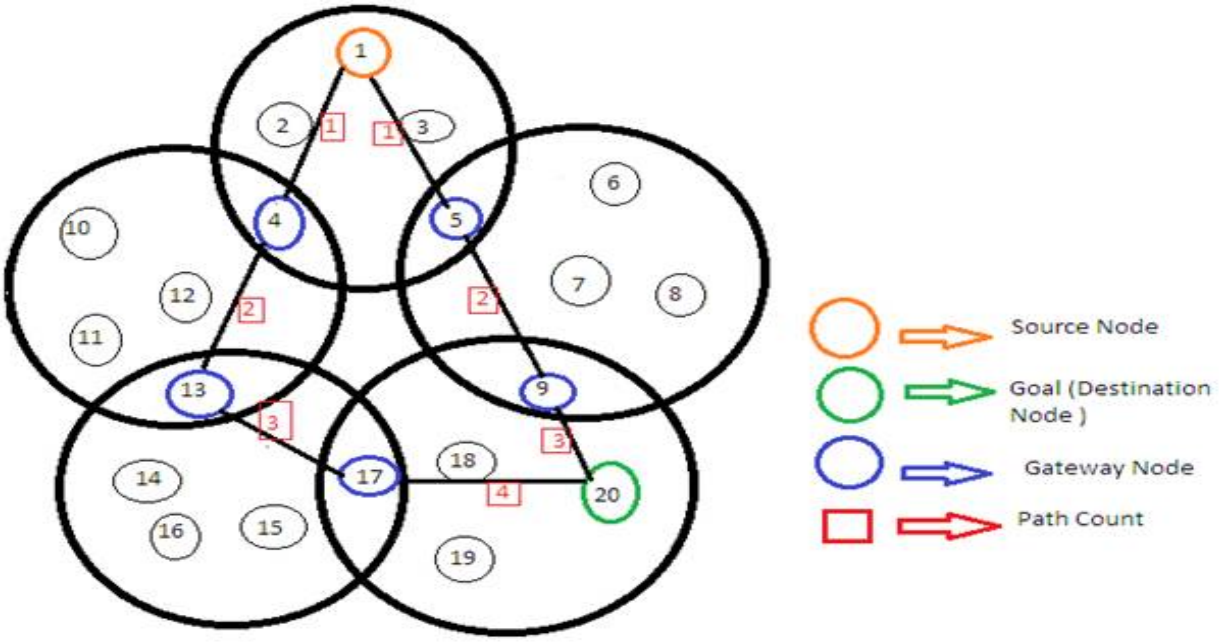

Fig.4.1Routing path on the bases of path count

In the above example the path count value for path AX is calculated as 4 and no of nodes covered is 5.

Similarly for path AY ,path count value is calculated as 3 and no of nodes covered is 4 .

So the path AY is we will consider the routing path as a best path which has low Path count value.If the path Count will be same from both the path then we will consider the path having the shortest distance from the source to destination.We can also consider the path which covers the less no of nodes.

If somehow we consider the distance between the two paths,then whole distance will be same from both the route then we will follow the following formula.

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Vol. 4, Issue 6, June 2016

Pval = Total distance covered

Total no of nodes

COMPARISON BETWEEN MTPR AND SPCR

MTPR algorithms sends the data to all its neighbouring nodes but the SPCR algorithm sends data only to gateway nodes. So it takes lesser time and covered lesser no of nodes as compared to MTPR.

Let us consider that a data packet is sent from Node-1 to Node-7 using MTPR. As the distance between Node-1 and Node-2 is minimum among all the neighbors of Node-1 (Nodes directly reachable from Node-1) thus packet is sent from Node-1 to Node-2. Similarly distance between Node-2 and Node-3 is minimum among all the neighbors of Node-2 and therefore packet is sent from Node-2 to Node-3. Following this way packet follow the path 1-2-3-5-6-4-7 and finally reaches to Node-7.Thus,the route followed by the packet from Node-1 to Node-7 using MTPR.

Distance Covered by each node.

