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Abstract— Multipath ring routing in wireless sensor network (WSN) is used to provide reliability and minimization of the congestion in a network. Multipath routing provides different alternative paths, so it is better to use multipath than single path. It provides variety of benefits like fault tolerance, increased bandwidth, and security. Here we are going to use ring topology with multipath routing protocol. We use Castalia simulator which is developed in omnet++. Omnet++ is an object oriented module. It is base platform for various wired and wireless sensor network. Simulation is conducted which shows the result of static implementation of multipath ring routing protocol.

Keywords— Multipath ring routing protocol, Wireless sensor network, Castalia, ring routing

I. INTRODUCTION

Wireless Sensor network (WSN) consist of large number of sensor nodes which have different size and different capabilities. WSN use multi-hop communication to send their data to base station. Multipath routing is a routing technique of using alternative paths through a network. Tree based technique set up a single path from sensor node to base station. So, It is better to use multipath technique. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. We use three different type of nodes: Source node, sink node and event node.

II. WORKING OF MULTIPATH RING ROUTING PROTOCOL

Nodes do not have defined parent in Multipath ring routing[2]. A node just gets level ring number. During topology formation, ring number indicates the hop distance from source to sink. Any node that receives this topology set up packet and it will increment the ring number by 1 and rebroadcast it. This process continues until all packets get ring number.
In Figure the nodes in ring R3 first broadcast their data with its own ring number. Any node having ring number lower than the broadcasted packet can receive this packet and further rebroadcast it with its current ring number. Node \( k \) broadcasts its data with its current ring number equals to 3, this broadcasted packet is now received on node 8 and node 9 of ring R2. Here as the received packet is destined to sink node and current node (node 8 and node 9) are not sink so it will rebroadcast the packet with its current level equals to 2. The packet broadcasted by nodes of ring \( R_N \) can be received by nodes of ring \( R_{N+1} \) and ring \( R_{N-1} \) but as the Multipath ring routing protocol is designed such a way that all traffic are towards Sink node and Sink node having Ring number equals to Zero, every time data packet will be received on lower level ring only. In given example packets broadcast by node of R2 can be received on ring R1 as well as R3 but Ring R1 only so the packet sent by node 8 and node 9 will be received on node 2. Now node 2 will also rebroadcast the packet with it current ring number equals to 1. At last the packet broadcasted by node 2(ring number \( R_1 \)) will reach to the Sink node and as the packet is also destined to Sink node packet will be given to higher layer (Application Layer) While the rings overlay aims to create multiple interleaving propagation paths for sensor nodes to transport data, each sensor node in the ring next to the base station (e.g., nodes b, e, h and i in ring \( R_1 \) of Figure) inherently has only one single-hop propagation path to the base station. Thus, the data acquired by these nodes remain to be transported by single path routing that is susceptible to communication failures. Since the sensor nodes in ring \( R_1 \) also relay data from sensor nodes in outer rings to the base station, the transportation of data acquired by sensor nodes in outer rings would also be affected if the sensor nodes in ring \( R_1 \) fail to communicate with the base station. Nodes in ring \( R_1 \) are direct or indirect parent of many nodes so if any nodes in ring \( R_1 \) will die then it will create impact on partial region of whole network.

### III. SIMULATION AND ENVIRONMENT

Castalia is a simulator for wireless sensor network (WSN) and body area network (BAN). Castalia provides advanced channel model and also provide real life scenario for wireless channel like path loss, interference of other nodes, mobility. As Castalia is used for wireless sensor network, the simulation nodes in the network are not connected directly to each other but they are connected via wireless link. Whenever any node wants to send their data, it will put their data onto wireless channel. Data dissemination is the process by which query or data are routed in the sensor network. The data connected by sensor nodes has to be communicated to the node which is interested in the data.

Simple Castalia Simulator architecture

Node is composite module of various sub modules. As Castalia is used for wireless network simulation nodes in the network are not connected directly to each other, but they are connected via wireless link. Whenever any node wants to send their data, it will put their data onto wireless channel. And as data is transmitted in wireless channel every node can listen that
data. But only destination node will take that data, other node will discard that data.

IV. STATIC IMPLEMENTATION OF MULTIPATH RING ROUTING IN HOMOGENEOUS SYSTEM

<table>
<thead>
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<th>Files</th>
<th>Configuration</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
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<td>General(1)</td>
<td>2014-10-25 02:09</td>
</tr>
<tr>
<td>141025-020911.txt</td>
<td>General(1)</td>
<td>2014-10-25 01:13</td>
</tr>
<tr>
<td>141030-081121.txt</td>
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</tr>
<tr>
<td>141117-201953.txt</td>
<td>General(1)</td>
<td>2014-11-19 23:24</td>
</tr>
</tbody>
</table>

Above table gives basic information about multipath ring routing protocol and its parameters. Whenever we implement static multipath routing protocol in homogeneous system we use value reporting application. We can increase or decrease the sensor nodes number and size. Whenever we implement value reporting application and generate the result with Castalia results below table will be generated. First column gives the description of files which are generated using value reporting application, Second column gives the configuration and third column gives date and time when the file was generated.

V. CONCLUSION

Here we just analyse the static implementation of multipath ring routing protocol. In future we can compare the performance of multipath ring routing protocol with other nodes and we can compare static and mobility nodes. We will also use the heterogeneous system concept and achieve better result.

REFERENCES


