ILLINOIS INSTITUTE OF TECHNOLOGY

CS 542 - PROJECT (FALL 2018)

NEW PACKET FRAGMENTATION PROTOCOL

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New Packet Fragmentation Protocol

Implementing a decentralized algorithm for the given problem would mean that we would apply the proposed algorithm at any given node in the network, knowing the information of just those nodes directly connected to the given node. We store the information that we get from each node in a routing table.

ALGORITHM:

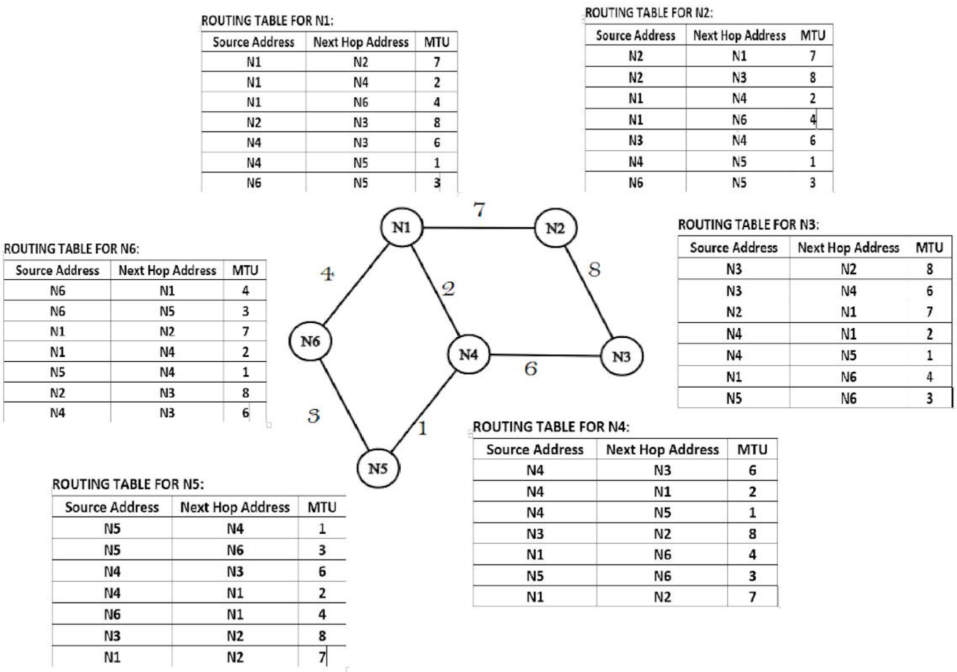
1. As each of the node will have the information of the nearest neighbouring nodes and the MTUs of the corresponding connecting links we get routing tables as the nodes can update their knowledge of the entire network topology and MTUs of other links by exchanging information with the nearest neighboring nodes only. This is done in several iterations as:
   A. For first iteration, every node will have the information of it's directly connected node and update them in node's routing table(Source Node, Next Hop Address and MTU of the corresponding link).
   B. For next iteration, we update the routing table of each node in the network with the information about the next hop address and the corresponding MTU of the directly connected node and its neighbouring node.
   C. Once we have information about the directly connected nodes and the nodes directly connected to these nodes, we look for any further updation for gathering information about all the nodes of the network at each node's routing table.
   D. We keep on updating the routing table till we have the information about all the nodes of the network at each node.

2. A packet whose size is known arrives at any arbitrary node (source node) in the network. We extract the destination address of the node where this packet needs to be delivered.

3. We look at the routing table of the source node and generate all possible paths to be taken from the source to the destination. While doing this if we get an incomplete path which is not reaching our intended destination then we discard this path and check for the next possible path.
   frag
4. For choosing the MTU of the path we have the following approach:
   A. If there is only one path from the source to the destination we take into account the MTU's of all the links over the path and choose the minimum of those MTU's to get the MTU of the path. This becomes the optimal path of the network.
   B. If there are more than one possible paths from the source to the destination:

i. For each path we take into account the MTU’s of all links over the path and choose the minimum of those MTU’s to get the MTU of each path.
ii. Then for getting the optimal MTU we choose the maximum of the found MTU’s of each path. This path is used to send the packet from the source to the destination.