No of nodes.	1	2	3	4	5	6	7
1	-	2	-	-	-	-	-
2	-	-	3	-	-	-	-
3	-	-	-	-	4	-	-
4	-	-	-	-	-	-	8
5	-	-	-	-	-	6	-
6	-	-	-	7	-	-	-
7	-	-	-	-	-	-	-

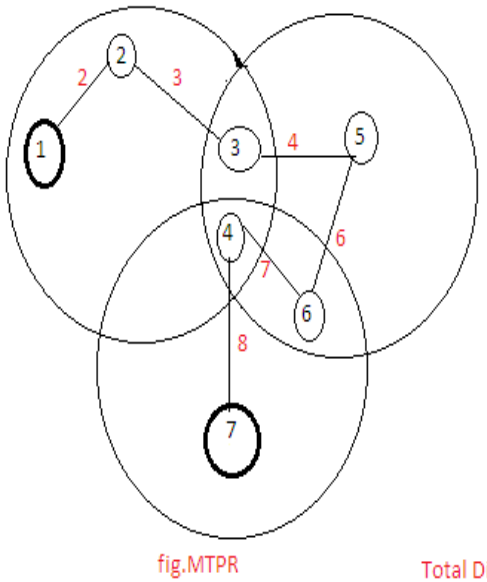

fig.MTPR Total Distance=30

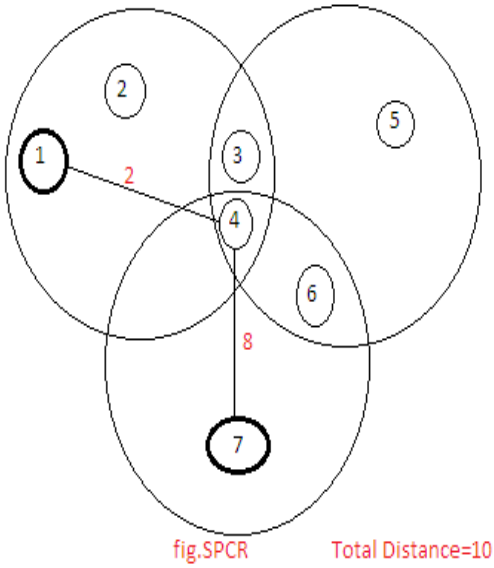

fig.SPCR Total Distance=10

Comparison between MTPR And SPCR

Total distance covered by the nodes from source to destination is 2+3+4+6+7+8=30 and the nodes covered are 7 [1,2,3,4,5,6,7]. If the above same example is followed and calculate it by using SPCR then it is found that total

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distance covered by the nodes is 2+8=10 and nodes cover are 3 [1,4,7]. It covers lesser no of nodes as compared to MTPR and having shortest distance. So this shortest path is considered as the best routing path.
In case if the distance calculated by two different paths are same then can calculate the ***Pval*** for the two different paths by using the formula:

$$P_{val} = \frac{\text{Total distance covered from source to destination}}{\text{Number of nodes}} \quad (1)$$

Let us considered that the distance covered by the two different paths is Ax=50 and Ay=50 is same, but the nodes covered are different these are 6,3 respectively. Then

$$Pval\ (Ax) = \frac{50}{6} = 8.3$$

$$Pval\ (Ay) = \frac{50}{3} = 16.6$$

Here the average value by two distinct path is 8.3 and 16.6 but will consider the P*val(Ay)* as the best routing path because it has lesser no of nodes.

V.CONCLUSION AND FUTURE WORK

We have seen a great development in the field of wireless networks (infrastructure based) and in the field of Mobile ad hoc network (infrastructure less network).In this paper a number of routing protocols for MANET, which are broadly categorized as proactive and reactive and Hybrid protocols. The effort has been made on the comparative study of Reactive, Proactive and Hybrid routing protocols has been presented in the form of table. In this paper "an efficient routing protocol for Mobile Adhoc Networks (MANET)" is proposed. SPCR (Shortest path count Routing) is proposed to send packets in MANET. The main focus is on finding a path that will deliver the packet following minimum number of intermediate nodes thus reducing the path count value to send a packet. It has been concluded that the proposed protocol SPRC generates the shorter routing path as compared to MTPR. In future we can work on the security of the data transfered and on the multicasting in routing.

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