

PUBLIC TECHNICAL SPECIFICATION

Service provider interconnection

Open Access wholesale connectivity

FiberEins connects service providers with customers over an open fibre access network. Combine your own brand, products and customer relationships with FiberEins Layer 2 transport and NNI interface options from 1 to 100 Gbit/s.

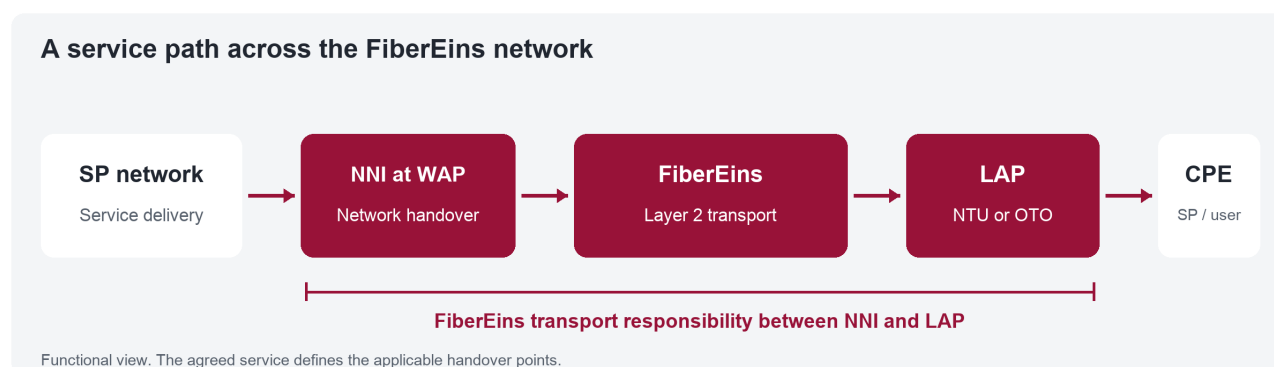


Figure 1 Functional service path and transport boundary

Using this guide

Use this document to assess interface compatibility and service requirements. The ordered service profile, agreed handover arrangement and applicable SLA define the parameters for each connection. Partner-specific configuration is supplied during ISP onboarding.

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Open Access with FiberEins

Open Access enables multiple service providers to use a common network infrastructure. FiberEins supplies the active Layer 2 transport so that providers can compete through their services, customer experience and commercial offers.

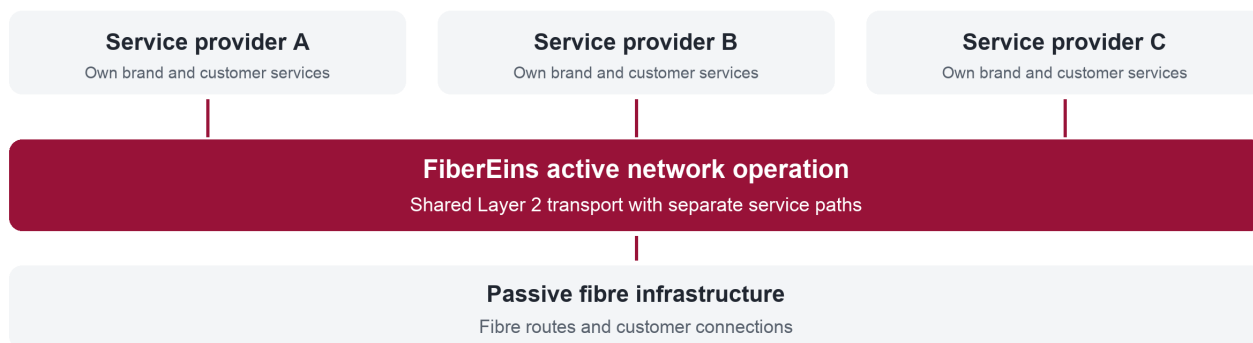


Figure 2 Open Access roles and shared infrastructure

A network open to service providers

The FiberEins model is multi-provider and multi-service. Connection requirements are transparent and apply equally to participating SPs, without exclusivity for a single provider. Participation requires the agreed commercial and technical arrangements. Customers choose among the participating providers and services available at their location.

