

Elisa Operator Broadband Services

Elisa Operator Broadband Services comprise wholesale-level bitstream data subscriptions classified as broadband services by the Finnish Communications Regulatory Authority and implemented using various subscriber line technologies through Elisa's Ethernet network (Ficora, market review M3b/2018). Client subscriptions are delivered from Elisa's subscriber switches to a NNI (Network-to-Network Interface) connection point between Elisa and another operator (see "Elisa Network-to-Network interconnection (NNI)").

Elisa's Operator Broadband Service can be delivered without any subscriber line, with a subscriber line (distribution points CO and FTTC) or with an upper band of a subscriber line (in situations where the point of use has a plain old telephone service and the broadband subscription is connected to the same pair where the POTS subscription is located). If the subscriber line or upper band is leased from Elisa when using the service, the prices of Elisa's subscriber line are applied to the subscriber line or upper band. Elisa's subscriber lines and upper bands always terminate in the building distribution centre. If a subscriber line or upper band of an operator other than Elisa is used in subscriptions, the operator customer will be responsible for ensuring that the connection is suitable for the specific type of use.

Broadband services are delivered with Group-specific VLAN by default. Additionally this VLAN type can be changed to other VLAN types, example Subscription-specific VLAN or Routed VLAN. Multi VLAN and GroupMultiVLAN types can be used to deliver total of four (4) VLAN connections to same subscription. Q-in-Q VLAN type activates two stacked vlan identifiers. This enable unlimited lower vlan usage to the subscription. The number of MAC addresses in a single subscriber port is limited to eight (8) when using Group-specific VLAN, GroupMultiVLAN or Routed VLAN identifier and to sixteen (16) when using Subscription-specific VLAN, Multi VLAN or Q-in-Q identifier.

Operator Broadband subscriptions support Ethernet frames pertaining to IEEE802.3. The maximum transmission unit (MTU) supported in the frame is 1,500 bytes. With Q-in-Q VLAN service maximum transmission unit (MTU) supported in the frame is 1,608 bytes. The subscriber port of Operator Broadband Services does not include 802.1Q support.

Operator Broadband Services are delivered to the NNI of the subscribing operator customer as an L2-level connection. Operator Broadband Services are intended for a single end customer, and their distribution to several end users or buildings/flats is prohibited.

All Operator Broadband Services are delivered in the Best Effort category.

Technologies, distribution centres and delivery interfaces

Each Elisa Operator Broadband Service is implemented using any of the following network technologies:

- ADSL2+
- VDSL2
- G.SHDSL/G.SHDSL.bis
- ETHERNET

The services are mainly built from the distribution centre which is closest to the customer. The available distribution centres are in the following locations:

- Central Office (CO)
- Fiber to the Cabinet (FTTC)
- Fiber to the Building (FTTB)
- Fiber to the Home (FTTH)

In addition to the broadband service, services (ADSL2+/VDSL2/SHDSL and G.SHDSL technologies) implemented from central office or street cabinet require a copper subscriber line or its upper band (ADSL2+/VDSL2 technologies).

Services implemented from the building's main distribution frame require an internal copper network (ADSL2+/VDSL2 technologies), general cabling (ETHERNET) or fiber cabling (ETHERNET FIBER). FTTB subscriptions cannot be delivered to the building's main distribution frame; instead, the order must always indicate the house identifier or number to which the service is to be delivered.

