CLAIMS

What is claimed is:

1. A method implemented at least in part by a first node, the first node selected from among a plurality of nodes including a full functionality node configured within a tree structured network, for establishing peer-to-peer communications in a tree structured network having a plurality of nodes including a root node or a router node, comprising:

sending a first message to one of the root node or the router node, either one of which has functionality capable of storing routes within the tree structured network, the first message requesting path information to a destination node;

receiving the path information sent by the root node or the router node, the path information comprising at least one of a shortest path or a most direct path between the source node and the destination node;

transmitting a second message to the destination node using the path information; and

receiving information from a node to which the second message was not addressed, the information announcing recommended path changes for the second message.

2. The method as in claim 1, further comprising:

sending a third message from the destination node to the root node or router node requesting reverse routing path information to the source node; and

receiving the reverse routing path information at the destination node.

3. The method as in claim 1, further comprising:

receiving automatically sent reverse path information at the destination node,

whereby the destination node responds to the second message from the source node without first requesting path information.

4. The method as in claim 1, further comprising:

caching the received path information to thereby avoid repeated requests for the path information.

5. The method as in claim 1, wherein the source node receives the path information from the root node.

6. The method as in claim 1, further comprising:

storing the path information within at least one router node of the tree structured network,

wherein the at least one router node sends the path information to the source node.

7. The method as in claim 1, further comprising:

storing addresses of nodes in a communications path from the source node to the destination node based on a packet header of a previous communication,

whereby subsequent packets sent from the source node to the destination node may be sent without adding route information into the packet header of the subsequent packets.

8. The method as in claim 1, further comprising:

forwarding message packet headers unchanged through nodes in a path between the source node and the destination node,

whereby the destination node determines a reverse root path to the source node based on the unchanged packet headers.

9. The method as in claim 1, wherein selected of said plurality of nodes comprise data endpoints.

10. The method as in claim 9, wherein selected of said data endpoints are associated with metering devices in an advanced metering infrastructure.

11. The method as in claim 1, wherein said plurality of nodes comprises metering devices.

12. The method as in claim 11, wherein said metering devices are respectively associated with wireless communication devices.

13. The method as in claim 1, wherein the path information is based at least in part on predetermined routing metrics and predefined routing objectives.

14. The method as in claim 1, wherein the path information includes the shortest path.

15. The method as in claim 1, wherein the path information includes the most direct path.

16. The method as in claim 1, wherein the path information includes the shortest and the most direct path.

17. A method in a first node from among a plurality of nodes and from a full functionality node configured within a tree structured network for establishing peer-to-peer communications, comprising:

requesting a path routing from the first node to a second node from among the plurality of nodes;

receiving from the full functionality node, the path, comprising at least one of a shortest path and a most direct path between the first node and the second node;

transmitting a message packet to the second node using the received path; and

receiving, from a node to which the transmitted message packet was not addressed, a peer-to-peer route to replace the received path.

18. The method of claim 17, wherein at least some nodes from among the plurality of nodes comprise data endpoints.

19. The method of claim 18, wherein at least some of the data endpoints are associated with metering devices in an advanced metering infrastructure.

20. The method of claim 17, wherein the plurality of nodes comprises metering devices.

21. The method of claim 19, wherein at least some of the metering devices are associated with wireless communication devices.

22. The method of claim 17, wherein the path is based at least in part on predetermined routing metrics and predefined routing objectives.

23. A method in a first node from among a plurality of reduced functionality nodes and from a full functionality node for establishing peer-to-peer communications in an advanced metering infrastructure, comprising:

requesting a path routing from the first node to a second node;

receiving from the full functionality node the path routing from the first node to the second node;

transmitting a message packet to the second node using the received path; and

receiving, from a node to which the transmitted message packet was not addressed, an evaluation of a routing header of the transmitted message packet and a peer-to-peer route to replace the received path.

24. The method of claim 23, wherein at least some nodes from among the plurality of reduced functionality nodes comprise data endpoints.

25. The method of claim 24, wherein at least some of the data endpoints are associated with metering devices in an advanced metering infrastructure.

26. The method of claim 23, wherein the plurality of reduced functionality nodes comprises metering devices.

27. The method of claim 26, wherein at least some of the metering devices are associated with wireless communication devices.

28. The method of claim 23, wherein the path is based at least in part on predetermined routing metrics and predefined routing objectives.

