WHAT IS CLAIMED IS:

1. A satellite system for use in a multi-satellite constellation for providing a communications network, the satellite comprising:

an antenna system comprising a plurality of spot beams, including first and second terra-link beams and a cross-link beam;

a bent-pipe pathway associated with the plurality of spot beams;

a memory coupled with the pathway and having a pathway configuration schedule stored thereon; and

a pathway configuration system to sequentially configure the pathway in each of a plurality of timeslots to form a signal path between a selected pair of the spot beams according to the pathway configuration schedule,

such that the pathway is configured in a first timeslot to establish connectivity between the first and second terra-link beams, and the pathway is configured in a second timeslot to establish connectivity between the first terra-link beam and the cross-link beam.

2. The system of claim 1, wherein the pathway is one of a plurality of pathways, each assigned to a respective subset of the plurality of spot beams, and each sequentially configurable in each timeslot to form a signal path between a selected pair of the respective subset of spot beams according to the pathway configuration schedule.

3. The system of claim 1, wherein the satellite is a low Earth orbit satellite.

4. The system of claim 1, wherein the satellite is a medium Earth orbit satellite.

5. A satellite constellation system comprising:

a plurality of bent-pipe satellites,

each satellite comprising an antenna system having a plurality of spot beams, including first and second terra-link beams and a cross-link beam, and

each satellite comprising a pathway that is sequentially configurable in each of a plurality of timeslots to form a signal path between a selected pair of the spot beams of the satellite according to a pathway configuration schedule, so that, for each satellite:

the pathway establishes connectivity between the first and second terra-link beams during at least one timeslot; and

the pathway establishes connectivity between the first terra-link beam and the cross-link beam during at least another timeslot.

6. The system of claim 5, wherein each satellite travels along a respective one of a plurality of orbital paths of the constellation.

7. The system of claim 6, wherein each terrestrial spot beam footprint follows a ground track path that corresponds to the orbital path of the satellite illuminating the terrestrial spot beam footprint.

8. The system of claim 1 or 5, wherein the pathway configuration system sequentially configures the pathway in each of the plurality of timeslots to form a physical circuit that couples the selected pair of spot beams according to the pathway configuration schedule.

9. The system of claim 1 or 5, wherein:

the pathway has a receive side coupled with a receiver; and

the pathway has a transmit side coupled with a transmitter.

10. The system of claim 1 or 5, wherein the antenna system comprises a plurality of fixed feed horns that service the terra-link beams and the cross-link beam.

11. The system of claim 1 or 5, wherein the pathway configuration system comprises a receive switch to selectively couple a receive side of the pathway to one of a plurality of receive feeds of the antenna system in each of the plurality of timeslots, according to the pathway configuration schedule, to establish connectivity between the receive feed and a transmit feed coupled with a transmit side of the pathway, thereby sequentially configuring the pathway in each of the plurality of timeslots to form the signal path between the selected pair of spot beams according to the pathway configuration schedule.

12. The system of claim 1 or 5, wherein the pathway configuration system comprises a transmit switch to selectively couple a transmit side of the pathway to one of a plurality of transmit feeds of the antenna system in each of the plurality of timeslots, according to the pathway configuration schedule, to establish connectivity between the transmit feed and a receive feed coupled with a receive side of the pathway, thereby sequentially configuring the pathway in each of the plurality of timeslots to form the signal path between the selected pair of spot beams according to the pathway configuration schedule.

13. The system of claim 1 or 5, wherein the pathway configuration system comprises:

a receive switch to selectively couple a receive side of the pathway to one of a plurality of receive feeds of the antenna system in each of the plurality of timeslots according to the pathway configuration schedule; and

a transmit switch to selectively couple a transmit side of the pathway to one of a plurality of transmit feeds of the antenna system in each of the plurality of timeslots according to the pathway configuration schedule,

thereby establishing connectivity in each timeslot between a receive spot beam and a transmit spot beam according to the pathway configuration schedule via the receive feed, the pathway, and the transmit feed.

14. The system of claim 1 or 5, wherein the antenna system comprises a phased-array antenna that services the terra-link beams and the cross-link beam.

15. The system of claim 14, wherein the pathway configuration system comprises a receive beamforming network coupled between the phased array antenna and a receive side of the pathway, the receive beamforming network operable to adjust beam weightings to form a signal coupling, in each of the plurality of timeslots, between a receive beam and the receive side of the pathway, thereby sequentially configuring the pathway in each of the plurality of timeslots to form the signal path between the selected pair of spot beams according to the pathway configuration schedule, one of the selected pair of spot beams being the receive beam.

