CLAIMS

1. A system comprising:

a network controller configured to:

receive information from a plurality of nodes of a network, the plurality of nodes including a first node that is in motion relative to a second node;

generate a table representing available nodes and possible links in the network based on the received information;

determine a topology of the network for a given point in time based on the generated table;

receive client data information from one or more client devices;

determine a first plurality of flows for the determined topology based on the client data information, each of the plurality of flows comprising one or more requirements for a routing path through the network;

generate a first network configuration for the first determined topology based on the determined first plurality of flows, the first network configuration identifying a first subset of the possible links to be established using the plurality of nodes at a first point in time and being based on at least in part a number of changes from a previous network topology required for the network to implement the first network configuration;

determine a second plurality of flows between pairs of nodes in the network based on a second topology of the network for a second point in time, each of the nodes in the pairs of nodes being able to communicate with the one or more client devices outside of the network;

generate a second network configuration for the second determined topology based on the determined second plurality of flows, the second network configuration identifying a second subset of the possible links to be established using the plurality of nodes at a second point in time; and

responsive to the received client data information, send instructions to the plurality of nodes of the network for forming the identified first subset of the possible links according to the generated first network configuration and transmitting client data the first point in time and forming the identified second subset of the possible links according to the generated second network configuration and transmitting client data the second point in time.

2. The system of claim 1, further comprising the plurality of nodes.

3. The system of claim 1, wherein the plurality of nodes includes one or more ground stations and one or more high-altitude platforms.

4. The system of claim 1, wherein the plurality of nodes is configured to perform free-space optical communication.

5. The system of claim 1, wherein the table includes scheduled times or time frames including future times during which a given node or link is predicted to be available based on a predicted location or a predicted link metric.

6. The system of claim 1, wherein the client data information comprises historical client data trends, and the network controller is configured to determine the plurality of flows for the determined topology by predicting the client data information based on the historical client data trends.

7. The system of claim 1, wherein the network configuration includes one or more routing paths, each routing path satisfying the one or more requirements of one of the plurality of flows.

8. The system of claim 7, wherein the instructions sent to the plurality of nodes of the network cause the plurality of nodes to steer one or more transceiver based on the one or more routing paths.

9. The system of claim 7, wherein the instructions sent to the plurality of nodes of the network cause at least one of the plurality of nodes to update a routing table according to the one or more routing paths.

10. The system of claim 1, wherein the network controller is further configured to generate a series of network configurations and a schedule for the series of network configurations.

11. The system of claim 1, wherein:

the client data information includes an aggregate of a first amount of data to be transmitted and a second amount of data to be transmitted.

12. A method comprising:

receiving, by a network controller for a network, information from a plurality of nodes of the network, the plurality of nodes including a first node that is in motion relative to a second node;

generating, by the network controller, a table representing available nodes and possible links in the network based on the received information;

determining, by the network controller, a topology of the network for a given point in time based on the generated table;

receiving, by the network controller, client data information from one or more client devices;

determining, by the network controller, a first plurality of flows for a first determined topology based on the client data information, each of the plurality of flows comprising one or more requirements for a first routing path through the network;

generating, by the network controller, a first network configuration for the first determined topology based on the determined first plurality of flows, the first network configuration identifying a first

subset of the possible links to be established using the plurality of nodes at a first point in time and being based on at least in part a number of changes from a previous network topology required for the network to implement the first network configuration;

determining, by the network controller, a second plurality of flows for a second determined topology based on the client data information, each of the plurality of flows comprising one or more requirements for a second routing path through the network;

generating, by the network controller, a second network configuration for the second determined topology based on the determined second plurality of flows, the second network configuration identifying a second subset of the possible links to be established using the plurality of nodes at a second point in time; and

sending, by the network controller, instructions to the plurality of nodes of the network for forming the identified first subset of the possible links according to the generated network configuration and transmitting client data at the first point in time and forming the identified second subset of the possible links according to the generated second network configuration at the second point in time.

13. The method of claim 12, wherein the table includes scheduled times or time frames including future times during which a given node or link is predicted to be available based on a predicted location or a predicted link metric.

14. The method of claim 12, wherein the client data information comprises historical client data trends, and the method further comprises determining, by the network controller, the plurality of flows for the determined topology by predicting the client data information based on the historical client data trends.

15. The method of claim 12, wherein the network configuration includes one or more routing paths, each routing path satisfying the one or more requirements of one of the plurality of flows.

16. The method of claim 15, wherein the instructions sent to the plurality of nodes of the network cause the plurality of nodes to steer one or more transceiver based on the one or more routing paths.

17. The method of claim 15, wherein the instructions sent to the plurality of nodes of the network cause at least one of the plurality of nodes to update a routing table according to the one or more routing paths.

18. The method of claim 15, wherein the network controller is further configured to generated a series of network configurations and a schedule for the series of network configurations.

19. The method of claim 12, wherein the plurality of nodes is configured to perform free-space optical communication.

20. A system comprising:

a network controller configured to:

receive information from a plurality of nodes of a network, the plurality of nodes including a first node that is in motion relative to a second node;

generate a table representing nodes, available storage at each node, and possible links in the network over a period of time based on the received information;

determine a series of topologies of the network over the period of time based on the generated table;

receive client data information from one or more client devices, the client data information including a data amount;

determine a plurality of flows for the determined series of topologies based on at least the data amount and the available storage at each node, each of the plurality of flows comprising one or more requirements for a routing path through the network;

generate a schedule of network configurations for the determined series of topologies based on the determined plurality of flows; and

send instructions to the plurality of nodes of the network for implementing the schedule of network configurations and transmitting client data over the period of time.

