ISSN: 0975-766X
CODEN: IJPTFI
Research Article
Available Online through
www.ijptonline.com

A NEW APPROACH FOR COLLISION FREE, ENERGY EFFICIENT, HYBRID ROUTING ALGORITHM WITH THE USE OF PROGRESSIVEADAPTIVE CONCEPT

E.Vijayan*[1], S.Hemalatha[2], Shweta Shaw[3] Alokananda Ghoshal[4]
School of Information Technology and Engineering, Vit University.
Email: vijayvsi81@gmail.com

Received on 06-08-2016 *Accepted on 10-09-2016*

Abstract

Hybrid routing algorithms are those algorithms which uses the concept of both proactive routing algorithms and reactive routing algorithms. Proactive routing algorithms are table driven. By the term table driven, we mean that every routing information about the nodes, in the network keeps on updating and is reflected in the table. Thus the modification in the table helps to have the current routes of every node to other nodes.Reactive algorithms are those algorithms in which the nodes keep the information about the active paths of the destination nodes. If any source wants to send a packet to the destination node then this algorithm will try to find out the best possible route and settle the request [6]. In this paper we propose an CFH (collision free and hybrid) routing algorithm that aims to route any data packet with no collision which will reduce the end to end delay and increase the throughput.

Keywords: Hybrid routing, collision free, proactive routing, reactive routing.

1. Introduction

Progressive adaptive routing is a concept in which the length of the routing path may increase or decrease after any routing decision. However it will try to bring the packet closer to the destination. There algorithms are mostly greedy.

In this paper, we propose a routing algorithm which holds the following properties [1]:

1) No Collision- By the term no collision we mean that while routing the data packets the packets won't collide and successfully reach the destination.
2) Greedy Algorithm- By the term greedy algorithm we mean that each transfer of packet to the next node will decrease the distance between it and the destination [4].
3) Assured Packet Delivery- This means that the packet once sent will be surely delivered to the destination.
4) Avoid Congestion- Even if more number of data packets are sent, it will not reduce the throughput.

5) Minimize Hop Count- The hop count will depend on the route that is decided in order to avoid collision. If the shortest distance between the source and the destination is free, then the hop count will be least. However if more number of data is being transferred at the same time, the hop count may increase.
6) Loop Avoidance- It is assured that the route that is finalized for a particular transfer must not enter in any loop [5]. This will assure that the data transfer is not blocked in any way.

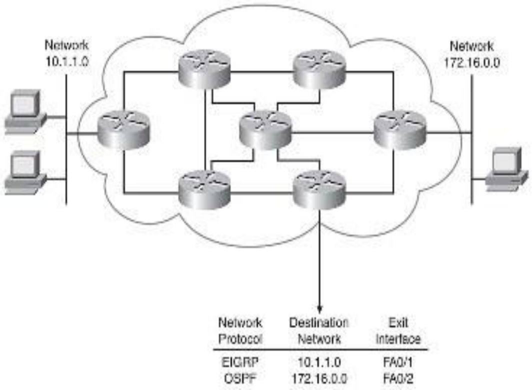

Fig 1 Shown above is the network where there are different sources and destinations in which data transfer can take place.

2. Routing Protocols

In respect to unicast routing protocol, first we need to understand the meaning of autonomous system. The autonomous system divides the internet into small administrative regions for the purpose of exchange of routing information's [2]. Some relevant terms which should be focused are:

- Cost or metric: A router is usually attached with several networks. A router receives a packet from one network and passes on to the other next network. The decision regarding the exchange of packets is done based on the optimization result. One such approach to determine the optimization is to assign the cost to the network. Thus cost is therefore a metric. The lowest cost route is selected for data transfer.
- Routing Information Base(RIB): A routing information base can either be static or dynamic [3]. A static relation is one with manual entries however a dynamic table is updated if any change occurs somewhere in the internet.
- Intra-domain and Inter-domain routing protocol: As explained before an autonomous system is one which is administered by a single manager. Routing within a single autonomous system is known as intra-domain and routing across the autonomous system is known as inter-domain routing protocol [7]. Shown below is the diagrammatic representation of inter and intra domain routing protocol.