WHAT IS CLAIMED IS:

1. A method for establishing peer-to-peer communications in a tree structured network having a plurality of nodes including a root node, comprising:

sending a message from a source node requesting path routing to a destination node;

determining the most advantageous path between the source node and the destination node;

sending the determined path information to the source node; and

transmitting a message from the source node to the destination node using the path information.

2. A method as in claim 1, further comprising:

sending a message from the destination node requesting reverse routing path routing to the source node; and

sending reverse routing path information to the destination node.

3. A method as in claim 1, further comprising:

automatically sending reverse path information to the destination node,

whereby the destination node may respond to a message from the source node without first requesting path information.

4. A method as in claim 1, further comprising:

configuring at least one of the source and destination nodes to cache the path information,

whereby repeating the path request may be avoided.

5. A method as in claim 1, wherein the root node determines the most advantageous path and sends the path information to the source node.

6. A method as in claim 1, further comprising:

storing routes within at least one full functionality node of the plurality of nodes of a tree structure of an associated network,

wherein the at least one full functionality node determines the most advantageous path and sends the path information to the source node.

7. A method as in claim 1, further comprising:

storing the address of the next-hop in nodes in a communications path from a source node to a destination node based on the packet header of a previous communication,

whereby subsequent packets from the same source to the same destination may be sent without adding route information into the header of the packet.

8. A method as in claim 1, further comprising:

forwarding message packet headers unchanged through nodes in the path between the source node and the destination node,

whereby the destination node determines the reverse root path to the source node based on the unchanged headers.

9. A method as in claim 1, further comprising:

processing packets heard by the destination node not necessarily destined to such destination node; and

announcing from the destination node a new peer-to-peer route to the source node.

10. A method as in claim 1, wherein selected of said plurality of nodes comprise data endpoints.

11. A method as in claim 10, wherein selected of said data endpoints are associated with metering devices in an advanced metering infrastructure.

12. A method as in claim 1, wherein said plurality of nodes comprises metering devices with associated wireless communication devices.

13. A method as in claim 12, wherein said metering devices are respectively associated with wireless communication devices.

14. A method as in claim 1, wherein determining the most advantageous path between the source node and the destination node comprises using predetermined routing metrics so that predefined routing objectives are achieved.

15. A method for establishing peer-to-peer communications in an advanced metering infrastructure, comprising:

providing a plurality of nodes including a root node configured as a tree structured network;

initiating peer-to-peer communications from a first node of the plurality of nodes with a second of the plurality of nodes by requesting a path routing to the second of the plurality of nodes;

determining the most advantageous path between the first node and the second node; and

transmitting a message packet from the first node to the second node.

16. A method as in claim 15, wherein the message packet includes a header including the path information.

17. A method as in claim 15, further comprising determining at the root node the most advantageous path between the first node and the second node and transmitting the path information to the first node.

18. A method as in claim 15, further comprising responding from at least one full functionality node to the first node's request for path routing.

19. A method as in claim 15, wherein:

at least selected of the plurality of nodes are wireless nodes; and

said method further comprises listening for messages at the wireless nodes not necessarily addressed to themselves, evaluating received messages for errors, and announcing path changes to a node sending them messages if a shorter path is available.

20. A method as in claim 15, further comprising:

caching at least a portion of the path information in nodes along a path between the first node and the second node,

whereby repeating the path request may be avoided.

21. A method as in claim 15, wherein said plurality of nodes respectively comprise metering devices with associated wireless communications devices.

22. A method for communications in an advanced metering infrastructure associated with a plurality of nodes at least selected of which are associated with metering device endpoints configured as a tree structured network utilizing wireless communications, comprising:

initiating peer-to-peer communications from a selected source node of the plurality of nodes with a selected destination node of the plurality of nodes by requesting a path routing to such destination node using such tree structured network;

determining the most advantageous path between such source node and such destination node using such tree structured network; and

transmitting a message packet from such source node to such destination node utilizing such determined most advantageous path.

23. A method as in claim 22, wherein said metering device endpoints comprise electricity metering devices with associated wireless communications devices.

24. A method as in claim 22, further including providing a root node for the tree structured network, and wherein said step of determining the most advantageous path includes requesting most advantageous path information from such root node.

25. A method as in claim 22, further including providing plural autonomous systems within the tree structured network, with at least one router

node within each autonomous systems, and wherein said step of determining the most advantageous path includes requesting most advantageous path information from the router node nearest to a requesting source node.