Your services and customer relationships

As an SP, you define your retail products, pricing and customer experience. You retain responsibility for your service delivery, IP addressing and customer support. FiberEins provides the access transport between the agreed handover points, allowing you to serve connected premises without building a separate access network for each provider.

Shared infrastructure with clear roles

An Open Access network separates passive infrastructure, active network operation and customer-facing services. These roles can be performed by different organisations. This guide describes the FiberEins active Layer 2 wholesale offering and its interfaces to SPs and customer connections.

A basis for growth

Standard Ethernet handovers, defined service profiles and NNI options of 1, 10, 40 and 100 Gbit/s support different interconnection needs. Providers can plan aggregate capacity as customer demand grows. Shared use of fibre infrastructure supports provider choice while avoiding the need for each SP to duplicate the same access routes.

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Service model and boundaries

FiberEins gives SPs a defined wholesale transport boundary while leaving room to differentiate their customer services. The service path connects the SP handover to the customer access point.

A service path for each service

A service path is a logical Ethernet connection between a service provider and a customer connection. Its service profile specifies the required upstream and downstream bandwidth, service class and applicable connection limits. Unicast and multicast services use the service model described on page 6.

The access network is primarily designed for FTTH services. Routed subnets can support business use cases. VPLS services are outside the service scope described in this guide.

Boundary	Role in the connection
WAP Wholesale Access Point	The agreed central or regional location where the SP connects to the FiberEins network.
NNI Network-to-Network Interface	The physical and/or logical interface between the SP network and FiberEins at the WAP.
LAP Local Access Point	The customer-side endpoint of the FiberEins Layer 2 transport service. Depending on the access variant, this is an NTU port or an OTO.
CPE Customer Premises Equipment	Equipment used by the SP or end customer beyond the agreed handover, such as a router or set-top box.

Customer separation

FiberEins provides Layer 2 isolation between end customers. Unicast traffic follows the service path to the relevant SP. Multicast distribution follows its own service model; it does not imply general connectivity between customer connections.

Connection identification

For the DHCPv4-based service model, FiberEins supplies network-side connection identification using DHCP Option 82. The SP uses that information to associate the connection with the requested service. The detailed identification and provisioning parameters are agreed during onboarding.

Equipment and handover choice

FiberEins controls the active equipment within its responsibility domain. Customer access is provided through a FiberEins NTU or, at NTU-less locations, through an optical outlet. SP and customer equipment must match the interface offered at the location. Equipment selection is vendor-neutral, subject to compatibility with the service requirements.

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Service provider interfaces

FiberEins offers optical Ethernet NNI connections at 1, 10, 40 and 100 Gbit/s. This range allows SPs to match the physical handover to their aggregate traffic and growth plans. The applicable interface is agreed at the selected WAP.

Service provider handover at the NNI

NNI rate	Physical interface
1 Gbit/s	1000BASE-LX optical Ethernet; LC-UPC handover.
10 Gbit/s	10GBASE-LR optical Ethernet; LC-UPC handover.
40 Gbit/s	40 Gigabit Ethernet optical handover. Optical standard, module type and connector are agreed for the connection.
100 Gbit/s	100 Gigabit Ethernet optical handover. Optical standard, module type and connector are agreed for the connection.

Optical interoperability

Both ends of the NNI must use compatible Ethernet optics. The port rate alone does not identify the required transceiver or fibre arrangement. Agree the optical interface before ordering equipment or arranging the cross-connect.

Parameter to agree	Purpose
Optical standard and module	Match the optical signalling standard and the supported transceiver at each end.
Fibre and connector	Confirm fibre type, fibre count, connector and polarity for the selected optics.
Optical budget	Match transmitter and receiver characteristics to the loss of the installed connection.
FEC where applicable	Align Forward Error Correction requirements and settings with the selected optical interface.
Ethernet frame handling	Confirm VLAN tagging and the supported frame size across the handover.

