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Energy Efficient & Secured Group Communication in MANET using RB-MULTICAST Protocol

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Abstract-Energy is one of the main issues to be discussed in MANET Sensor network. Since each sensor node is powered by a battery which is not rechargeable and it is not possible to change the batter. Prior creation of a multicast tree is required for the multicast routing protocols. The each sensor nodes has to maintain its state information. When there is a network which is dynamic in nature where long periods of silence are expected between the burst of data, an overhead will be developed. Thus to overcome this , we propose a stateless receiver based multicast protocol that uses a list of the members of the multicast. The list contains addresses, embedded in packet headers. And here we propose a lossless compression algorithm using which secure data transfer can be made, which also increases the energy efficiency / battery life of each nodes(sensor nodes) in the multicast communication. Key words: MANET, RB protocol, WSN, Energy efficiency simple lossless compression algorithm.

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1.INTRODUCTION

Several applications in our daily life require data delivery to multiple destination nodes, where the use of multicast routing is frequently used to manage networks with burst traffic and thereby reduce the traffic. This application ranges from member based TV / audio broadcasting to push media such as headlines etc. And few of the applications may use sensor networks which are normally made up of large number of sensor nodes which performs the task together and monitors a specific region and collect the related information and often this services are required of over networks that are highly dynamic. Such networks can be mobile ad hoc, vehicular or WSN.

Source recipients have a fixed location in few wireless multicast applications. In each sensor of a sensor node it is loaded with a radio transreciever or some other wireless communication device, a small microcontroller, and an energy source, most often cells/battery. This batteries power the sensor nodes to perform the required tasks. Hence it is very necessary to consume the battery life, because it is neither rechargeable nor chargeable. So here in this paper we propose to merge a routing protocol with a compression algorithm[10] which is lossless for a network and hence thereby increase the security, efficiency and robustness of the network for the multicast communication.

2.EXISTING SYSTEM.

Generally a tree is used to connect the multicast members by the multicast protocols for WSN's[3] and MANETs. Additionally a routing table[6] has to be maintained at each intermediate node for the multicast tree for the multicast algorithm.

In multicast routing[7,8] based on location based approaches, location information application requirement by each node, or

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provided as a system module. Multicast routing is possible if location information is known and routing can be solely done on location information without building any external tree structure.

The RB multicast is completely stateless and no costly state maintenance is required like the previous location based approaches[9]. In the conventional multicast protocols, extra traffic I required to keep the state information up to date, but in RB multicast only the source nodes own location and the location of the multicast members are needed for multicast packet routing.

The energy consumed during the data communication in WSNs or MANETs[1] may drain the small battery that powers each sensor nodes. This may lead to the death of the sensor nodes that has to be changed, because these batteries are not rechargeable or changeable. This might turn out to be a major problem during some emergencies like a bomb blast or any natural disasters. Here the sensor may not alive and may cause to unresolved the mystery in the former case. So the data that is been sensed can be compressed to same energy and uploaded to the sensor cloud so that it can be used in the future, because the value of the data sensed in a sensor is only useful in case it is stored.

In WSN LZW algorithm was used. Here we try using another possible simple lossless algorithm that is better than LZW based on energy consumption[2] and this would provide security for the data communication. Using this compression algorithm we can encrypt the data to be sent and thereby increase the security of the communication.

3.PROPOSED SYSTEM

RB multicast is a receiver-based cross-layer protocol. And performs routing based on receiverbased geographic unicast protocol. Here only the sender nodes location and the final destination nodes location are required for the receiver based unicast protocol. To decide the next hope along the route, the location is provided by the MAC packet.

Here we will assume that all the nodes which involves in the multicast communication are stationary, such as multiple stationary links in WSNs. The intermediate nodes can be either static or mobile. No extra cost is required in the RB Multicast which has mobile intermediate nodes, since no multicast tree or mesh is used in RB Multicast routing protocol[4].

"Multicast regions" are created by the nodes which are centred on them. There are many ways of creating these multicast regions; where in each multicast region corresponds to one quadrant of the network for a grid centred at a node.

Where request to send (RTS) is initiated by the user to send a data packet to a multicast group[5], the data are passed down to RB multicast module in a protocol stack. When the RB multicast module gets this packet, it retrieves the group list from its group table, group nodes are assigned to the multicast region based on their locations, and by a virtual node is calculated based on their location for each multicast region.

The packet for each multicast region is replicated by the RB multicast that contains one or more multicast members and appends a header consisting of a list of destination nodes in that region, Time To Live (TTL) values and checksum values. The destination of the packet which is replicated in the "virtual node" of the corresponding multicast region can be determined in several ways, example, as the geometric means of the locations of all the multicast members in that multicast region. Finally in the end MAC queue is used to insert all the packets for all the multicast regions and they are then broadcasted to the neighbourhood. The node which is closest to the virtual node handles the responsibility of forwarding the packet.