21. The system of claim 20, further comprising the plurality of nodes.

22. The system of claim 20, wherein the plurality of nodes includes one or more ground stations and one or more high-altitude platforms.

23. The system of claim 20, wherein the plurality of nodes is configured to perform free-space optical communication.

24. The system of claim 20, wherein the schedule of network configurations includes a first network configuration, a second network configuration scheduled to follow the first network configuration, a first routing path having a first portion between a first node and a second node and a second portion between the second node and a third node, and the first portion of the first routing path being a part of the first network configuration and the second portion of the first routing path being a part of the second network configuration.

25. The system of claim 24, wherein the second node has enough available storage to store the data amount, and the second portion of the first routing path beings at the second node and the second node is configured to store the client data before transmitting the client data via the second portion of the routing path.

26. The system of claim 25, wherein the second network configuration includes a newly established link between the second node and a next hop in the second portion of the routing path.

27. The system of claim 26, wherein the second node is in motion relative to the next hop in the second portion of the routing path.

28. The system of claim 24, wherein the network controller is further configured to:

determine that there are no routes between the first node and the third node in each topology in the series of topologies; and

generate the schedule of network configurations in response to determining that there are no routes between the first node and the third node in each topology in the series of topologies.

29. The system of claim 20, wherein the network controller is configured to determine a plurality of flows for the determined series of topologies based on at least the data amount and the available storage at each node by:

identifying a given node having enough available storage to store the data amount; and

determining at least one flow including the given node in which the given node is used to store the client data for a period of time in the at least one flow.

30. A method comprising:

receiving, by a network controller for a network, information from a plurality of nodes of the network, the plurality of nodes including a first node that is in motion relative to a second node;

generating, by the network controller, a table representing nodes, storage capacity of each node, and possible links in the network over a period of time based on the received information;

determining, by the network controller, a series of topologies of the network over the period of time based on the generated table;

receiving, by the network controller, client data information from one or more client devices, the client data information including a data amount;

determining, by the network controller, a plurality of flows for the determined series of topologies based on at least the data amount and the storage capacity of each node, each of the plurality of flows comprising one or more requirements for a routing path through the network;

generating, by the network controller, a schedule of network configurations for the determined series of topologies based on the determined plurality of flows; and

sending, by the network controller, instructions to the plurality of nodes of the network for implementing the schedule of network configurations and transmitting client data over the period of time.

31. The method of claim 30, wherein the schedule of network configurations includes a first network configuration, a second network configuration scheduled to follow the first network configuration, a first routing path having a first portion between a first node and a second node and a second portion between the second node and a third node, the first portion of the first routing path being a part of the first network configuration and the second portion of the routing path being a part of the second network configuration.

32. The method of claim 31, wherein the second node has enough available storage to store the data amount, and the second portion of the first routing path being at the second node, and the second node is configured to store the client data before transmitting the client data via the second portion of the routing path.

33. The method of claim 32, wherein the second network configuration includes a newly established link between the second node and a next hop in the second portion of the routing path.

34. The method of claim 33, wherein the second node is in motion relative to the next hop in the second portion of the routing path.

35. The method of claim 31, further comprising:

determining, by the network controller, that there are no routes between the first node and the third node in each topology in the series of topologies; and

generating, by the network controller, the schedule of network configurations in response to determining that there are no routes between the first node and the third node in each topology in the series of topologies.

36. The method of claim 30, wherein determining a plurality of flows for the determined series of topologies based on at least the data amount and the available storage at each node includes:

identifying a given node having enough available storage to store the data amount; and

determining at least one flow including the given node in which the given node is used to store the client data for a period of time in the at least one flow.

37. A non-transitory, tangible computer-readable storage medium on which computer readable instructions of a program are stored, the instructions, when executed by a network controller for a network, cause the network controller to perform a method, the method comprising:

receiving information from a plurality of nodes of the network, the plurality of nodes including a first node that is in motion relative to a second node;

generating a table representing nodes, storage capacity of each node, and possible links in the network over a period of time based on the received information;

determining a series of topologies of the network over the period of time based on the generated table;

receiving client data information from one or more client devices, the client data information including a data amount;

determining a plurality of flows for the determined series of topologies based on at least the data amount and the storage capacity of each node, each of the plurality of flows comprising one or more requirements for a routing path through the network;

generating a schedule of network configurations for the determined series of topologies based on the determined plurality of flows; and

sending instructions to the plurality of nodes of the network for implementing the schedule of network configurations and transmitting client data over the period of time.

38. The medium of claim 37, wherein the schedule of network configurations includes a first network configuration, a second network configuration scheduled to follow the first network configuration, a first routing path having a first portion between a first node and a second node and a second portion between the second node and a third node, the first portion of the first routing path being a part of the first network configuration and the second portion of the routing path being a part of the second network configuration.

39. The medium of claim 38, wherein the second node has enough available storage to store the data amount, and the second portion of the first routing path beings at the second node, and the second node is configured to store the client data before transmitting the client data via the second portion of the first routing path.