Telia Ethernet

Service description, 15 April 2024

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1. Telia Ethernet

This document describes the Telia Ethernet services implemented in Finland in the Telia Metro Ethernet network and the procedures and practices adhered to in their implementation. Telia's Ethernet services allow the implementation of networking solutions with the following service types: Ethernet E-Access (point-to-multipoint), Ethernet E-line (point-to-point) and Ethernet E-LAN (full mesh).

The Ethernet E-Access service is a solution that can be used, for example, to connect local area networks (LANs) using Ethernet-based connections. Physically separate LANs or other network solutions can be combined into a single entity by creating virtual connections between the networks. The user network interfaces (UNI) in the Ethernet E-Access service are logically connected to a network-to-network interface (ENNI). Ethernet E-Access is implemented either with fibre from the customer's property to the nearest Telia ME switch or as a Mobile Access solution via Telia's 4G network. Multiple Ethernet accesses can be connected to an ENNI.

The Ethernet E-line service is a solution that can be used to implement connections between two sites. Applications include connections between data centres and offices. Ethernet access is a simple and reliable service implemented with UNIs at both ends and a network connection between them.

The Ethernet E-LAN service provides a solution that, like Ethernet E-Access, can be used to connect local area networks between customer sites, but the E-LAN service also allows direct traffic between UNIs. The UNIs in the Ethernet E-LAN service are logically connected to the same network via network bridge access configured on the Telia network.

Ethernet services can be used to implement both local and national network solutions in Finland, in the Nordic and Baltic countries (Ethernet Nordic products), as well as globally through Telia partners.

Telia's network in Finland is divided into several Metro Ethernet (ME) areas (see section 7). If both ends of the connection are within one ME area, the connection is a local Telia Ethernet service. If, however, the ends are in different ME areas, the connection is a remote Telia Ethernet service. With the Ethernet E-access service, the UNI is considered one end of the access and the other is the ENNI to which it is logically connected.

As a general rule, the Telia Ethernet service handover interface is a building distribution frame or similar point at the site, unless otherwise agreed.

The sale of new copper-based implementations of Ethernet services and speed classes below 10 Mbps has been discontinued on 1 January 2022. For these and MEOD subscriptions, the implementations in use apply the specifications of the previous version of this service description dated 6 April 2020.

Telia's General delivery terms for Telia operator products concerning services apply to Ethernet service deliveries.

Ethernet services provide:

- Reliability and cost-efficiency: The service is implemented in the Telia MPLS network, which is redundant and monitored 24/7.

- Several speed classes, the transmission rate of which can easily be changed at a later stage as subject to availability

- Multiple service level categories: client can choose from 5 SLA options

- Several class-of-service profiles for data communications classification and prioritisation

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2. Terms and abbreviations

Table 1Concept definitions

Terms and abbreviations	Definitions
CoS profile	Class of Service profile; determines how the access capacity is divided between different classes of service
CPE	Customer Premises Equipment; a managed terminal device provided by Telia
Dot1Q	The access supports VLAN-tagged traffic.
ENNI	External Network-to-Network Interface. Service operator's interconnection point to the Telia ME network
Ethertype	A field describing the protocol used for the Ethernet frame
EVC	Ethernet Virtual Circuit; a term used by MEF for a point-to-point Ethernet connection.
FCS	Frame Check Sequence: A Frame Check Sequence; a checksum in an Ethernet frame for error correction
GE	Gigabit Ethernet
ME	Metro Ethernet
MEC	Metro Ethernet capacity connection (MEC)
MEL	A Metro Ethernet access; the end customer's user network interface to the ME network
MNNI	Multi-service NNI, an ENNI product that allows the implementation of all Telia L2 services via the same interconnection point
MPLS	Multi Protocol Label Switching; a method of implementing backbone and ME networks based on MPLS labels
MTU	Maximum Transmission Unit; the maximum size of an Ethernet frame
Q-in-Q	The access supports the use of two stacked VLAN tags.
QoS	Quality of Service; classification and prioritisation of communications traffic in network equipment based on CoS tags
OVC	Operator Virtual Connection, a term used by MEF for a UNI-to-ENNI-Ethernet connection
SLA	A service level agreement that specifies the level of service
TSEN	The user network interface prefix for Ethernet Nordic products (cf. MEL, MEC)
UNI	User network interface, the demarcation point at the user's site
VLAN	Virtual LAN