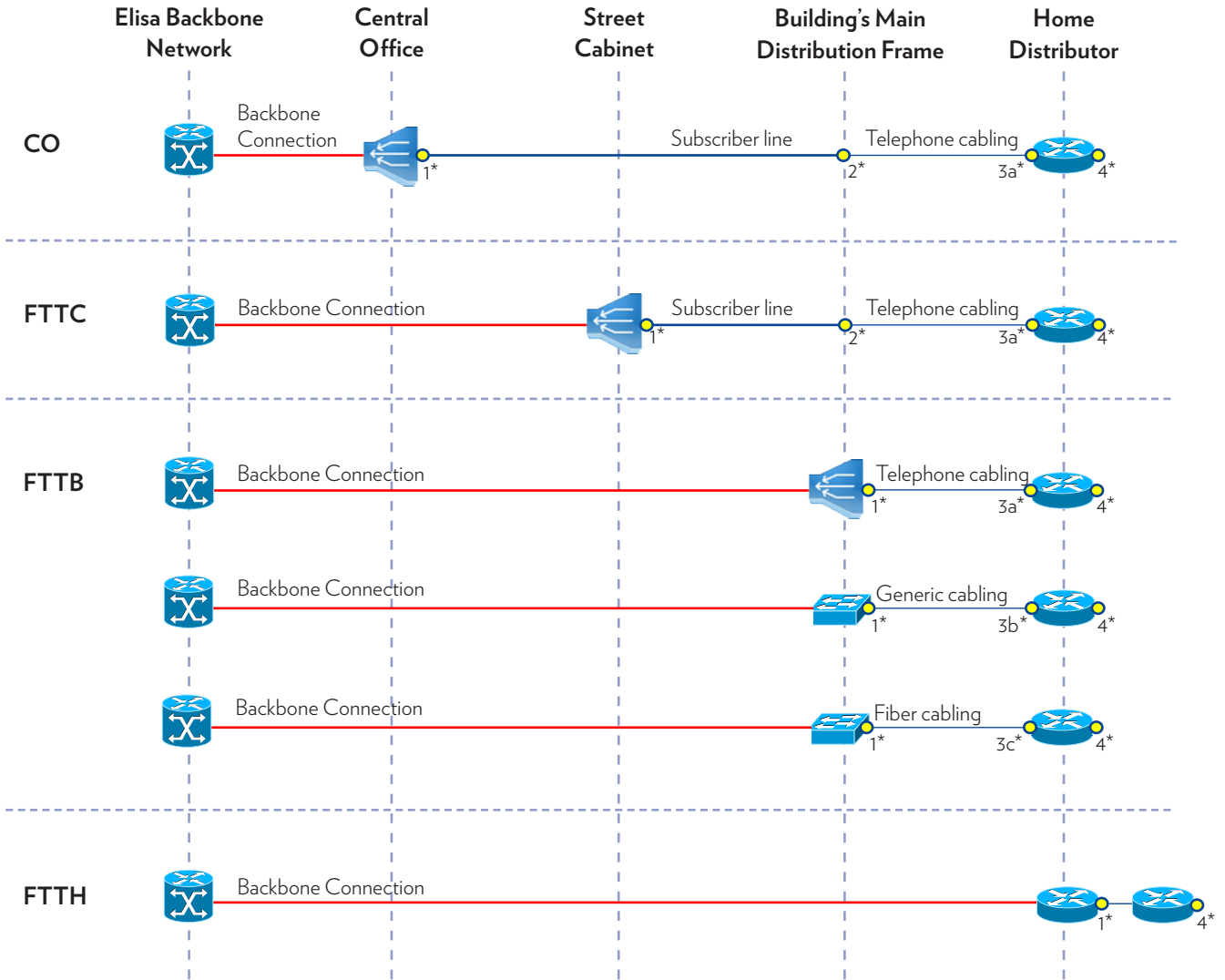
Services implemented from apartment's ethernet switch (FTTH) are offered directly from the fibre switch port (ETHERNET) in the house.

The availability of subscriptions implemented using ADSL2+, VDSL2 and G.SHDSL technologies is limited according to the length of the copper connection. In services implemented using the ADSL2+/SHDSL technology, the default VPI/VCI values are 0/100, unless the order includes other values.

The faultless operation of subscriptions implemented using the ETHERNET technology requires general Ethernet cabling following at least the Cat 5e Ethernet standard.