Link aggregation and capacity

The 1 and 10 Gbit/s connection options support groups of up to four interfaces of the same speed. Mixed 1 and 10 Gbit/s groups are not supported. Aggregation options and member limits for 40 and 100 Gbit/s handovers are agreed separately.

The NNI carries the SP's aggregated service traffic. Its physical capacity is distinct from the bandwidth ordered for each service. A higher NNI rate does not change the customer access interface or the individual service profile.

Interconnection cabling

The SP provides cabling to the agreed FiberEins port or meet-me-room / ODF connection point. The handover location, cross-connect arrangement and responsibilities are agreed with FiberEins for the relevant facility.

Customer access and fibre infrastructure

FiberEins supports two customer handover variants: an electrical interface on an NTU or a direct optical handover at an OTO. This gives SPs a clear basis for selecting compatible customer equipment.

Customer handover at the LAP

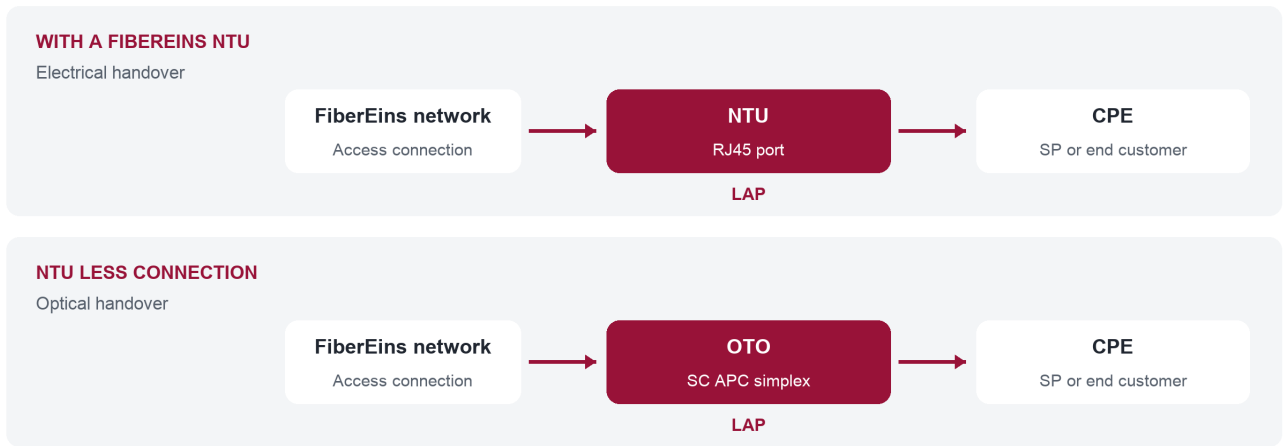


Figure 3 Customer handover with an NTU or at an optical outlet

Access variant	Customer-facing connection
With NTU	RJ45 Ethernet; supported variants include 100 Mbit/s and 1 Gbit/s, with auto-negotiation. The number of available ports depends on the installed NTU.
NTU less	SC APC simplex OTO. Customer-side optical interface: 1000BASE-BX-U, BiDi, 1310 nm TX / 1550 nm RX, 10 km class.

Fibre infrastructure and optical compatibility

The fibre access infrastructure uses ITU-T G.652.D / G.657.A fibre as applicable to the connection. The documented optical access arrangement uses a single fibre, with different transmit and receive wavelengths for the two directions. The physical handover remains the agreed NTU port or OTO.

At an NTU-less handover, the SP or customer equipment must provide the specified customer-side optical interface. Match the transmit and receive wavelengths, connector and optical budget to the connection. The customer access specification is separate from the NNI specification on page 4.

The optical interface class describes equipment compatibility; it does not specify the actual route length or replace the connection-specific optical requirements.

Service presentation at the customer port

Customer equipment receives the agreed service on an untagged port or, where ordered, a tagged multi-service port. The access variant determines the physical handover; the service profile determines bandwidth, traffic class and applicable limits. The logical service requirements are described on page 6.

Services and logical interfaces

Build differentiated customer offers on defined FiberEins transport profiles. Services are handed over using Ethernet and IEEE 802.1Q VLAN tagging, with agreed upstream and downstream capacity for each aggregated service.