4.PSEUDO CODE FOR PACKET TRANSMISSION.

Algorithm 1:RBMulticast Send Require: Packet output from upper layer. Ensure: Packets inserted to MAC queue.

```
Generate group list N from the given group table
for node n in group test N do
        for multicast region r in 4 quadrants region R do
            if n Є r then
                Add n into r.list
            end if
        end for
end for
for r Є R do
    if r.list is non-empty then
```

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11: Duplicate a new packet *p*
12: Add RB Multicast header (*TTL, checksum, r.list*)to *p.*
13: Insert *p* to MAC queue
14: end if
15: end for

When a multicast packet is received by the node, it first examines the checksum in the packet header and drops the packet if any corruption exists in the packet. If the packet is not in a forwarding zone it again drops the packet. The area within the radio range of the sender that has a smaller distance to the destination than the sender destination distance is called the Radio range.

After a multicast packet is received by a node, the destination list is retrieved from the RB multicast header. If this node is inside the destination list, it removes itself from the list and then a copy of the packet is passed on to the upper layer in the protocol stack.

The packet is dropped by the RB multicast if TTL value is less than 0.If there still remains nodes in the multicast region and virtual nodes are done and new packets are generated if required. The pseudo code for the procedure is executed after receiving packet is given in Algorithm 2.

Algorithm 2: RBMulticast Receive Require: Packet input from lower layer.
Ensure: Forwarded packets inserted to MAC queue.

1: Calculate checksum. Drop packet if error detected.
2: Drop packet if not in forwarding zone.
3: Get destination list D from packet header.
4: for node *d* in destination list D do
5: if I am *d* then
6: Duplicate the packet and input to upper layer.
7: Remove *d* from list D
8: end if
9: end for
10: if *TTL*in header=0 then
11: Drop the packet
12: return
13: end if
14: for *d* Є D do
15: for multicast region *r* in 4 quadrants regions R do
16: if *d* Є *r* then
17: Add *d* into *r.list*
18: end if
19: end for
20:end for
21:for *r* Є R do
22: if *r.list* is non-empty then
23: Duplicate a new packet *p*
24: Add RBMulticast header(*TTL-1,checksum,r.list*) to *p*
25: Insert *p* to MAC queue
26: end if
27:end for

Fig1 given in the paper with explanation.

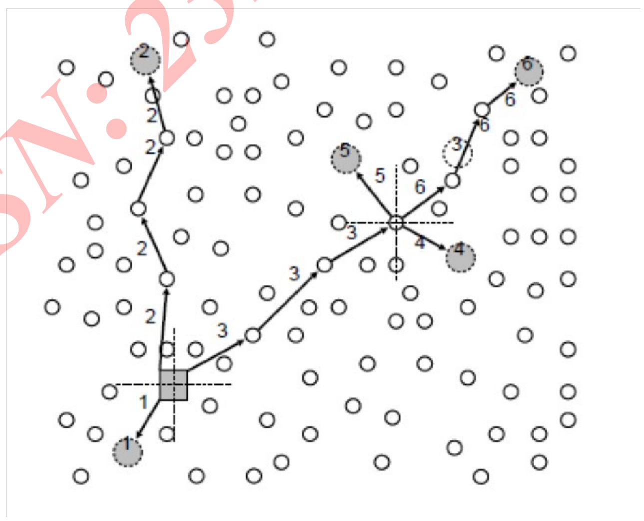

Fig 4.1. RB Multicast delivers multicast packets.

To provide security we use a commitment based scheme. The nodes or the sensors negotiate the key to use for every periodic interval of time. The data is then encrypted by the node/sensor. Here we propose a following algorithm to compress the data from node to node. This simple algorithm uses the data from the Huffman coding table.

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n_t	s_t	d_t
0	00	0
1	010	-1,+1
2	011	-3,-2,+2,+3
3	100	-7,…,-4,+4,…,+7
4	101	-15,…,-8,+8,….,+15
5	110	-31,….,-16,+16,….,+31
6	1110	-63,…..,-32,+32,….,+63
7	11110	-127,…..,-64,+64,….,+127
8	111110	-255,…,-128,+128,…,+255
9	1111110	-511,…,-256,+256,….,+511
10	11111110	-1023..,-512,+512,…,+1023
11	111111110	-2047,..,-1024,+1024,.,+2047
12	1111111110	-4095,..,-2048,+2048,..+4095
13	11111111110	-8191,..40916,+4096,….+8191
14	111111111110	-16383,..-8192,+8192,…+16383

Algorithm:Huffman coding.

