CLAIMS

What is claimed is:

1. An advanced metering infrastructure system comprising:

a plurality of gateways interconnected by a network comprising a plurality of subnets based on one or more types of networking protocols, each of the plurality of gateways communicatively coupled to or integrated in a metering device; and

a concentrator connected to the network for receiving metering data from the metering devices,

wherein the concentrator and the plurality of gateways each defines a communication node in the network, and

wherein each of the gateways is configured to:

store a route information comprising at least a primary route information and is operable to route uplink data received based on the route information, the primary route information indicating a predetermined one of the communication nodes for the gateway to route the uplink data to next as a first priority,

receive a gateway propagation message from an immediate neighbouring communication node in the network and to determine whether to set the primary route information to indicate the immediate neighbouring communication node as the predetermined communication node based on one or more parameters of the gateway propagation message transmitted from the immediate neighbouring communication node, and

add node information to the uplink data upon receiving the uplink data and before routing the uplink data to the next communication node, said node information comprises information for identifying the gateway which added the node information to the uplink data and information for identifying the subnet from which the gateway received the uplink data.

2. The advanced metering infrastructure system according to claim 1, wherein the parameters of the gateway propagation message transmitted by the immediate neighbouring communication node comprises a parameter for identifying the immediate neighbouring communication node and a parameter indicating a hop count between the immediate neighbouring communication node and the concentrator.

3. The advanced metering infrastructure system according to claim 1, wherein the route information further comprises a secondary route information, the secondary route information indicating another predetermined one of the communication nodes for the gateway to route the uplink data to next as a second priority, which is lower than the first priority.

4. The advanced metering infrastructure system according to claim 3, wherein the gateway is configured to operate in a primary route status or a secondary route status based on whether a communication link between the gateway and the communication node indicated by the primary route information is operating, the primary route status operable to route the uplink data to the communication node indicated by the primary route information, and the secondary route status operable to route the uplink data to the communication node indicated by the secondary route information.

5. The advanced metering infrastructure system according to claim 4, wherein the gateway is configured to initiate a route discovery process for locating one or more immediate neighbouring communication nodes when the communication links between the gateway and the communication nodes indicated by the primary and secondary route information, respectively, are inoperative or when the gateway does not have the primary route information and/or the secondary route information.

6. The advanced metering infrastructure system according to claim 1, wherein the uplink data originates from one of the metering devices, and the concentrator is configured to:

receive the uplink data including the node information added to the uplink data by each of the gateways which routed the uplink data along an uplink path from said one of the metering devices to the concentrator, and

store the node information added by said each of the gateways as being associated with said one of the metering devices, wherein the stored node information indicates said each of the gateways along a downlink path to be used for routing downlink data from the concentrator to said one of the metering devices.

7. The advanced metering infrastructure system according to claim 6, wherein the concentrator is configured to send downlink data to one of the metering devices by adding the stored node information associated with said one of the metering devices to the downlink data, and

wherein each of the gateways along the downlink path indicated by the added node information is configured to remove the node information associated therewith from the downlink data upon receiving the downlink data and before routing the downlink data to the next communication node.

8. A method of configuring an advanced metering infrastructure system comprising a plurality of gateways interconnected by a network including a plurality of subnets based on one or more types of networking protocols, each of the plurality of gateways communicatively coupled to or integrated in a metering device, and a concentrator connected to the network for receiving metering data from the metering devices, wherein the concentrator and the plurality of gateways each defines a communication node in the network, the method comprising:

configuring each of the gateways to store a route information comprising at least a primary route information and to route uplink data received based on the route information, the primary route information indicating a predetermined one

of the communication nodes for the gateway to route the uplink data to next as a first priority,

configuring each of the gateways to receive a gateway propagation message from an immediate neighbouring communication node in the network and to determine whether to set the primary route information to indicate the immediate neighbouring communication node as the predetermined communication node based on one or more parameters of the gateway propagation message transmitted from the immediate neighbouring communication node, and

configuring each of the gateways to add node information to the uplink data upon receiving the uplink data and before routing the uplink data to the next communication node, said node information comprises information for identifying the gateway which added the node information to the uplink data and information for identifying the subnet from which the gateway received the uplink data.

9. The method according to claim 8, wherein the parameters of the gateway propagation message transmitted by the immediate neighbouring communication node comprises a parameter for identifying the immediate neighbouring communication node and a parameter indicating a hop count between the immediate neighbouring communication node and the concentrator.

10. The method according to claim 8, wherein the route information further comprises a secondary route information, the secondary route information indicating another predetermined one of the communication nodes for the gateway to route the uplink data to next as a second priority, which is lower than the first priority.