Service classes

Service	E-CoS value	Use
Best effort unicast	1	General unicast traffic
Prioritized unicast	2	Unicast traffic with higher priority
VoIP	5	Voice traffic
IP-TV multicast	4	Multicast service, including associated unicast traffic

These values describe the service mapping used by FiberEins. FiberEins controls CoS marking. Prioritization applies during congestion or queuing; the class value alone does not define a bandwidth or quality guarantee.

Unicast and routed subnets

Each unicast service requires a service profile with a service name, upstream and downstream bandwidth, the routed-subnet option where needed, and a MAC-address limit. NTU-based services support up to eight MAC addresses per service per NTU. MAC-address handling and requirements for multiple services are specified during onboarding.

A routed subnet is an IP address range supplied by the SP behind the customer connection. IPv4 and IPv6 requirements must be agreed for the selected service; this guide does not define a general dual-stack offering.

Multicast

FiberEins provides Layer 2 IGMP snooping for multicast. Multicast routing remains outside the FiberEins service scope. Up to eight concurrent multicast joins are supported per service. DHCP addressing for set-top boxes is the SP's responsibility where applicable; arrangements without DHCP require coordination with FiberEins.

Customer port behaviour

Parameter	Service behaviour
Default handover	An untagged customer port is assigned to a service path.
Multiple services	A tagged customer port can be agreed for services belonging to the same SP. The documented NTU trunk option supports up to four VLANs: three unicast and one multicast.
VLAN assignment	FiberEins assigns service VLANs in coordination with the SP. Actual VLAN identifiers are supplied during onboarding.
MTU	The documented customer interface MTU is 1500 bytes. Confirm the required Ethernet frame handling, including tags, during interconnection planning.

Provisioning and responsibilities

Clear responsibilities support a practical partnership: FiberEins operates the access transport, while the SP delivers its customer-facing services. Both parties coordinate the connection, service profiles and handover before activation.

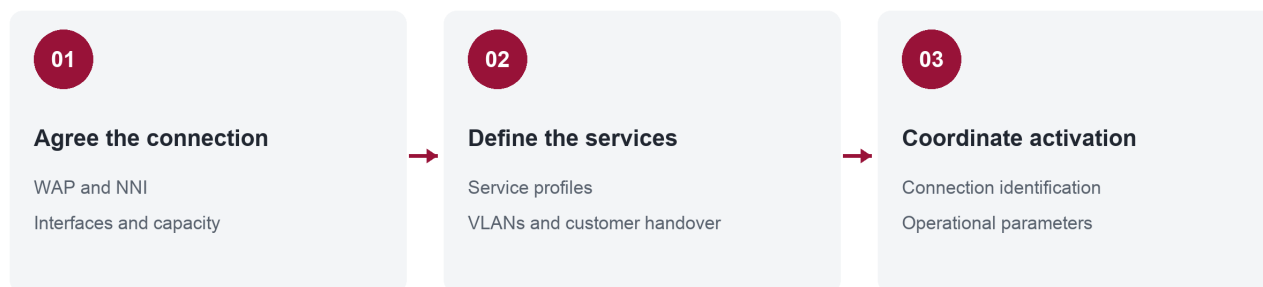


Figure 4 Information agreed during ISP onboarding

Operational responsibilities

Area	FiberEins	Service provider
Transport	Layer 2 transport between the agreed NNI and LAP.	SP network and services beyond the NNI.
Customer separation	Layer 2 isolation between end customers.	Correct operation of SP and customer equipment.
Service profiles	Apply transport profiles, bandwidth limits and MAC limits.	Specify requested services, capacity and profile requirements.
DHCPv4	Provide network-side Option 82 connection identification.	Handle DHCP requests and configure the agreed DHCP parameters.
Addressing	Provide the agreed Layer 2 service.	IP addressing, routed subnets and local proxy ARP as required.
Multicast	IGMP snooping within the multicast service.	Multicast service delivery and set-top-box addressing where applicable.
Incidents	Handle incidents within the FiberEins responsibility domain.	Customer incident management and reporting to FiberEins.