Delivery interfaces for Elisa Operator Broadband Services



1* Operator broadband port

2* Operator broadband port + Subscriber line/Upper band

3a* Connection to the internal network installed in a telephone socket (3-NNI telephone socket/RJ11)

3b* Connection to the internal network installed in a general cable socket (RJ45)

3c* Connection to the internal network installed in a fiber interface

4* Customer premises equipment delivery (RJ45)



Group-specific VLAN

Operator customers have access to one group-specific VLAN identifier for each NNI connection used within the Operator Broadband Service. The group-specific VLAN is service area-specific. Subscriptions including a group-specific VLAN cannot be ordered for NNIs other than those located in the same service area.

A single operator broadband subscription can be identified using the DHCP option 82 circuit ID field (IPv4). Operator customers can define the content of the field when ordering the subscription. Elisa will provide each subscription with a value if no definition is made. The maximum length of the data content in the field is 30 characters. In subscription group-specific operator broadband subscriptions, traffic is only permitted using addresses obtained from the DHCP server. Elisa reserves the right to limit broadcast storms in the network. A maximum of 5,000 subscriptions can be connected to a single group-specific VLAN identifier.

Elisa has technically prevented any traffic between subscriptions including the same group-specific VLAN identifier within the Elisa network.

| Group-specific VLAN | |
|---------------------|---------|
| VLAN identifiers | 10 - 19 |

Subscription-specific VLAN

Operator customers can use VLAN identifiers for single subscriptions. The VLAN identifier is subscription-specific and a single VLAN identifier cannot be ordered for several subscriptions located in a single NNI. When ordering a user subscription, operator customers provide information about the VLAN identifier to which the ordered user subscription is forwarded in the NNI connection.

Subscriptions including a subscription-specific VLAN identifier can be delivered to a NNI located in the same service area or to another NNI of the same operator located in any other service area for an extra charge (see "Transferring a subscription from one service area to another" in the price list).

| Subscription-specific VLAN | |
|----------------------------|---------|
| VLAN identifiers | 20-4092 |

Multi VLAN

Operator customer can use multiple subscription-specific VLAN identifiers in a single broadband subscription using Multi VLAN service. Maximum VLAN identifier count for a single subscription is 4. In ADSL2+, G.SHDSL and G.SHDSL.bis technologies separate VLAN identifiers are transferred to end customers using VPI/VCI pipes. In VDSL2 and Ethernet technologies first VLAN identifier is transferred to CPE without VLAN tag (untagged) and others with VLAN tag (tagged).

VLAN tags used in Multi VLAN subscriptions are confirmed in order acknowledgement. VLAN's used in Multi VLAN service have same rules and restrictions as broadband subscriptions with a single subscription-specific VLAN. MultiVLAN service has limited availability. Availability is based on the technology used in destination address.

GroupMulti VLAN

Operator customer can use multiple group-specific VLAN identifiers in a single broadband subscription using GroupMulti VLAN service. Maximum VLAN identifier count for a single subscription is 4. In ADSL2+, G.SHDSL and G.SHDSL.bis technologies separate VLAN identifiers are transferred to end customers using VPI/VCI pipes. In VDSL2 and Ethernet technologies first VLAN identifier is transferred to CPE without VLAN tag (untagged) and others with VLAN tag (tagged).

VLAN's used in GroupMulti VLAN service have same rules and restrictions as broadband subscriptions with a single group-specific VLAN. GroupMulti VLAN service has limited availability. Availability is based on the technology used in destination address.

Routed VLAN

Operator customer can order operator broadband service subscription with internet access. This option is called Routed VLAN. VLAN is routed directly to Elisa's internet-access with Elisa's IP-addresses. Routed VLAN –service is delivered to subscriptions with maximum speeds up to 100M/10M.



Q-in-Q VLAN

Operator customer can order Q-in-Q VLAN service to transfer stacked vlan identifiers through broadband subscription. Upper VLAN tag (S-tag) is used to identify subscription. Lower VLAN tag (C-Tag) is part of customers traffic and can be used freely. Subscription with Q-in-Q VLAN service has MTU size of 1608 bytes.

