

Service description

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Telia Operator broadband services

The Ethernet-based DSL operator product consists of an interface to the Metro Ethernet network of Telia Finland Oyj ('Telia'), an ADSL/VDSL/G.SHDSL access, and the connection between them. The connection enables both an access-group-specific and access-specific VLAN connection from a Metro Ethernet backbone network access point to an ADSL/VDSL/G.SHDSL access and a fibre port product. An Ethernet NNI is a 1 or 10 Gbit/s optical single-mode interface to Telia Metro Ethernet backbone network. The Ethernet DSL operator product is implemented with ADSL, VDSL or G.SHDSL technology. The fibre port product is implemented with VDSL or Ethernet technology.

Terms and abbreviations used in the service description:

Terms and abbreviations	Definition
ADSL	Asymmetric Digital Subscriber Line
CPE	Customer Premises Equipment, the end user's network device
DSLAM	Digital Subscriber Line Access Multiplexer
Ethernet	Packet-based data transfer form
G.SHDSL	Symmetric High-Bitrate Digital Subscriber Loop
End user	The service provider's designated customer that uses the product.
NNI	Network to network interface
Parallel connection	A connection the bandwidth of which is less than 20 KHz, separated from the subscriber line by means of technical equipment. One and the same subscriber line can be used for both voice and ADSL.
VDSL2	Very-High-Speed-Digital-Subscriber-Line-2
VLAN	Virtual Local Area Network (IEEE 802.1Q)

NOTE! ADLS- and- G.SHDSL-access types end of sales shall commence on 1st of September 2022.

Description of functionalities

1.1 DSL operator product

The Ethernet-based DSL operator product comprises an interface to Telia Metro Ethernet network, an ADSL/VDSL/G.SHDSL access and the connection between them. The connection enables both an access-group-specific and an access-specific VLAN connection from the access point of the Metro Ethernet backbone network to an ADSL/VDSL/G.SHDSL access.

The Ethernet network to network interface (NNI) of the DSL operator product is a 1 Gbit/s or 10 Gbit/s optical single-mode interface to Telia Metro Ethernet backbone network. Ethernet NNI is available at the equipment facilities designated according to the service area (Appendix 1). Ethernet NNI can be delivered to other Telia equipment facilities or the service provider's premises with a separate Telia Metro Ethernet product.

The ADSL/VDSL port includes a DSLAM interface. The transmission rates delivered are 512/512 kbit/s, 1M/512 kbit/s, 2M/512 kbit/s, 8/1 Mbit/s, 24/1 Mbit/s, 20/20 Mbit/s, 50/10 Mbit/s and 100/10 Mbit/s.

The G.SHDSL port includes also a DSLAM interface. The transmission rates delivered are 1/1 Mbit/s, 2M/2 Mbit/s, 4M/4M bit/s, 5/5 Mbit/s and 10/10 Mbit/s.

Company information

Telia Finland Oyj
 Pasilan asema-aukio 1, 00520 HELSINKI
 Registered office: Helsinki
 Business ID 1475607-9, VAT No. FI14756079

The fibre port product includes a DSLAM or Ethernet interface. The transmission rates delivered are 10M/10 Mbit/s, 20/20 Mbit/s, 50/10 Mbit/s, 100M/10 Mbit/s, 100/100 Mbit/s, 200/100 Mbit/s and 1000/100 Mbit/s.

The connection required for the ADSL access can be implemented as a parallel connection of a telephone subscription or as a subscriber line. The connection required for the G.SHDSL access can only be implemented with a subscriber line.

1.2 FTTB operator product fiber

FTTB operator product Fiber is implemented with VDSL2 or Ethernet technology. Ethernet technology is used, when the internal communications network has been implemented with category 5 or 6 cabling (CAT5/6) or fibre. VDSL2 is used, when the internal communications network has been implemented with traditional telephone cabling, i.e. category 3 (CAT 3) cabling (Figure 1).