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3 Accesses and services

3.1 Access descriptions

3.1.1 Ethernet ENNI

The Telia Ethernet ENNI service is provided by Telia Finland Oyj. The service solution contains components as per the following table:

- ✓ Included
- - Optional

Table 2: Basic services for an ENNI

Basic services for an ENNI		
Subscription capacity:		
10 Gbps	✓	
100 Gbps	-	
OinQ	✓	
Service level (SLA):		
Basic	-	
Standard	-	
Gold	-	
Platinum	✓	
Diamond	-	(Route-redundant access)
Redundancy-secured access	-	

The customer can select the following features for ENNIs:

- The interface is either 10 GE or 100 GE Ethernet, and the maximum access capacities are 10 Gbps and 100 Gbps, respectively. The access is implemented at a specified handover point in a Telia equipment facility. Any other handover points must be agreed upon separately.

- Redundancy for ENNI connections: Accesses of all service levels can be provided with redundancy, but only ENNIs of the Diamond level are always provided with redundancy using two separate fibre routes.

In addition, ENNIs have the following features:

- Two VLAN tags (QinQ) are used in the ENNI. The MTU of the access is 2,000. The outer VLAN tag (S tag) is used to identify traffic coming from different UNIs in the ENNI. An inner VLAN tag (C-tag) is part of end-customer traffic. When ordering a new UNI, the customer specifies the VLAN tag (S-tag) with which the traffic of the UNI in question is to be identified in the ENNI. The outer VLAN tag values may vary from 1 to 4,094, and the inner VLAN tag from 1 to 4,095.

- The Ethertype options are 0x8100 (default) and 0x88A8. Other values can be used by separate agreement. Auto-negotiation is set to 'on'.

- Several UNIs can be connected to a single ENNI. In practice, the number is limited primarily by the traffic volume coming in from the UNIs.

- The multi-service NNI product allows for connecting also Telia L2VPN services other than the Telia Ethernet service to the same ENNI.

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Fibre availability permitting, the ENNI can be located anywhere in Finland or other Nordic countries.

3.1.2 Telia Ethernet UNI

The Telia Ethernet UNI is provided by Telia Finland Oyj. The service solution contains components as per the following tables:

- ✓ Included
- - Optional

Table 3: Basic services for an UNI

Basic services for an UNI	
Subscription capacity:	
- Fibre connection 10 Mbps–10 Gbps	✓
- Mobile connection 50 Mbps, 100 Mbps or 300 Mbps	✓
Service level (SLA):	
Basic	-
Standard	✓
Gold	-
Platinum	-
Diamond	-
Redundancy-secured access	-
Classified traffic:	
– Standard (CoS L) – (default)	✓
– OnlyBC+ (CoS M)	-
– Mix (CoS LMH)	-
– Mix Voice (CoS LMH)	-
MTU:	
– 2000	✓
– 9100	-
Telia terminal device (CPE):	
– Fibre connection	-
– Mobile connection	✓

Ethernet E-Access UNIs are implemented as shown in figure 1 below. The UNIs are connected to the ENNI via a network connection, which is a connection between ME switches within a backed-up MPLS network. In the terminology of the international Metro Ethernet Forum, this connection is an Ethernet Virtual Connection (EVC).
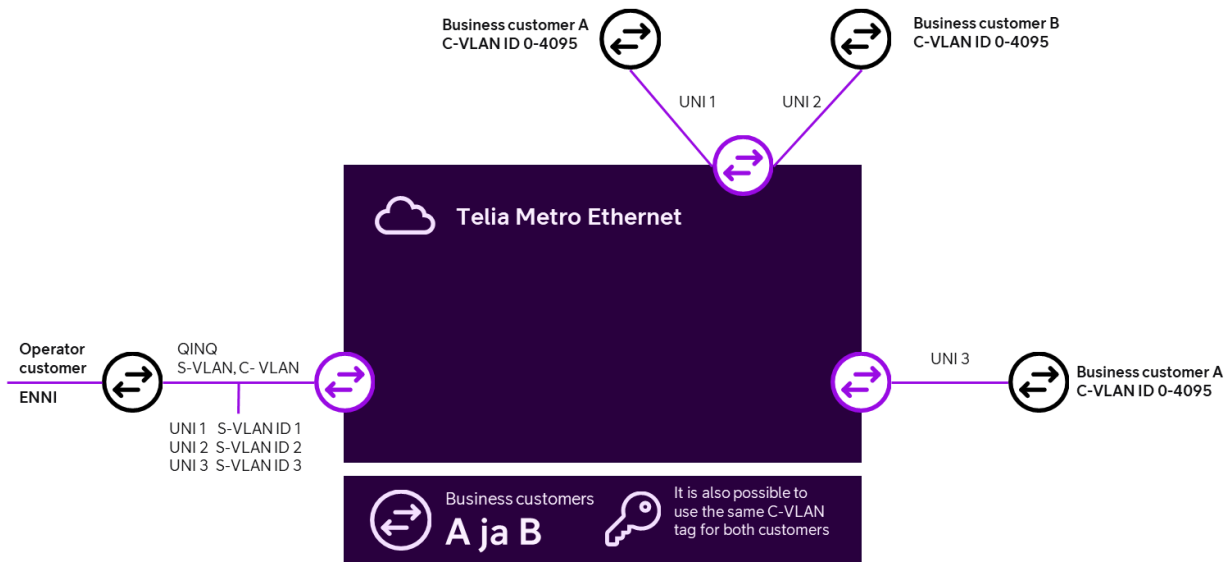
Figure 1: Ethernet E-Access, UNIs