Using connection identifiers

DHCP Option 82 supports connection identification. It is not a user password or a stand-alone cryptographic authentication mechanism. Identifier interpretation and the trusted handover arrangements must follow the agreed onboarding specification.

Service-specific identifiers, VLAN assignments, protocol timers and special configuration rules are provided through the partner onboarding process. They should be used only for the relevant SP connection.

Other service obligations

The SP is responsible for the obligations associated with the services it provides, including lawful interception where applicable. The contractual allocation of responsibilities remains applicable.

Performance and availability

Plan service growth with a clear distinction between physical capacity, traffic treatment and availability. FiberEins service profiles and the applicable SLA define the commitments for the ordered transport service.

Bandwidth and traffic treatment

Bandwidth is managed for individual service paths and for the aggregated SP handover. The SP specifies the required upstream and downstream capacity. Traffic is subject to the agreed profile and bandwidth controls.

Parameter	Meaning
Physical interface rate	The Ethernet port rate. It does not by itself define the bandwidth committed to an individual service.
Service bandwidth	The upstream and downstream rates specified in the ordered service profile.
Committed Information Rate	CIR is the committed rate where specified for the service. Any associated quality commitments follow the service agreement and SLA.
Class of service	The relative treatment of service traffic during congestion or queuing.
Availability	The measured service availability under the definitions, scope and conditions of the applicable SLA.

Capacity management and operations

FiberEins monitors its network and manages transport capacity within the agreed responsibility domain. Capacity is reviewed and expanded according to service demand and operational requirements. Capacity at the SP handover is coordinated with the SP.

Monitoring coverage, incident handling and maintenance arrangements are defined in the applicable service documentation and SLA. The SP reports customer service incidents through the agreed operational process so that FiberEins can investigate issues in its domain.

Redundancy options

Redundancy depends on the access location, network segment and selected handover arrangement. Redundant structures are used in the distribution and core network. The redundancy of an individual customer connection or SP handover must be confirmed for that service.

LACP can be used for an agreed aggregated SP connection. Link aggregation alone does not establish device or geographical redundancy. Any requirement for separate chassis, diverse paths or separate sites must be expressly agreed with FiberEins.

Planning the service

Confirm the required capacity, availability and failure coverage together. The agreed SLA determines the service commitment; the schematic diagrams in this guide show functional boundaries and do not represent physical route diversity or a site-specific redundancy design.

Terminology and onboarding

Use this guide as a starting point for your FiberEins interconnection. The onboarding specification turns the selected interfaces and service profiles into the parameters for your SP connection.

Term	Meaning
SP	Service provider delivering services to end customers over the FiberEins access network.
CO	Communication operator. FiberEins performs this role for the transport service.
WAP	Wholesale Access Point: the agreed SP handover location.
NNI	Network-to-Network Interface: the interface between the SP network and FiberEins at the WAP.
LAP	Local Access Point: the customer-side endpoint of the FiberEins transport service.
NTU	Network Termination Unit: FiberEins equipment providing the customer service interface.
OTO	Optical Termination Outlet: the optical socket used for a fibre connection.
CPE	Customer Premises Equipment: equipment at the customer location used to receive or provide a service.
EVC	Ethernet Virtual Circuit: the logical Ethernet connection underlying a service path.
Service profile	The technical parameters associated with a service path, including bandwidth and applicable limits.
CoS and CIR	Class of Service describes traffic priority. Committed Information Rate describes an agreed committed rate.
LACP	Link Aggregation Control Protocol: a protocol for combining compatible Ethernet links into a logical group.

Information exchanged during onboarding

The partner specification records the agreed WAP and NNI, physical port and cabling details, service profiles, VLAN assignments and customer handover variant. It also provides the connection identification rules, DHCP and MAC parameters, and any multicast or trunk configuration requirements.

The applicable service documentation supplies the operational contacts, incident reporting arrangements and agreed redundancy configuration. Connection-specific values are exchanged with the relevant SP through the partner process.

Document information

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