CLAIMS

1. An interconnection system comprising:

at least one interconnection facility and a programmable network platform,

the at least one interconnection facility including:

an optical switch fabric having a plurality of optical fibers and a plurality of photonic switches interconnected by the plurality of optical fibers;

a first customer space, for a first customer of an interconnection system provider for the interconnection system, within the at least one interconnection facility, the first customer space associated with a first fiber patch panel comprising a first plurality of provider-side optical ports accessible to the interconnection system provider and a first plurality of customer-side optical ports accessible to the first customer from the first customer space, the first plurality of provider-side optical ports including a first provider-side optical port operably coupled to a first optical fiber from the plurality of optical fibers; and

a second customer space, for a second customer of the interconnection system provider, within the at least one interconnection facility, the second customer space associated with a second fiber patch panel comprising a second plurality of provider-side optical ports accessible to the interconnection system provider and a second plurality of customer-side optical ports accessible to the second customer from the second customer space, the second plurality of provider-side optical ports including a second provider-side optical port operably coupled to a second optical fiber from the plurality of optical fibers, and

the programmable network platform configured to, in response to receiving a fiber cross-connect request that requests an interconnection between the first customer and the second customer and specifies an identifier for the first provider-side optical port and an identifier for the second provider-side optical port for an end-to-end optical fiber cross-connect, configure the plurality of photonic switches to create an optical fiber cross-connect between the first optical fiber and the second optical fiber to provide the end-to-end optical fiber cross-connect that includes the first optical fiber, the second optical fiber, and the optical fiber cross-connect.

2. The interconnection system of claim 1,

wherein the at least one interconnection facility comprises one or more interconnection system provider cages that enclose a provider space within the at least one interconnection facility that is accessible only to the interconnection system provider,

wherein each interconnection system provider cage of the one or more interconnection system provider cages includes at least one photonic switch of the plurality of photonic switches, and

wherein the optical fiber cross-connect comprises respective transmission paths for the plurality of photonic switches.

3. The interconnection system of claim 2, wherein the one or more interconnection system provider cages comprise a main distribution facility and plurality of intermediate distribution facilities, the main distribution facility including at least one photonic switch of the plurality of photonic switches operably coupled, via the plurality of optical fibers, to photonic switches included in the plurality of intermediate distribution facilities.

4. The interconnection system of claim 1, wherein the first fiber patch panel comprises:

a photonic switch configured to, in response to receiving configuration data according to a configuration initiated by the programmable network platform, create an optical transmission path between the first provider-side optical port and a customer-side optical port of the first plurality of customer-side optical ports,

wherein the end-to-end optical fiber cross-connect comprises the optical transmission path between the first provider-side optical port and the first customer-side optical port of the plurality of customer-side optical ports.

5. The interconnection system of claim 1, wherein the end-to-end fiber cross-connect comprises a Layer 0 optical transmission path configured to transport optical signals between the first provider-side optical port and the second provider-side optical port.

6. The interconnection system of claim 1, further comprising a network services exchange, the network services exchange comprising one of an Ethernet exchange, an Internet exchange, and a cloud-based service exchange, and

wherein the programmable network platform configures the network services exchange to exchange Layer 2 or Layer 3 packets over the end-to-end fiber cross-connect

between respective customer equipment located at the first customer space and the second customer space.

7. The interconnection system of claim 1, further comprising:

one or more software-defined networking (SDN) controllers each responsible for managing at least one photonic switch of the plurality of photonic switches,

wherein, to configure the plurality of photonic switches, the programmable network platform comprises an orchestration engine configured to direct the one or more SDN controllers to configure the plurality of photonic switches.

8. The interconnection system of claim 1, further comprising:

an application including one of a customer portal application accessible to the first customer and an interconnection system provider application accessible only to the interconnection system provider,

wherein the programmable network platform comprises a service interface configured to receive, from the application, the fiber cross-connect request.

9. The interconnection system of claim 1,

wherein the programmable network platform, in response to the fiber cross-connect request, identifies an optical path through the optical switch fabric configurable for optically coupling the first provider-side port and the second provider-side port, and

wherein the programmable network platform, in response to the identifying, configures the plurality of photonic switches to create the optical fiber cross-connect over the optical path.