In the Ethernet E-line service type, UNIs are connected to each other via a network connection that is a connection between ME switches in a backed-up MPLS network, figure 2.

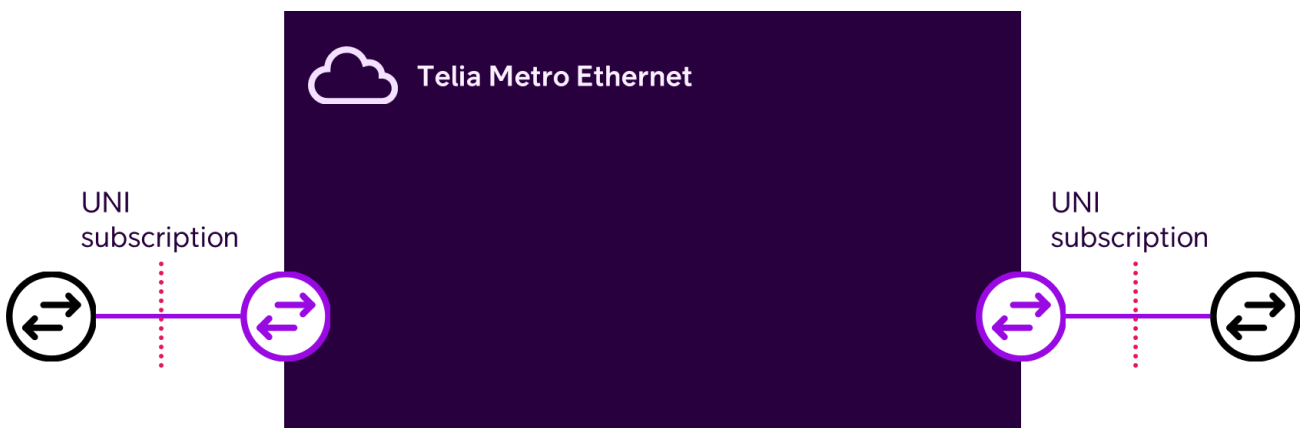Figure 2: Ethernet E-line, UNIs

In the Ethernet E-LAN service type, UNIs (EVP-LAN) are connected to the Telia network using a network connection (network bridge) that is the connection between ME switches in a backed-up MPLS network, figure 3.
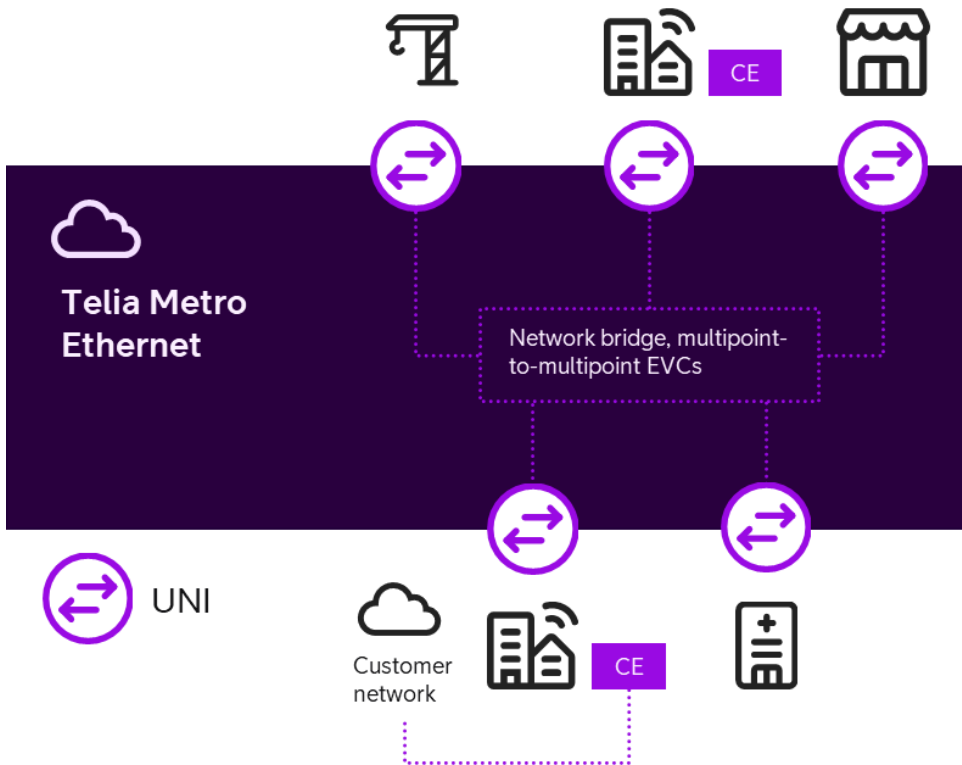
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Figure 3: Ethernet E-LAN, UNIs

3.1.3 International Telia Ethernet UNI

UNIs can also be implemented in Telia's own network in the Nordic and Baltic countries, as well as through our partners in several countries around the world. The features of international UNIs may be limited in some respects to the above general UNI features. Available speed classes, service levels, CoSes, etc. are subject to availability in the target country.

3.1.4 UNI Mobile access

In E-Access and E-LAN service solutions, UNIs can also be implemented with wireless mobile connectivity. A Mobile access to Telia's network is implemented using wireless technology, using the mobile telephone network. The technology used in the mobile network depends on the geographical location. Traffic over the mobile telephone network is encrypted using the IPSec protocol.

As a wireless service, the data transmission rate and other service quality of the connection may vary for reasons related to the customer equipment, antenna solution, connection, Telia Company's mobile communications network or load on the base stations of the radio network.

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The service includes the required mobile data subscriptions. The terminal device and SIM card are automatically supplied with the subscription. Telia owns the SIM card used in the service, and it may not be used for any other purpose.

The capacity of mobile subscriptions depends on the Telia mobile data network used in each location. The customer is responsible for verifying the coverage of the mobile network at the

