CLAIMS

1. A discovery method for a power line communication network, comprising:

broadcasting, by a first node, a discovery request to at least one receiver, wherein the discovery request comprises the following information:

a node address of the first node;

a total downward path cost through the first node;

a downward hop address associated with the total downward path cost;

a total upward path cost through the first node; and

an upward hop address associated with the total upward path cost.

2. The method of claim 1, wherein if the first node is a data concentrator (DC), the total downward path cost and total upward path cost are the values of 0, and wherein the downward hop address associated with the total downward path cost and the upward hop address associated with the total upward path cost are excluded from the discovery request.

3. A discovery method for a power line communication network, comprising:

receiving, by a node, a discovery request which comprises a total downward path cost, a total upward path cost from a transmitter;

determining, by the node, a total downward path cost from a data concentrator (DC) to the node by using a total downward path cost in the discovery request;

storing a node address included in the discovery request and a downward hop cost from the transmitter to the node, the received total downward path cost and the received total

upward path cost from the transmitter into a discovery table of the node.

4. The method of claim 3, further comprising rejecting, by the node, paths which include the node itself as an upward or downward node in the path.

5. A discovery method for a power line communication network, comprising:

receiving, by a registering node, a discovery request from a transmitter;

choosing the best downward hop address from a stored discovery table, using a total downward path costs from a data concentrator(DC) to the registering node; and

broadcasting, by the registering node, a registration request, wherein the registration request comprises the following information:

a registering node address;

a downward hop address;

a downward hop cost to the registering node; and

a downward hop's total upward path cost.

6. The method of claim 5, the registration request further comprises an upward hop address, an upward hop cost from the registering node to the upward hop address and an upward hop's total upward path cost which are filled by relaying or re-broadcasting nodes.

7. A discovery method for a power line communication network, comprising:

receiving, by a neighbour node, a registration request; and

re-broadcasting the registration request if the neighbour node is in unregistered state or relaying the registration request if the neighbour node is in registered state.

8. The method of claim 7, further comprising determining to relay based on a total upward cost of the neighbour node and a downward hop's total upward path cost.

9. A discovery method for a power line communication network, comprising:

transmitting, by a data concentrator (DC), a registration confirm message to at least one registering nodes based on a total upward path costs in registration requests from the at least one registering nodes;

updating a routing table, by the DC, based on the registration requests from the at least one registering nodes, wherein the registration confirm message comprises the following information:

a registering node address;

a downward hop address;

a total downward path cost to the registering node;

an upward hop address; and

a total upward path cost from the registering node.

10. The method of claim 9, wherein the registering node address is assigned a shorter address instead of a longer address pre-configured into the registering node.

11. The method of claim 9, further comprising receiving, by the at least one registering nodes, the registration confirm message from the DC; and transitioning, by the at least one registering nodes, to registered state.

12. A discovery method for a power line communication network, comprising:

comparing, by a registered node, a total downward costs through a different downward hop addresses in a discovery table with a current total downward path cost; and

determining, by thea registered node, to send a registration request with a newly selected downward hop.

13. A discovery method for a power line communication network, comprising:

receiving, by a registered node, a polling from a data concentrator(DC); and

transmitting, by the registered node, a response which informs the DC of a newly selected downward hop address.

14. A discovery method for a power line communication network, comprising:

receiving, by a registered node, a discovery request;

determining, by the registered node, a total upward path cost from a node which transmits the discovery request to a data concentrator (DC) if the registered node is replaced as a upward hop for the node; and

deciding to send a registration request to the DC on behalf of the node which transmits the discovery request, if the determined total upward path cost is less than a total upward path cost specified in the discovery request by a certain margin.

15. The method of claim 14, further comprising:

checking, by the registered node, if the upward hop address involves itself and the upward hop cost has differed above a certain threshold; and

transmitting, by the registered node, a registration request to the DC or waiting for a poll, to inform of the changes in upward hop cost.

16. The method of claim 1, wherein the discovery request further comprises information associated with multiple downward and upward routes for the first node.

17. The method of claim 3, wherein the discovery table of the node further comprises path number information.

18. The method of claim 5, wherein the registration request further comprises path number information.

19. An apparatus for a power line communication network, comprising:

a power line transceiver;

a processor coupled to the power line transceiver; and

memory accessible to the processor, wherein the processor is configured to store a discovery table which comprises a node address and a downward hop cost, the received total downward path cost and the received total upward path cost in the memory for routing packets.

20. An apparatus for a power line communication network, comprising:

a power line transceiver;

a processor coupled to the power line transceiver; and

memory accessible to the processor, wherein the processor is configured to store a routing table which comprises a downward hop address, a downward hop cost, a upward hop addresses and upward hop cost for each node.

21. The apparatus of claim 19, wherein the discovery table further comprises path number information.

22. The apparatus of claim 20, wherein the routing table further comprises path number information.