11. The method according to claim 10, further comprises configuring the gateway to operate in a primary route status or a secondary route status based on whether a communication link between the gateway and the communication node indicated by the primary route information is operating, the primary route status operable to

route the uplink data to the communication node indicated by the primary route information, and the secondary route status operable to route the uplink data to the communication node indicated by the secondary route information.

12. The method according to claim 11, further comprises configuring the gateway to initiate a route discovery process for locating one or more communication nodes when the communication links between the gateway and the communication nodes indicated by the primary and secondary route information, respectively, are inoperative or when the gateway does not have the primary route information and/or the secondary route information.

13. The method according to claim 8, wherein the uplink data originates from one of the metering devices, and the method further comprises configuring the concentrator to:

receive the uplink data including the node information added to the uplink data by each of the gateways which routed the uplink data along an uplink path from said one of the metering devices to the concentrator, and

store the node information added by said each of the gateways as being associated with said one of the metering devices, whereby the stored node information indicates said each of the gateways along a downlink path to be used for routing downlink data from the concentrator to said one of the metering devices.

14. The method according to claim 13, further comprises:

configuring the concentrator to send downlink data to one of the metering devices by adding the stored node information associated with said one of the metering devices to the downlink data, and

configuring each of the gateways along the downlink path indicated by the added node information to remove the node information associated therewith from the downlink data upon receiving the downlink data and before routing the downlink data to the next communication node.

15. A metering device for an advanced metering infrastructure system comprising a plurality of gateways interconnected by a network comprising a plurality of subnets based on one or more types of networking protocols, wherein the plurality of gateways each defines a communication node in the network, the metering device comprising:

a processor operable to collect metering data, and

a gateway for the advanced metering infrastructure system for routing uplink data and downlink data received;

wherein the gateway is configured to:

store a route information comprising at least a primary route information and is operable to route the uplink data received based on the route information, the primary route information indicating a predetermined one of the communication nodes for the gateway to route the uplink data to next as a first priority,

receive a gateway propagation message from an immediate neighbouring communication node in the network and to determine whether to set the primary route information to indicate the immediate neighbouring communication node as the predetermined communication node based on one or more parameters of the gateway propagation message transmitted from the immediate neighbouring communication node, and

add node information to the uplink data upon receiving the uplink data and before routing the uplink data to the next communication node, said node information comprises information for identifying the gateway which added the node information to the uplink data and information for identifying the subnet from which the gateway received the uplink data.

16. A method of routing data in an advanced metering infrastructure system comprising a plurality of gateways interconnected by a network comprising a plurality of subnets based on one or more types of networking protocols, each of the plurality of gateways communicatively coupled to or integrated in a metering

device, wherein the plurality of gateways each defines a communication node in the network, the method comprising:

routing, by a gateway of the plurality of gateways, uplink data based on a route information comprising at least a primary route information stored at the gateway, the primary route information indicating a predetermined one of the communication nodes for the gateway to route the uplink data to next as a first priority,

receiving, by the gateway, a gateway propagation message from an immediate neighbouring communication node in the network and determining, by the gateway, whether to set the primary route information to indicate the immediate neighbouring communication node as the predetermined communication node based on one or more parameters of the gateway propagation message transmitted from the immediate neighbouring communication node, and

adding, by the gateway, node information to the uplink data upon receiving the uplink data and before routing the uplink data to the next communication node, said node information comprises information for identifying the gateway which added the node information to the uplink data and information for identifying the subnet from which the gateway received the uplink data.

17. A computer program product, embodied in a computer-readable storage medium, comprising instructions executable by a computer processor to perform a method of routing data in an advanced metering infrastructure system comprising a plurality of gateways interconnected by a network comprising a plurality of subnets based on one or more types of networking protocols, each of the plurality of gateways communicatively coupled to or integrated in a metering device, wherein the plurality of gateways each defines a communication node in the network, the method comprising:

routing, by a gateway of the plurality of gateways, uplink data based on a route information comprising at least a primary route information stored at the

gateway, the primary route information indicating one of the communication nodes for the gateway to route the uplink data to next as a first priority,

receiving, by the gateway, a gateway propagation message from an immediate neighbouring communication node in the network and determining, by the gateway, whether to set the primary route information to indicate the immediate neighbouring communication node as the predetermined communication node based on one or more parameters of the gateway propagation message transmitted from the immediate neighbouring communication node, and

adding, by the gateway, node information to the uplink data upon receiving the uplink data and before routing the uplink data to the next communication node, said node information comprises information for identifying the gateway which added the node information to the uplink data and information for identifying the subnet from which the gateway received the uplink data.