MULTI-HOP ROUTING

➢ Problem Statement

Q3. 4 nodes are available out of which one is the coordinator . The nodes can be configured with any address. On network startup the coordinator will transmit the information (payload upto max packet size). The nodes should discover the nearest neighbor and transmit the information to the last node in a multihop fashion.

➢ COMPONENTS USED:

- ZIGBEE MODULE *4
- WASPMOTE *4

➢ DESCRIPTION:

1. NEIGHBOUR DISCOVERY:
   In this project, we have four nodes in a cluster, out of which one node is cluster head. Cluster head starts scanning for the nearby neighbours by sending a message to all the nodes. The other three nodes are in receiving mode. The message sent by the cluster head is received by all the nodes and they send an acknowledge message to cluster head. All the three nodes will save the first node as cluster head after they receive the message from it. Cluster head thus calculates RSSI value and stores them in an array. Then it compares the magnitudes of all the RSSI values of the three nodes and the one with least magnitude will be identified as nearest node to the cluster head and it's address will be stored by cluster head as 'final address'. This nearest node will be labelled as 'Level 1' by cluster head and it will then start scanning for it's neighbours.
   Similar to the neighbours discovery done by cluster head, the second node will also perform same operation that is, sending a message to all the nodes nearby and after getting acknowledgement from everyone, calculate the RSSI value,

$$RSSI = -10n\log_{10}(d) + C$$

d is the T-R separation distance in meters

and on the basis of minimum RSSI magnitude, nearest neighbour is known. Since this node has identified the first node as cluster head, it will not send message to cluster head.

This process will repeat for third node also, but it will not send message to second node because it has stored the address of it as 'source address' and also it has turned off it's receiving. The last node will scan for neighbours, but it would not send message as all other nodes will have address of source, which is third node, the second node as 'Level 1' and first node as cluster head. The final address stored will be 0 and the last node will be identified as 'end node'. The neighbours are stored in a 2D array in the order they are discovered.

2. MESSAGE FORWARDING:

As all nodes have stored the address of their successor nodes as 'final address', the message from cluster head will be forwarded (after 2 minutes for the first time and then the subsequent messages will be sent after every 20 seconds) node-by-node till the 'end node'. The message will not be back propagated since every node also has the information about 'source node' that is the precursor node.

3. REROUTING:

Whenever any node fails, let say when 'Level 1' node fails, then cluster head 'Send' fails, and then Cluster head waits for 20 seconds before restarting Rerouting that is the same neighbour discovery process as mentioned above. Rest nodes will restart after 40 seconds in case any node fails and Node's 'receive' or 'send' fails.

➢ WORK DISTRIBUTION:

1. Neighbour discovery: Plaban Mohapatra, Ashish Tanwar, Mohit Bora.

2. Rerouting and message forwarding: Ashutosh Sharma and Himanshu Kumar.