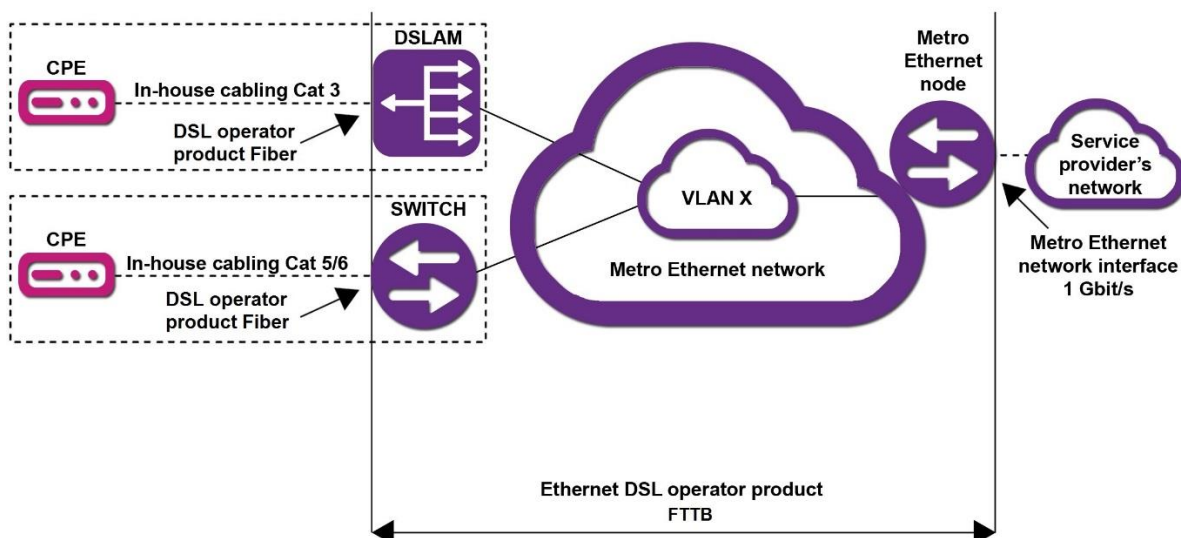


Figure 1: DSL operator product Fiber.

1.3 FTTH/FTTC operator product fiber and connection

FTTH/FTTC operator product is also implemented by utilizing Ethernet technology, and the interface connection is an optical connection (one single-mode fibre) from Telia's equipment facility (Figure 2). FTTC-solutions are implemented with VDSL2 technology.



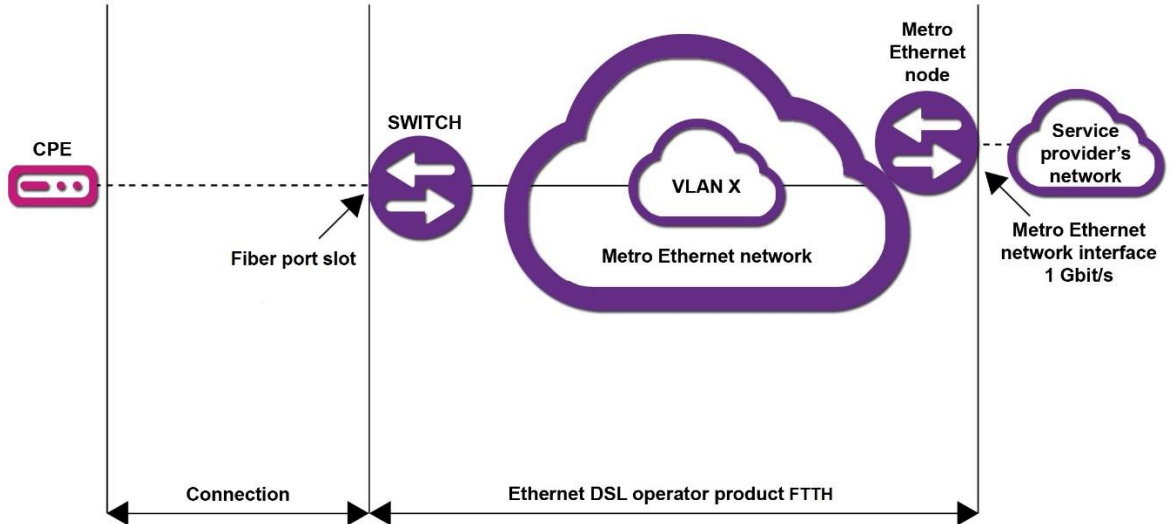


Figure 2: DSL operator product Fiber port slot and connection.

The transmission rates for FTTB/FTTH/FTTC operator product are listed in the table below.

	Ethernet	VDSL2
50/10Mbit/s	X	X (myös FTTC)
100/10Mbit/s		X (myös FTTC)
100/100Mbit/s	X	
200/100Mbit/s *)	X	
1000/100Mbit/s *)	X	

*) The transmission rate class is not available at all locations.