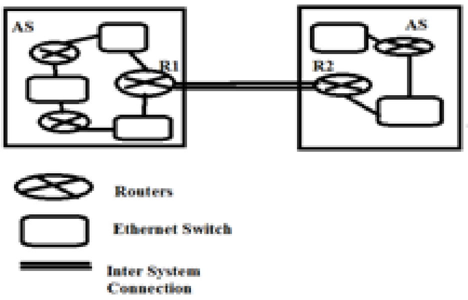

Fig 2 Autonomous System.

3. Related Work

In [8], a unique signature is used for collision notification which is sent with the same frequency as data. Getting the signal the transmitter terminates the collision freeing the other carrier channels to carry data. This was named as CSMA/CN. In this case the additional hardware requirement is also very less. The paper [9] proposes algorithms. One is TCP's congestion avoidance algorithm. When a collision occurs it adjusts the transmission rate. And the second algorithm is to minimize collision the packet transmission time shifts. In simulation these approaches has reduced the collision by factor of 8 and energy consumption by 50% nearly. In paper [10],it has depicted the collision emission. This paper has approached the coding in low level language which is more appropriate for Operation System. A MAC protocol is proposed which is capable of detecting collisions in distributed networking system. The pulses are used to detect two transmitting node and getting a sense of each other. CTS pulses are also embedded into this protocol to make it more efficient in collision detection while data transfer [11]. The paper [12] has evaluated the collision detection and recovery The collision detection scheme has three important properties- i) It can differentiate between a packet collision and packet loss. ii) Collision detection happens at receiver side. iii) Transmitters involved in collision is often detected.

4. Proposed network model and requirements for implementation

For the purpose of implementation of the above mentioned requirements and for the successful execution of the algorithm proposed, we need three routing information base:

- Node versus node RIB
- Link versus node RIB
- Link versus weight RIB

Let us assume a simple network for the understanding of the above concept.

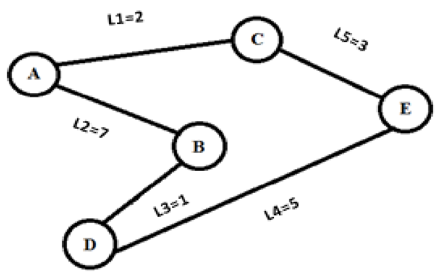

Fig 4

4.1Node versus node RIB

This table contains the information regarding the nodes which initiates the request for data transfer. Assume if node A wants to send some data packets to node D and then node C initiates the request, then the table looks like

	A	B	C	D	E
A				1	
B					
C					
D				2	
E					

Fig 4.1

The above table is drawn with respect to the Fig 2. If any other node wants to send data packets, its sequence number will be one value incremented than the previous. After the transfer is completed for any particular node, the entry for that node will become zero and the values for all other nodes in the table entry will be decremented by one. This table will help to keep the track of sequence in which the nodes initiates the request for data transfer.

4.2 Link versus node RIB

This relation contains the information about the links. Every node will be connected with at least one link if it is a connected network. Thus shown below is the node versus link RIB with respect to Fig 2

	A	B	C	B	E
L1	1	0	1	0	0
L2	1	1	0	0	0
L3	0	1	0	1	0
L4	0	0	0	1	1
L5	0	0	1	0	1

Fig 4.2

Since L1 is connected to node A and node C, the entry for node A and C will be 1 and rest all entries for L1 will be 0. The property is used to find the source and the destination for all other links. This relation gives us connectivity information of the links in the network.

4.3 Link versus Weight RIB

We also need to know the distance between the nodes. This will help us to find the shortest distance during the routing procedure. Show below is a link versus weight RIB with respect to network in Fig 2.

