I claim:

1. An energy harvesting sensor network, comprising:

a plurality of energy harvesting sensors (200-1, 200-2, …) operating as nodes, wherein each of said energy harvesting sensors is configured to operate in accordance with a predefined communication protocol; and

a server (100) configured to wirelessly communicate with the energy harvesting sensors;

wherein the predefined communication protocol includes a RECEIVE state in which a node transmits a ready to receive (RTR) beacon indicating to other nodes that the node is awake and has sufficient energy to receive and retransmit a data packet,

wherein the energy harvesting sensor, while in the RECEIVE state, broadcasts an RTR beacon to a plurality of sensors indicating that the energy harvesting sensor is ready to receive the data packet; and upon receiving data from another sensor, queues this data for transmission toward the server.

2. The energy harvesting sensor network of claim 1, wherein the predefined communication protocol further includes a SLEEP state and a TRANSMIT state.

3. The energy harvesting sensor network of claim 2, wherein an energy harvesting sensor of the plurality of energy harvesting sensors remains in the SLEEP state until the energy harvesting sensor has harvested a predetermined threshold of energy.

4. The energy harvesting sensor network of claim 3, wherein, upon harvesting the predetermined threshold of energy, the energy harvesting sensor enters one of the TRANSMIT state or the RECEIVE state based on a non-deterministic function of a local network state.

5. The energy harvesting sensor network of claim 4, wherein the non-deterministic function determines a mode of operation based on the channel state, a traffic backlog, a local topology, or energy characteristics.

6. The energy harvesting sensor network of claim 1, wherein the energy harvesting sensor, while in the TRANSMIT state, waits to receive an RTR beacon from a potential relay node, wherein potential relay nodes are determined by an opportunistic routing scheme;

if the energy harvesting sensor does not detect any transmissions, it transmits the packet to the relay node as determined by the opportunistic relay scheme; and

if the energy harvesting sensor detects another transmission, it delays transmission until the currently active transmissions have completed.

7. The energy harvesting sensor network of any one of claims 2-3, wherein each node routes packets using one or more received RTR beacons.

8. The energy harvesting sensor network of any one of claims 2, 3, or 7, wherein the predefined communication protocol comprises a media access control (MAC) protocol.

9. An energy harvesting node, comprising:

an energy harvesting device (210);

an energy storage device (220) coupled to the energy harvesting device;

a microcontroller (240); and

a wireless transceiver (250) coupled to the microcontroller;

wherein the microcontroller and wireless transceiver are powered by the energy storage device; and

wherein the microcontroller is configured to operate the energy harvesting node in accordance with a predefined communication protocol includes a RECEIVE state in which the transceiver transmits a ready to receive (RTR) beacon indicating that the node is awake and has sufficient energy to receive a data packet from another node and to retransmit the data packet,

wherein the energy harvesting node in the RECEIVE state broadcasts an RTR beacon to a plurality of sensors indicating that the energy harvesting node is ready to receive the data packet; and upon receiving data from another sensor, queues this data for transmission.

10. The energy harvesting node of claim 9, wherein the predefined communication protocol further includes a SLEEP state and a TRANSMIT state.

11. The energy harvesting node of claim 10, wherein the energy harvesting node is configured to remain in the SLEEP state until a predetermined threshold of energy has been harvested.

12. The energy harvesting node of claim 12, wherein, upon harvesting the predetermined threshold of energy, the energy harvesting node enters one of the TRANSMIT state or the RECEIVE state based on a non-deterministic function of a local network state.

13. The energy harvesting node of claim 13, wherein the non-deterministic function comprises one or more of a channel state, traffic backlog, local topology, or energy characteristics.

14. The energy harvesting node of claim 9, wherein the energy harvesting node, while in the TRANSMIT state, waits to receive an RTR beacon from a potential relay node determined by an opportunistic routing scheme;

if the energy harvesting sensor does not detect any transmissions, it transmits the packet to the relay node as determined by the opportunistic relay scheme; and

if the energy harvesting sensor detects another transmission, it delays transmission until the currently active transmissions have completed.

15. The energy harvesting node of any one of claims 10-11, wherein the energy harvesting node routes packets using one or more received RTR beacons to infer information about the energy status of neighboring nodes.

16. The energy harvesting node of any one of claims 10, 11, or 15, wherein the predefined communication protocol comprises a media access control (MAC) protocol.

17. The energy harvesting node of any one of claims 9-10, further comprising a sensor (230).