1.4 Access-group-specific and access-specific VLAN

Access-group-specific VLAN

When the Operator Broadband port is implemented using an access-group-specific VLAN connection, traffic is directed through Telia's network to the service provider over the same VLAN of the Ethernet NNI (ADSL/VDSL/G.SHDSL port solution, Figure 3). An individual access of an access-group-specific VLAN connection is identified by means of the DHCP option 82 Remote ID field, the content of which is determined by the service provider in connection with the order. A maximum of 32 characters can be entered in Remote ID field.

The supported protocol for the access-group-specific VLAN is bridged RFC 2684 or IEEE802.3. The maximum number of MAC addresses per port is 10. The broadcast feature of an access-group-specific access is limited, and the end-user's IP address must be defined by means of the DHCP service..

An access-group-specific VLAN can be delivered with the values 10-19.



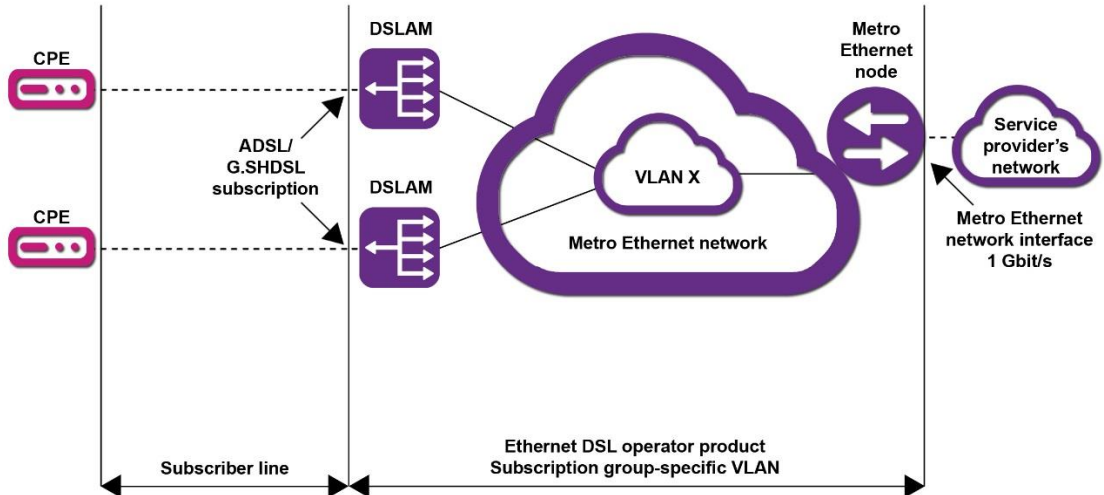


Figure 3: Ethernet DSL operator product, access-group-specific VLAN and a subscriber line

Access-specific VLAN

When an Operator Broadband port is implemented with an access-specific VLAN connection, traffic is routed through Telia network to the service provider over the access-specific VLAN (ADSL/VDSL/G.SHDSL port solution, Figure 4). The supported protocol for the port of the access-specific VLAN connection is bridged RFC 2684 or IEEE 802.3. Several separate connections (max. 4) terminated at the same Ethernet NNI with separate VLAN values can be implemented at the port. The maximum number of MAC addresses at an individual port is 50. An access-specific VLAN can be delivered with the values 20-4094.