Link	Weight
L1	2
L2	7
L3	1
L4	5
L5	3

Fig 4.3

5. Energy efficient CFH routing algorithm

Let us assume that node A requests to send packets to E and then node C also wants to send data packets to E. The node versus node RIB will be

	A	B	C	D	E
A					1
B					
C					2
D					
E					

Fig 5

For the purpose of transferring data packets from node A to node E, there can be two routes.

- $N_A \rightarrow N_C \rightarrow N_E$, In this case data packets have to travel across two links (L2, L5) and the total distance is 5.
- $N_A \rightarrow N_B \rightarrow N_D \rightarrow N_E$, In this case the data packets have to travel across (L2, L3, L4) and the summation of the distance is 13.

Thus the first case will be selected since it is the shortest path. Now let us see the different route from node C to E.

- $N_C \rightarrow N_E$, In this case the packets need to travel from L5 and the distance will be 3
- $N_C \rightarrow N_A \rightarrow N_B \rightarrow N_D \rightarrow N_E$, The links are (L1, L2, L3, L4) and the total distance is 15.

However the shortest path for this transfer will be case 1 but collision might happen. To avoid it the following steps must be taken

I. Check the node versus node RIB determining the priority of data transfer. From Fig 4.1, we know that 1 < 2. Hence node A will send data first. It simply signifies that the routing decision for node A will be taken first since its sequence number has lower value. Once its path is decided then the decision for next node shall be taken.

II. Now since A initiates the data transfer, link L5 will be blocked for node C as the link is being used by some other node for its data transfer.

III. From the remaining routing choices node C needs to decide its best route. For our example it will be case 2. If there is no other route, then the node have to wait until the common link is freed.

Algorithm 1

Input: All the RIB relations mentioned in [2].

Output: Routing Paths

For each node (N_1, N_2, N_3,…., N_m) which request for data transfer and has entry in node versus node RIB, check in the link versus node RIB

- If there is 1 in both the source and the destination node within the same row then the corresponding link will be the shortest path and

  $S_n = L_n$

- If the above condition is false, with the source node say $N_S$check all other nodes except the destination (N_i). Check how many cases are there where there is 1 in $N_S$and $N_i$in same row. Keep a count of it. Now

  M_n(no of stack) = count

- For each N_i, check for the next connected node and push the link in the corresponding stack and add $L_i$to S_n.

Continue this process until destination is reached. Select the min(S_i) for the source node N_S.

Algorithm 2

Checks the common links among all the requested nodes and blocks it.

For each stack S_i, pop the links from the stacks and compare it.

- If there is no common link, check for the lowest sequence number and release the packet. After the packet is released, reduce the sequence number of all entries in the node versus node RIB by 1.
- If the stack have common link, check the lowest sequence number of the node and release its packet and go to next step.

- Find new S_i for the nodes having common link. Again go to the first step and check if it has common link or not. If there is no common link send the packet else repeat this step.

Continue this process until there is no entry in the node versus node RIB.

6. Conclusion

We tried to introduce a new algorithm which will avoid the collision permanently. However there exists other unicast routing algorithm like RIP, OSPF, BGP which reduces the collision. The basic criterion is that the overall network should be known prior to this algorithm execution. Any change in the network needs to update the relations for proper execution.

7. Acknowledgement

We thank Prof Vijayan E to help us in this project completion and guiding us through out.I would also like to appreciate his excitement in regard to teaching.

References

1. Sanjay Kumar Dhurandher, Sudip Misra, “An Energy-Efficient On-Demand Routing Algorithm for Mobile Ad-Hoc Networks”, 15th IEEE International Conference on Electronics, Circuits and Systems, 2008.
2. K.Sumathia, A.Priyadharshinib “Energy Optimization In Manets Using Ondemand Routing Protocol” Procedia Computer Science, Elsevier (2015) 460 –470
3. Kai,A.A. and Jan,H.,R. “Adaptive Topology Control for MobileAd Hoc Networks” IEEE transaction on parallel and distributed system, Vol. 22 Issue 12, pp. 1960-1963, 2011.

Corresponding Author:

E.Vijayan*,

Email: *vijayvsi81@gmail.com*