Claims

WHAT IS CLAIMED IS:

1. A node of a Routing Protocol for Low Power and Lossy Networks (RPL) network, the node comprising:

a radio configured to receive data destined for members of a multicast group;

one or more processors communicatively coupled to the radio; and

memory communicatively coupled to the one or more processors, the memory storing one or more instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

receiving, by the radio, data destined for members of a multicast group;

determining that the node is a member of the multicast group;

determining that the node is part of a forwarding chain for a member of the multicast group; and

causing the radio to transmit, to a child node, a message instructing the child node to disable a pruning state to allow data forwarding from the child node for the multicast group.

2. The node of claim 1, wherein the operations further comprise:

receiving, via the radio and from a child node, a subscription message advertising membership to the multicast group;

updating a data structure indicating a number of child nodes that have sent subscription messages for the multicast group; and

causing the radio to transmit the subscription message to a parent node.

3. The node of claim 1, wherein the operations further comprise:

causing the radio to transmit a subscription message advertising membership of the node to the multicast group, the subscription message being destined for a root node of the RPL network.

4. The node of claim 1, wherein operations further comprise:

determining that the pruning state is enabled to restrict data forwarding from the node for the multicast group.

5. The node of claim 1, wherein operations further comprise:

determining that the pruning state is disabled to allow data forwarding from the node for the multicast group; and

forwarding the data to the adjacent node by causing the radio to transmit the data to an adjacent node.

6. A method comprising:

receiving, by a radio of a node, data destined for members of a multicast group;

determining to forward the data to an adjacent node to propagate the data to a member of the multicast group, wherein the determining comprises:

receiving, from a first child node, a first subscription message advertising membership to the multicast group;

receiving, from a second child node, a second subscription message advertising membership to the multicast group;

based at least in part on receiving the first subscription message from the first child node and the second subscription message from the second child node, determining that the node has received a subscription message for the multicast group from two or more different child nodes; and

sending, to each of the first child node and the second child node, a message instructing the respective child node to disable a pruning state and enable data forwarding from the respective node for the multicast group; and

based at least in part on determining to forward the data to the adjacent node, transmitting, by the radio of the node, the data to the adjacent node.

7. The method of claim 6, wherein the adjacent node is a parent of the node.

8. The method of claim 6, wherein the adjacent node is the first child node and is a member of the multicast group.

9. The method of claim 6, wherein the adjacent node is the first child node and is not a member of the multicast group; and

wherein the transmitting the data to the adjacent node comprises transmitting the data to the first child node to reach a member of the multicast group that is located in a branch connected to the first child node.

10. The method of claim 6, wherein the multicast group comprises an anycast group where each member of the multicast group is configured to initiate a multicast communication.

11. The method of claim 6, wherein the first subscription message and the second subscription message each comprise a Destination Advertisement Object (DAO) message.

12. The method of claim 6, wherein the message instructs the respective child node to disable the pruning state comprises a DODAG Information Object (DIO) message.

13. The method of claim 6, further comprising:

determining that the node is a member of the multicast group;

determining that the node is part of a forwarding chain for a member of the multicast group; and

wherein transmitting, by the radio of the node, comprises transmitting, to at least one of the first child node or the second child node, the message instructing the first child node or the second child node to disable the pruning state to allow data forwarding for the multicast group.

14. A node comprising:

one or more processors; and

memory communicatively coupled to the one or more processors, the memory storing one or more instructions that, when executed by the one or more processors, cause the one or more processors to perform operations comprising:

receiving, from a first child node, a first subscription message advertising membership to a multicast group;

receiving, from a second child node, a second subscription message advertising membership to the multicast group;

counting a number of child nodes from which the node has received a subscription message for the multicast group, the number of child nodes including the first child node and the second child node;

determining that the number of child nodes is greater than a threshold;

based at least in part on determining that the number of child nodes is greater than the threshold, sending a message to the first child node to change the first child node to a state in which data forwarding, from the first child node to the node, is enabled for the multicast group;

receiving, from the first child node, data for the multicast group; and

determining whether or not to send the data to an adjacent node.

15. The node of claim 14, wherein the first subscription message indicates at least one of:

that the first child node is subscribing to the multicast group; or

that a node along a branch including the first child node is subscribing to the multicast group.

16. The node of claim 14, wherein the multicast group comprises an anycast group where each member of the multicast group is configured to initiate a multicast communication.

17. The node of claim 14, wherein sending the message to the adjacent node further comprises sending the message based at least in part on:

determining that the node is part of the forwarding chain for the multicast group; and

determining that the node is a member of the multicast group.

18. The node of claim 14, wherein the first subscription message and the second subscription message each comprise a Destination Advertisement Object (DAO) message.

19. The node of claim 14, wherein the message to the first child node comprises a DODAG Information Object (DIO) message.

20. The node of claim 14, wherein the adjacent node corresponds to at least one of the first child node, the second child node, or a parent of the node.