Claims

1. A mesh routing method operative in a channel-diverse mesh network having a plurality of nodes, the method comprising:

receiving, by a particular node, beacon messages broadcasted by neighbour nodes, wherein each of the beacon messages identifies a respective time and channel information of Radio Resource Map (RRM) broadcast;

based on a location of the particular node and a RRM message received by the particular node at an appointed time and channel according to one of the beacon messages, determining, by the particular node, available channels for the particular node;

computing, by the particular node, weighted values for the available channels for the particular node based on available channels, temporary operating channel and operating channel of each of the neighbour nodes, which are further defined in the beacon messages broadcasted by the neighbour nodes;

based on the weighted values, determining, by the particular node, one of the available channels as a temporary operating channel for the particular node; and

based on a pre-determined criteria relating to at least one subsequently-determined temporary operating channel, determining, by the particular node, the same one of the available channels as an operating channel for the particular node.

2. The method of claim 1, further comprising:

receiving, by the particular node, a Routing Request (RREQ) message from a sending node, which includes information relating to a source node and a destination node;

based on the information relating to the source node and the destination node, establishing, by the particular node, a reverse route to the sending node;

transmitting, by the particular node, the RREQ message to any receiving node having an available channel being the operating channel of the particular node;

receiving, by the particular node, a Routing Response (RRSP) message generated by the destination node in response to the RREQ message; and

transmitting, by the particular node, the RRSP message based on the reverse route and establishing a forward route for the particular node based on the RRSP message.

3. The method of claim 2, wherein before establishing, by the particular node, the reverse route for the sending node of the RREQ message, the method further comprising:

checking, by the particular node, a sequence number of the RREQ message against a sequence number of any previously-received RREQ message; and

disregarding the RREQ message if the sequence number of the RREQ message and the sequence number of any previously-received RREQ message are the same.

4. The method of any one of claims 2 to 3, further comprising:

receiving, by the particular node, data packets using the operating channel; and

transmitting, by the particular node, data packets to a receiving node using an operating channel for the receiving node, which is any one of the available channels for the particular node.

5. The method of any one of claims 2 to 4, wherein receiving, by the particular node, the RRSP message generated by the destination node includes receiving, by the particular node, the RRSP message generated by the destination node which is associated with a first route, wherein the RRSP message identifies at least one node being the particular node and a suggested operating channel thereof,

the method further comprising:

switching, by the particular node, to the suggested operating channel; and

notifying, by the particular node, a sending node of the RRSP message of the switching to the suggested operating channel,

wherein transmitting, by the particular node, the RRSP message based on the reverse route includes transmitting, by the particular node, the RRSP message which further identifies a switched operating channel for the particular node.

6. The method of claim 5, further comprising:

generating, by the particular node, a Routing Repair (RREP) message and transmitting the RREP message to a source node associated with a second route which includes the particular node.

7. The method of claim 6, further comprising:

receiving, by the source node associated with the second route, the RREP message; and

based on the RREP message, initiating, by the source node associated with the second route, route repair procedure in the second route.

8. The method of claim 1, further comprising:

broadcasting, by any node connected to a RRM database, the beacon messages wherein each of the beacon messages includes information on available channels, temporary operating channel and operational channel of the any node connected to the RRM database.

9. The method of any one of claims 1 to 8, wherein after determining, by the particular node, the same one of the available channels as the operating channel for the particular node, the method further comprising:

broadcasting, by the particular node, other beacon messages at the operating channel.

10. A mesh node device comprising:

a single transceiver configured to receive beacon messages from neighbour nodes and transmit messages, wherein each of the beacon messages identifies a

respective time and channel information of Radio Resource Map (RRM) broadcast, and determine available channels for the mesh node device based on a location thereof and a RRM message received by the mesh node device at an appointed time and channel according to one of the beacon messages;

a memory storage configured to store the beacon messages;

a channel selector configured to:

compute weighted values for the available channels for the mesh node device based on available channels, temporary operating channel and operating channel of each of the neighbour nodes, which are further identified in the beacon messages;

based on the weighted values, determine one of the available channels as a temporary operating channel for the mesh node device; and

based on a pre-determined criteria relating to at least one subsequently-determined temporary operating channel, determine the same one of the available channels as an operating channel for the mesh node device.

11. The device of claim 10, wherein the transceiver is configured to:

receive a Routing Request (RREQ) message from a sending node, which includes information relating to a source node and a destination node;

the device further comprising:

a mesh routing executor configured to: establish a reverse route to the sending node based on the information relating to the source node and the destination node,

wherein the transceiver is configured to:

transmit the RREQ message to any receiving node having an available channel being the operating channel of the mesh node device;

receive a Routing Response (RRSP) message generated by the destination node in response to the RREQ message; and

transmit the RRSP message based on the reverse route,

wherein the mesh routing executor is configured to: establish a forward route for the mesh node device based on the RRSP message.

12. The device of claim 11, wherein the mesh routing executor is configured to:

before determining the reverse route for the sending node of the RREQ message, check a sequence number of the RREQ message against a sequence number of any previously-received RREQ message; and disregard the RREQ message if the sequence number of the RREQ message and the sequence number of any previously-received RREQ message are the same.

13. The device of any one of claims 11 to 12, wherein the transceiver is configured to:

receive data packets using the operating channel; and

transmit data packets to a receiving node using an operating channel for the receiving node, which is any one of the available channels for the mesh node device.

14. The device of any one of claims 11 to 13, wherein the transceiver is configured to:

receive the RRSP message generated by the destination node which is associated with a first route, wherein the RRSP message identifies at least one node being the mesh node device and a suggested operating channel thereof,

wherein the mesh routing executor is configured to: switch to the suggested operating channel;

wherein the transceiver is configured to: notify a sending node of the RRSP message of the switch to the suggested operating channel; and

transmit the RRSP message which further identifies a switched operating channel for the mesh node device.

15. The device of claim 14, wherein the mesh routing executor is configured to:

generate a RREP message and transmit the RREP message to a source node associated with a second route which includes the mesh node device.

16. The device of claim 10, further comprising:

a beacon message generator configured to:

after determining the same one of the available channels as the operating channel for the particular node, generate other beacon messages wherein each of the other beacon messages includes information on available channels, temporary operating channel and operational channel of the mesh node device; and

wherein the transceiver is configured to: broadcast the other beacon messages to neighbour nodes at the operating channel.