16. The system of claim 14, wherein the pathway configuration system comprises a transmit beamforming network coupled between the phased array antenna and a transmit side of the pathway, the transmit beamforming network operable to adjust beam weightings to form a signal coupling, in each of the plurality of timeslots, between a transmit beam and the transmit side of the pathway, thereby sequentially configuring the pathway in each of the plurality of timeslots to form the signal path between the selected pair of spot beams according to the pathway configuration schedule, one of the selected pair of spot beams being the transmit beam.

17. The system of claim 14, wherein the pathway configuration system comprises:

a receive beamforming network coupled between the phased array antenna and a receive side of the pathway, the receive beamforming network operable to adjust beam weightings to form a signal

coupling, in each of the plurality of timeslots, between a receive beam and the receive side of the pathway; and

a transmit beamforming network coupled between the phased array antenna and a transmit side of the pathway, the transmit beamforming network operable to adjust beam weightings to form a signal coupling, in each of the plurality of timeslots, between a transmit beam and the transmit side of the pathway,

thereby sequentially configuring the pathway in each of the plurality of timeslots to form the signal path between the selected pair of spot beams according to the pathway configuration schedule, the selected pair of spot beams comprising the receive beam and the transmit beam.

18. The system of claim 17, wherein:

the receive beamforming network is coupled between a first reflector of the phased array antenna and the receive side of the pathway; and

the transmit beamforming network is coupled between a second reflector of the phased array antenna and the transmit side of the pathway.

19. The system of claim 1 or 5, wherein the antenna system comprises a plurality of fixed feed horns that service the terra-link beams, and a phased-array antenna that services the cross-link beam.

20. The system of claim 1 or 5, wherein:

one of the terra-link beams is to communicate uplink traffic in an uplink band and an uplink polarization; and

the other of the terra-link beams is to communicate downlink traffic in a downlink band and a downlink polarization,

wherein the uplink band is different from the downlink band and/or the uplink polarization is different from the downlink polarization.

21. The system of claim 20, wherein:

the cross-link beam is to communicate cross-link traffic in a cross-link band that is different from at least one of the uplink band or the downlink band.

22. A method for scheduled connectivity switching in a satellite of a multi-satellite constellation, the method comprising:

first configuring a pathway of the satellite to form a bent-pipe signal path that establishes connectivity between a first terra-link beam and a second terra-link beam in a first timeslot according to a pathway configuration schedule stored in memory of the satellite, the satellite having an antenna comprising a plurality of spot beams including the first and second terra-link beams and a cross-link beam; and

second configuring the pathway to form a bent-pipe signal path that establishes connectivity between the first terra-link beam and the cross-link beam in a second timeslot according to the pathway configuration schedule.

23. The method of claim 22, further comprising:

receiving the pathway configuration schedule by the satellite from one of the terrestrial terminals while the satellite is in flight.

24. The method of claim 22, further comprising:

first receiving, subsequent to the first configuring, first traffic as a first uplink communication from a first terrestrial terminal illuminated by the first terra-link beam;

first transmitting, via the pathway, the first traffic as a downlink communication to a second terrestrial terminal illuminated by the second terra-link beam;

second receiving, subsequent to the second configuring, second traffic as a second uplink communication from the first terrestrial terminal illuminated by the first terra-link beam; and

second transmitting, via the pathway, the second traffic as a cross-link communication to another satellite of the constellation illuminated by the cross-link beam.

25. The method of claim 22, wherein the first configuring comprises forming a physical circuit that establishes connectivity between the first terra-link beam and the second terra-link beam according to the pathway configuration schedule.

26. The method of claim 22, wherein configuring the pathway comprises switching a receive switch to selectively couple a receive side of the pathway to one of a plurality of antenna receive feeds in at least one of the plurality of timeslots according to the pathway configuration schedule.

27. The method of claim 22 or 26, wherein configuring the pathway comprises switching a transmit switch to selectively couple a transmit side of the pathway to one of a plurality of antenna receive feeds in at least one of the plurality of timeslots according to the pathway configuration schedule.

28. The method of claim 22, wherein configuring the pathway comprises adjusting beam weightings in a receive beamforming network coupled between a phased array antenna and a receive side of the pathway in at least one of the plurality of timeslots according to the pathway configuration schedule.

29. The method of claim 22 or 28, wherein configuring the pathway comprises adjusting beam weightings in a transmit beamforming network coupled between a phased array antenna and a transmit side of the pathway in at least one of the plurality of timeslots according to the pathway configuration schedule.