Broadband subscriptions with Q-in-Q VLAN service have same have same rules and restrictions as broadband subscriptions with a single connection-specific VLAN. Q-in-Q VLAN service has limited availability. Availability is based on the technology used in destination address.

VULA VLAN

Operator customer can order Virtual unbundled local access (VULA) by choosing VULA VLAN type with operator broadband service. VULA VLAN type changes the operator broadband service to VULA Service. VULA Services are delivered to nearest CO (Central Office) location equipped with VULA-NNI. More information about VULA services at Virtual unbundled local access (VULA) service description.

SLA Service Levels

The Service Levels are:

| Service Level Category | Service Hours Category | Response Time | Repair Time |
|------------------------|--------------------------|---------------|-------------|
| P0V8 | P0: Mon-Fri 8 am-4pm | 8 h | 24 h |
| P1K12 | P1: Mon-Fri 7 am-6 pm | 1 h | 12 h |

Elisa Operator Broadband doesn't include by default any SLA category. With the exception of operator broadband subscriptions G.SHDSL and G.SHDSL.bis which are not possible to order without SLA. Also Elisa CPE requires SLA.

Service hours refer to the time when fault limitation and repair measures will be carried out.

Response time refers to the time within which actions according to a service request will be started.

Repair time refers to the time within which a fault has been repaired.

The content and application of the service levels are described in more detail in the Elisa SLA service description. Elisa reserves the right to restrict the number of the service levels offered on a subscription-specific basis in offices where restrictions are imposed by:

- Geographical distances
- Technical quality of the access connection implemented using copper cable
- The limited level of service for the access connection provided by a third party (local network operator)

Core network transfer service

Core network transfer service is available to the connections with Subscriber VLAN, Multi VLAN and Q-in-Q VLAN. Core network transfer service is an additional service subject to an extra charge. Core network transfer service is automatically added to a subscriptions where subscription and NNI connection are located in different service areas.

Elisa Network-to-Network interconnection (NNI)

Ordering and delivering of Elisa Operator Broadband product requires a working and applicable Network-to-Network interconnection between Elisa and ordering operator customer. Applicable types of NNI service are Broadband NNI and Multi NNI. The Elisa NNI connection enables the visibility of no more than 500 MAC addresses from the network of the operator customer towards Elisa's network. Any Spanning Tree protocol messages received by the connection are filtered out. Operator broadband services and additional services have dependencies with Elisa NNI service location and can be service area specific. Additional information: See Elisa Network-to-Network Service description, Elisa Service areas.

Service areas

For service areas of the Elisa trunk network, see appendix "Elisa's service areas."

Customer premises equipment

Delivery interfaces of customer premises equipment (CPE) connected to the operator broadband network comply with the following recommendations:



| | |
|-------------|--|
| ADSL2+ | ITU-T G.992.5 annex A/M |
| VDSL2 | ITU-T G.993.2 annex B profile 17a |
| G.SHDSL | ITU-T G.991.2 annex B TC-PAM 16 |
| G.SHDSL.bis | ITU-T G.991.2 annex G TC-PAM 32 |
| ETHERNET | IEEE 802.3 10Base-TX/100Base-TX/1000Base-TX |
| FIBER | IEEE 802.3 1000BASE-BX10-U (SM, TX 1310nm RX 1490nm) |

A routing CPE can be ordered separately for Elisa's Operator Broadband Service as delivered by Elisa. Elisa owns the CPE and is responsible for its installation using a basic configuration and any maintenance/replacement of the specific CPE in case of malfunctions. The operator customer is responsible for the supervision and management of the device after its installation and the definition of any device settings (configurations) needed when using the device. The operator customer is also responsible for fulfilling installation environment requirements set for the CPE as set out in "Prerequisites and restrictions."