10. The interconnection system of claim 1, further comprising:

a cloud-based services exchange,

wherein the first customer is an enterprise and the second customer is a cloud service provider.

11. The interconnection system of claim 1, wherein each of the first customer space and the second customer space comprises at least one of a cage, a cabinet, a rack, and a suite.

12. The interconnection system of claim 1, wherein the fiber cross-connect comprises at least one lambda switched by the plurality of photonic switches to provide an optical path for optical signals exchanged between respective customer equipment located at the first customer space and the second customer space.

13. The interconnection system of claim 1, wherein the programmable network platform comprises:

one or more network field units; and

a centralized network control module including:

a service interface configured to receive the fiber cross-connect request; and

a fiber cross-connect provisioning engine configured to determine, based on the fiber cross-connect request, service parameters that specify one or more requirements to implement the end-to-end fiber cross-connect,

wherein the fiber cross-connect provisioning engine is further configured to determine, based on the service parameters, at least one network field unit of the one or more network field units that are capable of servicing the fiber cross-connect request,

wherein the at least one network field unit controls a portion of the optical switch fabric, wherein the service parameters are usable by the at least one network field unit to configure the portion of optical switch fabric to provide a segment of the end-to-end fiber cross-connect, and

wherein the at least one network field unit is configured to configure the portion of optical switch fabric to provide a segment of the end-to-end fiber cross-connect.

14. A computing device comprising:

at least one programmable processor operably coupled to a memory; and

a programmable network platform configured for execution by the at least one programmable processor to:

receive a fiber cross-connect request that requests an interconnection in at least one interconnection facility between a first customer and a second customer and specifies an identifier for a first provider-side optical port and an identifier for a second provider-side optical port for an end-to-end optical fiber cross-connect; and

in response to receiving the fiber cross-connect request, configure a plurality of

photonic switches to create an optical fiber cross-connect between a first optical fiber and a second optical fiber to provide an end-to-end optical fiber cross-connect that includes the first optical fiber, the second optical fiber, and the optical fiber cross-connect,

wherein the first customer has a first customer space located within the at least one interconnection facility and the second customer has a second customer space located within the at least one interconnection facility,

wherein the first customer space is associated with a first fiber patch panel comprising a first plurality of provider-side optical ports accessible to an interconnection system provider for the at least one interconnection facility and a first plurality of customer-side optical ports accessible to the first customer from the first customer space, the first plurality of provider-side optical ports including the first provider-side optical port operably coupled to the first optical fiber from a plurality of optical fibers interconnecting the plurality of photonic switches to form an optical switch fabric, and

wherein the second customer space is associated with a second fiber patch panel comprising a second plurality of provider-side optical ports accessible to the interconnection system provider and a second plurality of customer-side optical ports accessible to the second customer from the second customer space, the second plurality of provider-side optical ports including the second provider-side optical port operably coupled to the first optical fiber from the plurality of optical fibers.

15. The computing device of claim 14, wherein the end-to-end fiber cross-connect comprises a Layer 0 optical transmission path configured to transport optical signals between the first provider-side optical port and the second provider-side optical port.

16. The computing device of claim 14, wherein the programmable network platform is further configured to configure a network services exchange to exchange Layer 2 or Layer 3 packets over the end-to-end fiber cross-connect between respective customer equipment located at the first customer space and the second customer space.

17. The computing device of claim 14, wherein the programmable network platform is further configured to direct one or more software-defined networking (SDN) controllers to configure the plurality of photonic switches managed by the SDN controllers.

18. The computing device of claim 14,

wherein the programmable network platform is further configured to, in response to the fiber cross-connect request, identify an optical path through the optical switch fabric configurable for optically coupling the first provider-side port and the second provider-side port, and

wherein the programmable network platform is further configured to, in response to the identifying, configure the plurality of photonic switches to create the optical fiber cross-connect over the optical path.