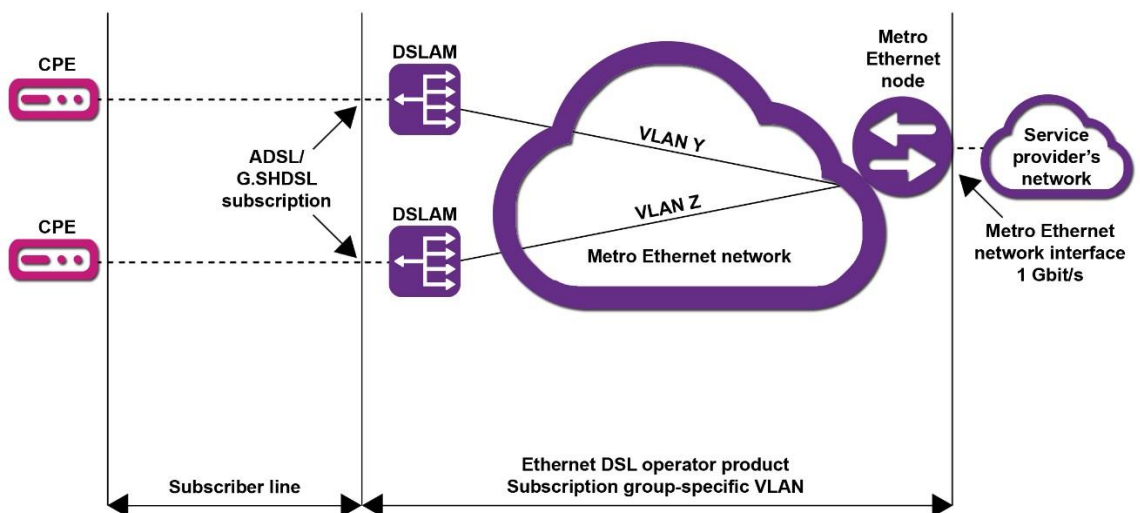


Figure 4: Ethernet DSL operator product, access-specific VLAN and a subscriber line

1.5 L2 core transfer service

The L2 core transfer service is used, when the Ethernet NNI of the service provider is not located in the same Metro Ethernet network service area as the DSL operator product. The



L2 core transfer service is automatically added to the order, and it is subject to a separate charge.

1.6 Network access equipment (CPE).

The network access devices tested by Telia (CPE) are listed in Appendix 3. Different software versions may cause compatibility problems. The end user's CPE is not included in the DSL operator product.

The settings of the terminal device have been defined according to the access technology in the table below.

	ADSL(2+) and SHDSL	VDSL2 and Ethernet
Access-group-specific VLAN or 1 access-specific VLAN	PVC: 0/100	VLAN: 100 Untagged
2nd access-specific VLAN	PVC: 0/101	VLAN: 101 Tagged
3rd access-specific VLAN	PVC: 0/102	VLAN: 102 Tagged
4th access-specific VLAN	PVC: 0/103	VLAN: 103 Tagged

1.7 Service levels and redundancy of an Ethernet NNI

The delivered SLA levels of an Ethernet NNI are: Minimum maintenance (basic level), Standard and Gold. The table below lists the basic features of each service level.

Feature	Minimum maintenance	Standard	Gold
Availability during service hours		99.20%	99.60%
Availability calculation period		1 month	1 month
Reporting on service availability		Upon request	Upon request
Maintenance window	Telia's nationwide	Telia's nationwide	Telia's nationwide
The minimum time of advance notice to customers regarding planned maintenance measures		7 days	7 days
Fault report receipt hours	24/7	24/7	24/7
Fault repair is started at the latest (delay during service hours)	on the next business day	4 h	Immediately upon receipt of the fault report
Access down time (ADT) during service hours	48 h	8 h	4 h
Fault repair reporting	No	When the fault has been repaired	When the status of the fault changes

1.8 Subscriber line

A subscriber line can be leased from Telia or some other operator, or it is possible to use the customer's own connection. If an ADSL/VDSL/G.SHDSL access is connected to a subscriber line not provided by Telia, the responsibility for its suitability lies with the customer.

Telia's subscriber line is delivered and charged for separately according to the valid service description and price-list. Telia's subscriber line terminates at the house MDF. Connection to a ready-made internal communications network is subject to a separate order and charge in accordance with the price list of Telia's Wholesale Supplementary services.

The maximum cable lengths of the subscriber line per transmission rate class are indicated in the table below.



Data transmission rate	Maximum cable length	Subscriber line 2/4 wire
512/512 kbit/s	6.0 km	2
1M/512 kbit/s	5,0 km	2
2M/512 kbit/s	4,5 km	2
8/1 Mbit/s	4,0 km	2
24/1 Mbit/s	2,0 km	2
10/10 Mbit/s VDSL2	600 m	2
20/20 Mbit/s VDSL2	400 m	2
50/10 Mbit/s VDSL2	600 m	2
100/10 Mbit/s VDSL2	300 m	2
1/1 Mbit/s G.SHDSL	4,0 km	2
2/2 Mbit/s G.SHDSL	3,5 km	2
4/4 Mbit/s G.SHDSL	3,5 km	4
5/5 Mbit/s G.SHDSL	2,0 km	2
10/10 Mbit/s G.SHDSL	2,0 km	4

Other issues

1.9 IP addresses

It is service operator's responsibility to order, manage, and maintain the IP addresses it uses.

1.10 Defaults and restrictions of the service

The availability and feasibility of the service must be checked with Telia. The access must not be shared with a third party i.e. the port capacity must not be shared between several end customers or several apartments by means of a switch or a corresponding device.