EXAMPLES:



ROUTING TABLE FOR N1:

Source Address	Next Hop Address	MTU
N1	N2	7
N1	N4	2
N1	N6	4
N2	N3	8
N4	N3	6
N4	N5	1
N6	N5	3

ROUTING TABLE FOR N2:

Source Address	Next Hop Address	MTU
N2	N1	7
N2	N3	8
N1	N4	2
N1	N6	4
N3	N4	6
N4	N5	1
N6	N5	3

ROUTING TABLE FOR N3:

Source Address	Next Hop Address	MTU
N3	N2	8
N3	N4	6
N2	N1	7
N4	N1	2
N4	N5	1
N1	N6	4
N5	N6	3

ROUTING TABLE FOR N6:

Source Address	Next Hop Address	MTU
N6	N1	4
N6	N5	3
N1	N2	7
N1	N4	2
N5	N4	1
N2	N3	8
N4	N3	6

ROUTING TABLE FOR N4:

Source Address	Next Hop Address	MTU
N4	N3	6
N4	N1	2
N4	N5	1
N3	N2	8
N1	N6	4
N5	N6	3
N1	N2	7

ROUTING TABLE FOR N5:

Source Address	Next Hop Address	MTU
N5	N4	1
N5	N6	3
N4	N3	6
N4	N1	2
N6	N1	4
N3	N2	8
N1	N2	7

Fig : 1

Suppose we have a graph of six nodes (Fig : 1) having information about the MTU’s of each of the bidirectional links. We generate the routing table for each of the node using the format given in the figure.

Now, let a packet of know size be sent from any arbitrary source node, say N1 to the destination node, N5.

We look at the routing table of Node N1 and generate all possible paths from the specified source node (N1) to destination node (N5). The list of possible paths found are:

(i) N1---->N2 then N2---->N3 but we don’t get any further path to our destination N5, so this is discarded.

(ii) N1--->N4 then N4--->N5 we reached our destination N5 so this path is taken into consideration. MTU for N1-N4 link is 2 and MTU for N4-N5 link is 1. So the MTU of the path will be minimum of all these MTU's, which is 1.

(iii) N1--->N6 then N6--->N5 we reached our destination N5 so this path is taken into consideration. MTU for N1-N6 link is 4 and MTU for N6-N5 link is 3. So the MTU of the path will be minimum of all these MTU's, which is 3.

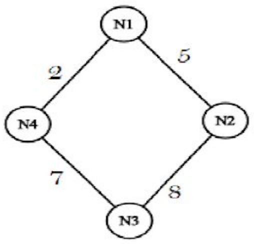
Then for getting the optimal MTU we choose the maximum of the found MTU's of each path, here we get that 3 is the maximum value. So,the path which has this MTU is used to send the packet from the source to the destination, which is N1--->N6--->N5.

ROUTING TABLE FOR N1:

Source Address	Next Hop Address	MTU
N1	N2	5
N1	N4	2
N2	N3	8
N4	N3	7

ROUTING TABLE FOR N4:

Source Address	Next Hop Address	MTU
N4	N1	2
N4	N3	7
N1	N2	5
N3	N2	8



ROUTING TABLE FOR N2:

Source Address	Next Hop Address	MTU
N2	N1	5
N2	N3	8
N1	N4	2
N3	N4	7

ROUTING TABLE FOR N3:

Source Address	Next Hop Address	MTU
N3	N2	8
N3	N4	7
N2	N1	5
N4	N1	2

Fig: 2

Suppose we have a graph of four nodes (Fig : 2) having information about the MTU's of each of the bidirectional links. We generate the routing table for each of the node using the format given in the figure.

Now, let a packet of know size be sent from any arbitrary source node, say N1 to the destination node, N4.

We look at the routing table of Node N1 and generate all possible paths from the specified source node (N1) to destination node (N3). The list of possible paths found are:

(i) N1--->N2 then N2--->N3 we reached our destination N3 so this path is taken into consideration. MTU for N1-N2 link is 5 and MTU for N2-N3 link is 8. So the MTU of the path will be minimum of all these MTU's, which is 5.

(iii) N1--->N4 then N4--->N3 we reached our destination N3 so this path is taken into consideration. MTU for N1-N4 link is 2 and MTU for N4-N3 link is 7. So the MTU of the path will be minimum of all these MTU's, which is 2.

Then for getting the optimal MTU we choose the maximum of the found MTU's of each path, here we get that 5 is the maximum value. So,the path which has this MTU is used to send the packet from the source to the destination, which is N1--->N2--->N3.

Similarly,we can apply this algorithm to a network of k nodes N1, N2,, N3 ,…, Nk which are interconnected with bidirectional links l_{ij} where i and j identify the end nodes Ni and Nj.