19. The computing device of claim 14, wherein the programmable network platform comprises:

one or more network field units; and

a centralized network control module including:

a service interface configured to receive the fiber cross-connect request; and

a fiber cross-connect provisioning engine configured to determine, based on the fiber cross-connect request, service parameters that specify one or more requirements to implement the end-to-end fiber cross-connect,

wherein the fiber cross-connect provisioning engine is further configured to determine, based on the service parameters, at least one network field unit of the one or more network field units that are capable of servicing the fiber cross-connect request,

wherein the at least one network field unit controls a portion of the optical switch fabric, wherein the service parameters are usable by the at least one network field unit to configure the portion of optical switch fabric to provide a segment of the end-to-end fiber cross-connect, and

wherein the at least one network field unit is configured to configure the portion of optical switch fabric to provide a segment of the end-to-end fiber cross-connect.

20. A method comprising:

receiving, by a programmable network platform for at least one interconnection facility, a fiber cross-connect request that requests an interconnection in the at least one interconnection facility between a first customer and a second customer and specifies an identifier for the first provider-side optical port and an identifier for the second provider-side optical port for an end-to-end optical fiber cross-connect; and

configuring, by the programmable network platform in response to receiving the fiber cross-connect request, a plurality of photonic switches to create an optical fiber cross-connect between a first optical fiber and a second optical fiber to provide an end-to-end optical fiber cross-connect that includes the first optical fiber, the second optical fiber, and the optical fiber cross-connect,

wherein the first customer has a first customer space located within the at least one interconnection facility and the second customer has a second customer space located within the at least one interconnection facility,

wherein the first customer space is associated with a first fiber patch panel comprising a first plurality of provider-side optical ports accessible to an interconnection system provider for the at least one interconnection facility and a first plurality of customer-side optical ports accessible to the first customer from the first customer space, the first plurality of provider-side optical ports including the first provider-side optical port operably coupled to the first optical fiber from a plurality of optical fibers interconnecting the plurality of photonic switches to form an optical switch fabric, and

wherein the second customer space is associated with a second fiber patch panel comprising a second plurality of provider-side optical ports accessible to the interconnection system provider and a second plurality of customer-side optical ports accessible to the second customer from the second customer space, the second plurality of provider-side optical ports including the second provider-side optical port operably coupled to the first optical fiber from the plurality of optical fibers.

21. The method of claim 20, further comprising:

installing, by an interconnection facility provider for the at least one interconnection facility and prior to the programmable network platform configuring the plurality of photonic switches to create the optical fiber cross-connect, the plurality of optical fibers including the first optical fiber and the second optical fiber.

22. An interconnection system comprising:

at least one interconnection facility and a programmable network platform, the at least one interconnection facility including:

an optical switch fabric having a plurality of optical fibers and a plurality of photonic switches interconnected by the plurality of optical fibers;

a first customer space, for a first customer of an interconnection system provider for the interconnection system, within the at least one interconnection facility, the first customer space associated with a first fiber patch panel comprising a first plurality of provider-side optical ports accessible to the interconnection system provider and a first plurality of customer-side optical ports accessible to the first customer from the first customer space, the first plurality of provider-side optical ports including a first provider-side optical port operably coupled to a first optical fiber from the plurality of optical fibers; and

a second customer space, for a second customer of the interconnection system provider, within the at least one interconnection facility, the second customer space associated with a second fiber patch panel comprising a second plurality of provider-side optical ports accessible to the interconnection system provider and a second plurality of customer-side optical ports accessible to the second customer from the second customer space, the second plurality of provider-side optical ports including a second provider-side optical port operably coupled to a second optical fiber from the plurality of optical fibers, and

the programmable network platform comprising an application programming interface to receive fiber cross-connect requests from applications,

wherein the programmable network platform, in response to receipt by the application programming interface of a fiber cross-connect request that requests an interconnection between the first customer and the second customer and specifies an identifier for the first provider-side optical port and an identifier for the second provider-side optical port for an end-to-end optical fiber cross-connect, is configured to configure the plurality of photonic switches to create an optical fiber cross-connect between the first optical fiber and the second optical fiber to provide the end-to-end optical fiber cross-connect that includes the first optical fiber, the second optical fiber, and the optical fiber cross-connect.