1.11 Order and delivery

Ordering an Ethernet NNI

A separate order form is available for ordering an Ethernet NNI. The form is submitted by email to wholesale-delivery@telia.fi.

Telia confirms the order in writing within five business days.

The Ethernet NNI order should contain at least the following data:

- Service provider's details (the company's name, address and business ID)
- Invoicing data (invoicing address and phone number)
- Delivery address for the Ethernet NNI
- Municipality where the MetroEthernet access point is located
- Basic SLA level for the Ethernet NNI: Minimum maintenance
- SLA levels subject to an extra charge: Standard and Gold
- Fibre pair information, if the fibre connection is not delivered by Telia
- Information on the provider of the fibre connection
- Technical contact person

Ordering a DSL operator product

Orders for the ADSL/VDSL/G.SHDSL operator product are submitted through the operaattorit.telia.fi website. Telia confirms the order within five workdays.

The DSL operator product order should contain at least the following data:



- The Telia-provided ID of the Ethernet NNI
- Service provider's details (subscriber's name and address)
- Invoicing data (invoicing address and phone number)
- Delivery addresses
- Details of the contact person at the installation address (name, address and phone number)
- Access rate of the port
- Information on the provider of the subscriber line. Telia specifies the connection points for the connection cable.
- End customer's name
- Access-specific or access-group-specific VLAN value
- Data entered in the DHCP option 82 field

Delivery

Telia aims at delivering the Ethernet NNI within four weeks of the approval of a written order.

Telia aims at delivering the Operator Broadband product access within approximately two weeks of the approval of a written order. The delivery time begins when Telia has received and accepted the written order.

1.12 Availability management

The service breaks (maintenance windows) of the DSL operator product are on Mondays at 00.00-04.00 am.

Telia reserves the right to carry out network maintenance and alteration work also at other times. Telia strives to minimize the inconvenience the network maintenance and alteration work may cause to the customer.

Any response times specified for a maintenance class are not applied during the maintenance window or other pre-scheduled maintenance times.

1.13 Maintenance and monitoring

Maintenance and monitoring comply with the delivery terms valid at any given time: "Telia's General Delivery Terms for Business Customers concerning Services" and "Telia's Special Terms for Telecommunications Companies concerning Regulated Products".

1.14 Changes in the service description

Telia has the right to change this service description. If the service description is changed substantially to the customer's detriment, the customer will be notified of the change at least one month prior to the entry into force of the change. In other cases, Telia will inform the customer of changes in the manner and schedule it considers appropriate. If the service agreement has been changed substantially to the detriment of the customer, the customer has the right to terminate the access with one month's period of notice.