A fault repair or device replacement process will be launched after the operator customer issues a fault notification (see "Network monitoring and fault repairs").

Using the CPE, the delivery interface in the user customer's premises is the LAN connection of the device.

Available CPEs and their suitability for operator broadband subscriptions are listed in the price list for Elisa's Operator Broadband Services. By default, CPEs delivered by Elisa are equipped with the IP Advanced software level. The operator customer can upgrade the IOS version of the CPE up to the version it uses through remote management after the installation process. Whenever modifications are made, the operator customer is responsible for licenses and any license fees associated with the software it uses in its CPEs.

Ordering and delivery time

Orders and offers are placed through the Elisa Carrier Service Online order and delivery system. A pricing zone and service area information as well as technologies, speeds and vlan types available are mentioned in an availability enquiry, offer request and order. Line distances shown are referential and can be deviate from real line distances. Final availability to all products are check when ordered or requested a quote. The target delivery time is 5 calendar days in Elisa's own existing network area and approximately 2 weeks in other operator's existing network area.

Network monitoring and fault repair

The targeted repair time is 24 hours from the receiving of the fault notification. The repair is carried out during the service hours. The service hours are workdays Mon – Fri from 8 am to 4 pm. Fault repair can be continued after the service hours if ordered separately by the customer. Measures are launched immediately to repair any failure or faults in Elisa's backbone network, including concentrating central NNI's.

Fault notifications should be made through the Elisa Carrier Services Online order and delivery system or by phone to the Service Desk (24h), service in English tel. +358 10 26 096, service in Finnish tel. +358 10 804 400.

Elisa's network maintenance and change work timetable

Elisa will perform scheduled network maintenance and change work on the second and fourth Wednesday each month at 00:30 a.m.–05:30 a.m. Elisa reserves the right to perform network maintenance and change work as needed. The maintenance and change work are attempted to announce in advance and to minimize outage and downtime of the services.

Prerequisites and restrictions

The implementation of the service requires the construction of a new physical cable route, the customer will be responsible for the cable routes in the site. The customer is responsible for ensuring that the condition of the internal network in each installation location allows for the installation of the Operator Broadband Service:

- Copper cabling from the building distribution centre to the final installation location
- Power supply (230V AC) for any network terminal
- Sufficient rack or shelf space for any network terminal
- Ambient conditions suitable for electrical equipment



Elisa Carrier Services

The price of the service is subject to the following restrictions:

- The prices are only valid on the precondition that a physical connection to the customer's building exists and a new physical network (optical fibre or copper cable) need not be constructed.
- The prices are only valid in those areas and buildings where Elisa's NNI equipment is located and where subscriber lines are available

There may be regional differences in the availability of subscriptions and additional services.

Data protection

Personal data is processed in the service, such as installation addresses and contact details for the onsite persons. The personal data is processed for service implementation. Concerning the personal data processed in the service, the telecommunications operator, that is ordering the service is the personal data controller stated in the data protection legislation and Elisa is the processor.

In addition, service information is stored in the form of logs due to failure repairs and prevent information security threats. For this information, Elisa is a data controller for data protection legislation.

Personal data processed in the service can be processed outside the EU / EEA area. Elisa ensures that in a country where personal data is processed, the level of data protection is adequate and in accordance with the European Commission's decision, or alternatively, that the transfer is subject to a legally appropriate safeguard measure such as a data transfer agreement in accordance with the EU standard contractual clauses on the transfer of personal data outside the EEA.

Elisa has the right to use subcontractors in the provision of services and in the processing of personal data.

Terms of agreement

If a subscription does not operate at the ordered speed due to the length or quality of the subscriber cable, Elisa reserves the right to discontinue the poorly operating service or agree upon another procedure with the customer. Elisa reserves the right not to deliver a subscription if the result of the availability enquiry differs significantly from the actual implementation. The service is governed by the general

agreement terms of operator products of Elisa Corporation.

Elisa Carrier Services Customer Support

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