encode(di,Table) 1:if di=0 then

2: set *ni* to 0
3:else
4: set *ni* to $\log_2(|di|)$
5:category
6:end if
7:set *si* to Table[ni]
8:if *ni*=0 then
9: set *bsi* to *si*
10:else
11: if *di*>0 then
12: set *ai* to (di)|ni
13: else
14: set *ai* to (di-1)|ni
15: end if
16: set *bsi* to <<*si*,*ai*>>
17:end if
18:return *bsi*

Table 4.1:Huffman variable length codes

5.CONCLUSION AND FUTURE SCOPE

Here we propose RB Multicast protocols that do not require the tree structures, the intermediate nodes need not have to maintain tree states or routing states for packet delivery since this is a stateless multicast protocol. And this lossless algorithm provides a better security. And in future we try to apply the RBMulticast protocol to the multicast sink being stateless.

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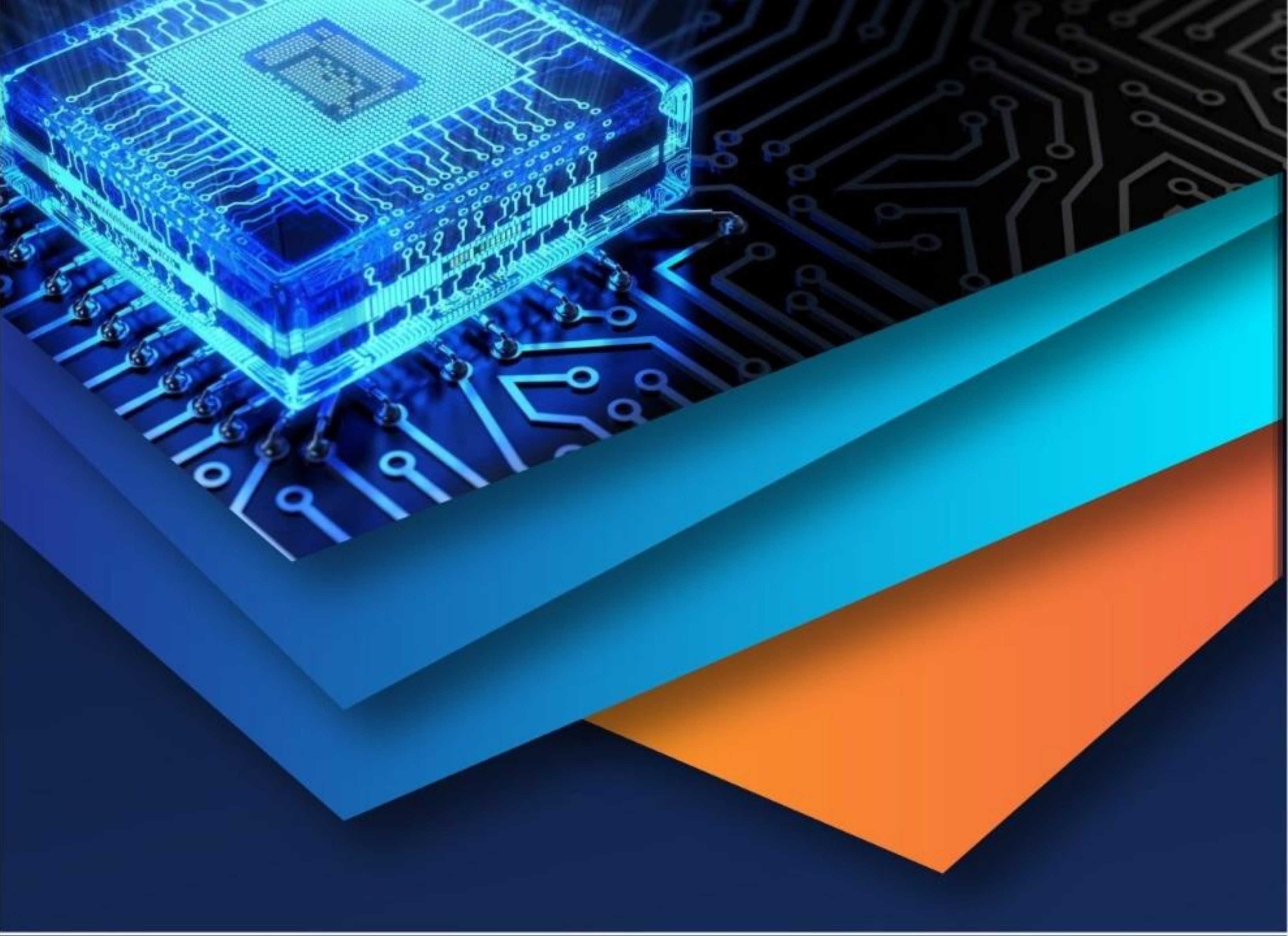

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