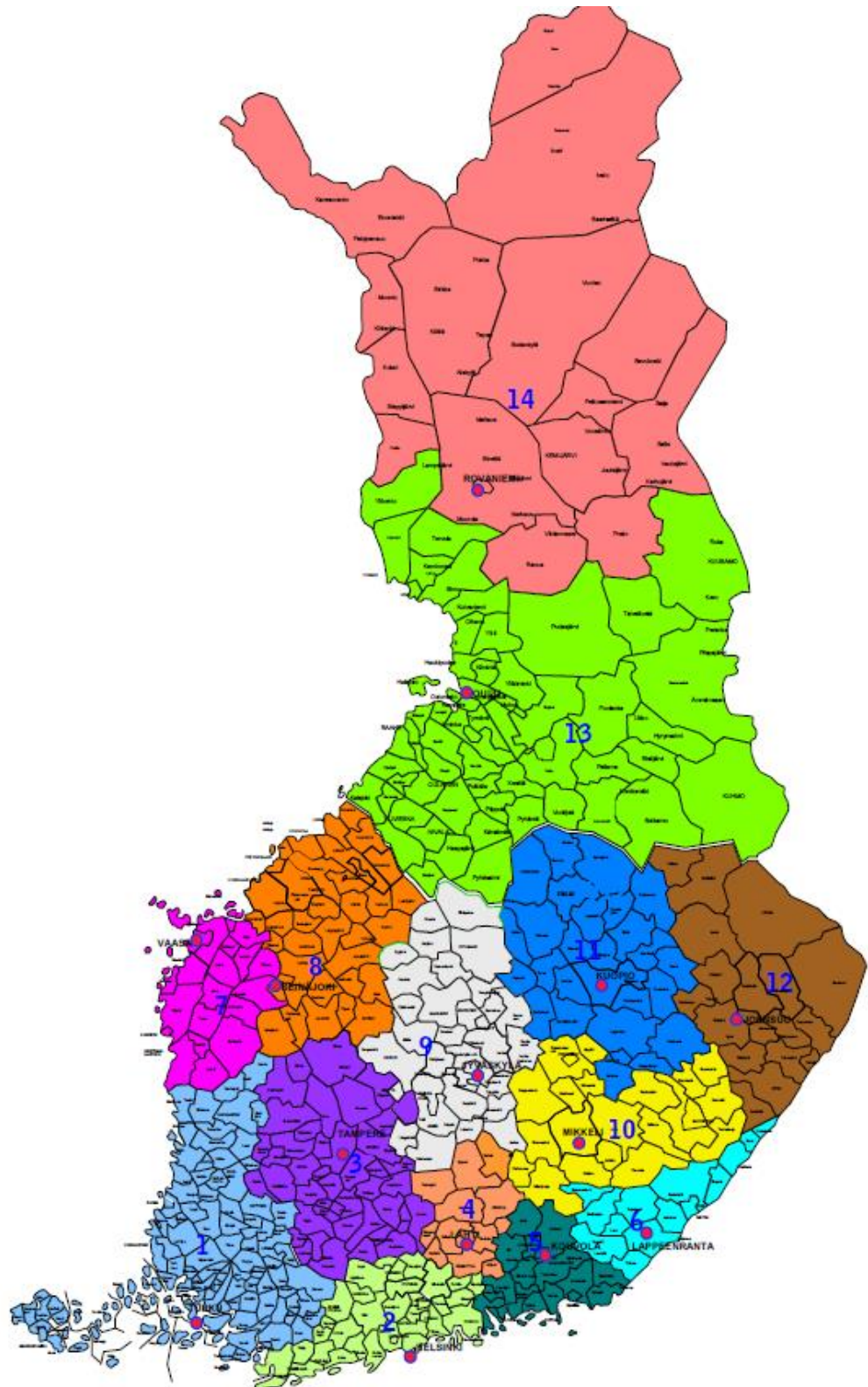


Appendix 1. Addresses and service areas of the Ethernet NNI

ID	Ethernet service area	Address of the Ethernet NNI
1	Turku	Kupittaankatu 152, 20810 Turku
2	Helsinki	Valimotie 3-5, 00380 Helsinki
3	Tampere	Pyhäranta 3, 33230 Tampere
4	Lahti	Vesijärvenkatu 60, 15140 Lahti
5	Kouvola	Vuorikatu 6, 45100 Kouvola
6	Lappeenranta	Kaarelankatu 7, 53100 Kouvola
7,8	Seinäjoki + Vaasa	Jouppilanvuori, 60100 Seinäjoki
9	Jyväskylä	Kilpisenkatu 8, 40100 Jyväskylä
10	Mikkeli	Mikonkatu 18, 50100 Mikkeli
11	Kuopio	Teletie 4, 70600 Kuopio
12	Joensuu	Pengerkatu 2, 80200 Joensuu
13	Oulu	Hallituskatu 36, 90100 Joensuu
14	Rovaniemi	Louhikkotie 28, 96100 Rovaniemi



The Ethernet service areas



Appendix 2. Network access devices tested by Telia

Network access devices intended for home users

- TeleWell TW-EA501v3
- TeleWell TW-EA510v3
- Telewell TW-510v3c
- A-link RR24AP
- D-Link DSL-G624M
- ZyXEL P660H-D1
- ZyXEL P660HW-D1
- ZyXEL P660HN-T1A
- Telewell TW-EV904/900 (ADSL2+, VDSL2 profiles 12a, 12b, 17a)
- ZyXEL P-870HW-51A v2 (ADSL2+, VDSL2 profiles 12a, 12b, 17a)
- ZyXEL P-870M-I1 v2 (ADSL2+, VDSL2 profiles 12a, 12b, 17a)
- ZTE 931WII (ADSL2+, VDSL2 profiles 12a, 12b, 17a)
- Thomson TG784 (ADSL2+, Ethernet)
- Thomson TG789 (ADSL2+, Ethernet, VDSL2)

Network access devices intended for corporate users

- Cisco 877
- Cisco 878
- Cisco (1720)1721 (G.SHDSL)
- Cisco 1841 (ADSL)
- Cisco 1841 (G.SHDSL)
- Thomson TG605s (G.SHDSL)
- Thomson TG784 (ADSL2+, Ethernet)
- Thomson TG789 (ADSL2+, Ethernet, VDSL2)

