WHAT IS CLAIMED IS

1. A radio communications system comprising multiple satellites orbiting the earth for providing a radio route for data communications between transceivers at two ground station locations via one or more of said satellites, each satellite and ground station comprising a node of the system, wherein each of a plurality of the satellites includes:

a plurality of directional satellite antennas for receiving an initial information signal from at least one ground station and for transmitting routing signals from multiple satellite antennas, each said antenna being constructed for transmitting radio signals in a plurality of directions different from each other and for receiving radio signals in a plurality of directions different from each other;

antenna pairing circuitry for storing (i) address information identifying a ground station from which the satellite received an initial information signal, (ii) the identity of the particular satellite antenna on which the satellite received the initial information signal, and (iii) the particular direction from which said particular satellite antenna received the initial information signal; and

route creation circuitry for transmitting routing signals from multiple satellite antennas, wherein the routing signals comprise (i) linking information including an address of the ground station that sent the initial information signal, and (ii) a property of the received initial information signal indicating a suitability of the satellite as a node in a radio route to the ground station identified by the stored address.

2. A system as in claim 1, wherein each of the satellite antennas comprises a reflector with a plurality of feeds for transmitting and receiving radio signals in the plurality of directions different from each other and the antenna pairing circuitry stores the feed on which the satellite received the initial information signal.

3. A system as in claim 2, wherein corresponding feeds of each of the satellite antennas are disposed in the same angular orientation relative to the antenna reflector for transmitting radio signals at the same angle relative to an axis of the antenna.

4. A system as in claim 2, wherein the satellite antennas are arranged to transmit and receive radio signals in multiple directions around the entire spherical space surrounding each of the satellites.

5. A system as in claim 2, wherein the satellite antennas are arranged to transmit and receive radio signals in multiple different directions around less than the entire spherical space surrounding each of the satellites.

6. A system as in claim 1, wherein the satellite nodes are designated as a first type and the ground station nodes are designated as a second type, and nodes of the same type do not communicate with each other.

7. A system as in claim 1, wherein the routing signals comprise packets of digital data, each packet including;

a header containing the linking information and the quality of the received initial information signal; and

a payload including a sample data stream used by another node receiving a routing signal to determine the quality of the routing signal received from the satellite, wherein the quality of the received routing signal is expressed as a quantitative figure of merit based at least in part on an error rate of the sample data stream.

8. A method for creating a radio communication route for data communications from a receiving ground station to a sending ground station via a system as in claim 1, wherein the ground

stations include a plurality of ground station directional antennas for transmitting and receiving radio signals, the method comprising:

(a) receiving at a satellite antenna of at least one satellite an initial information signal transmitted from an antenna at a sending ground station;

(b) storing at any satellite receiving an initial information signal at least (i) address information identifying the ground station from which the satellite received an initial information signal, (ii) the satellite antenna on which the satellite received the initial information signal, and (iii) the direction from which the antenna received the information signal;

(c) transmitting routing signals from multiple antennas of at least one satellite receiving the initial information signal, wherein the routing signals comprise (i) linking information including an address of the ground station that sent the initial information signal, and (ii) a property of the received initial information signal indicating a suitability of the satellite as a node in the radio route to the ground station identified by the stored address;

(d) storing at a receiving ground station receiving at least one routing signal (i) the receiving ground station antenna on which the routing signal was received, and (ii) the property of the initial information signal received at the satellite transmitting the routing signal; and

(e) determining a quality of a radio route for data communications from the receiving ground station to the sending ground station via a particular satellite based on (i) the property of the received routing signal indicating a suitability of the particular satellite as a node in a radio route between the ground stations, and (ii) the property of the initial information signal.

9. A method as in claim 8, wherein the satellites are designated as a first type of node and the ground stations are designated as a second type of node, and nodes of the same type do not communicate with each other.

10. A method as in claim 9 further including sending a data transmission from the receiving ground station to the sending ground station, wherein the first type of node only transmits radio signals in a first mode and only receives radio signals in a second mode that eliminates interference with transmissions in the first mode, and the second type of node only receives radio signals in the first mode and only transmits radio signals in the second mode.

11. A method as in claim 8, wherein all of the satellite antennas comprise a reflector with a plurality of feeds for transmitting radio signals in a like plurality of directions different from each other and for receiving radio signals in the respective different directions.

12. A method as in claim 11, wherein corresponding feeds of each of the satellite antennas are disposed in the same angular orientation relative to the antenna reflector for transmitting radio signals at the same angle relative to an axis of the antenna.

13. A method as in claim 8, wherein the satellite antennas are arranged to transmit and receive radio signals in multiple directions around the entire spherical space surrounding each of the satellites.

14. A method as in claim 8, wherein the determining step is performed by the receiving ground station without using a controlling computer communicating with the satellites or other ground stations.

15. A method as in claim 8, wherein the satellites rotate about an axis of rotation.

16. A method as in claim 15, wherein a predetermined plurality of the satellites rotate in a first direction about a rotational axis and a second predetermined plurality rotate in a second direction about a rotational axis.

17. A method as in claim 16, wherein predetermined numbers of the satellites rotate in opposite directions.

18. A method for creating a radio communication route including multiple satellites via a system as in claim 1, wherein the route comprises plural satellites, the method comprising:

(a) transmitting a first routing signal from a plurality of the antennas of a first satellite N1 receiving the initial information signal;

(b) identifying at a second satellite N2 one or more signal directions from which each of a first antenna and a second antenna receives the first routing signal;

(c) designating at the second satellite N2 the signal direction of the first antenna with the highest quality signal and the signal direction of the second antenna with the highest quality signal;

(d) selecting from the designated message directions the antenna and direction of satellite N2 with the higher signal quality;

(e) storing at the satellite N2 the antenna and direction selected in step (d); and

(f) transmitting from the satellite N2 a second routing signal indicating the higher signal quality selected in step (d) and the signal quality of the initial information signal .

19. A system as in claim 1, wherein the satellites orbit the earth in random orbits without attitude control.

20. A system as in claim 1, wherein the satellites orbit the earth in uncontrolled orbits.

21. A ground station for use with a radio communications system comprising multiple satellites orbiting the earth for providing a radio route for data communications between transceivers at two ground stations via one or more satellites, wherein each of a plurality of the satellites includes (a) a plurality of directional satellite antennas for receiving an initial information signal from at least one ground station and for transmitting routing signals, (b) antenna pairing

circuitry for storing address information identifying a ground station from which the satellite received an initial information signal and the identity of the particular satellite antenna on which the satellite received the initial information signal, and (c) route creation circuitry for transmitting routing signals from multiple satellite antennas, wherein the routing signals comprise (i) linking information including an address of the ground station that sent the initial information signal, and (ii) a property of the received initial information signal indicating a suitability of the satellite as a node in a radio route to the ground station identified by the stored address,

the ground station including a plurality of directional antennas for sending initial information signals in a plurality of different directions, said initial information signals including the address information identifying the sending ground station, and at least one directional antenna for receiving from at least one of said satellites a routing signal with linking information including address information identifying a different ground station that transmitted an initial information signal.

22. A ground station as in claim 21 for use with a radio communications system in which the satellites orbit the earth in random orbits without attitude control.

23. A ground station as in claim 21 for use with a radio communications system in which the satellites orbit the earth in uncontrolled orbits.