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location of the Mobile access connection terminal device and determining the need for an additional antenna to ensure service functionality.

The capacity of the subscription depends on the maximum speed available on Telia's mobile data network at any given time. Note that the capacity of an individual connection is the maximum capacity of the installation site, not a guaranteed capacity.

Environmental and safety requirements

We require customer-premises equipment to be powered in such a way and used under such environmental conditions (such as temperature, humidity and cleanliness) that enable the appropriate functioning of the devices.

The physical security of customer equipment is important in mobile use and customer-premises equipment must not be accessible by any third parties. The connection is not dependent on the physical installation location. The connection will remain active even if the device is moved from the original installation location. In case of theft of the customer equipment, Telia Customer Service must be immediately contacted to disable the SIM card.

Limitations

Access to the customer-premises equipment's installation address must be possible through the public road network or similar open road network.

The service level (SLA) does not cover wireless transmission path faults.

The Mobile access connection service is not guaranteed to operate at full speed if the size of the Ethernet packets is less than 500 bytes. In addition, the order of packets larger than 1360 bytes may change in the upstream direction.

3.2 Speeds of service

The table below shows the speeds available for different connection types.

Table 4: Telia Ethernet product design and service speeds

Subscription type	Products	Connection type	Speeds
HUB (ENNI)	– Ethernet Nordic ENNI/HUB Access – Multi-service NNI	Single Access Dual Access	10 Gbps, 100 Gbps
E-Access (UNI)	– Ethernet Nordic Access-EPL – MetroEthernet access	Single Access Dual Access	10 Mbps, 20 Mbps, 30 Mbps, 50 Mbps, 100 Mbps, 200 Mbps, 300 Mbps, 500 Mbps, 1 Gbps, 2 Gbps, 4 Gbps, 6 Gbps, 8 Gbps, 10 Gbps
		Mobile access	50 Mbps, 100 Mbps, 300 Mbps
E-line (UNI)	– Ethernet Nordic E-line EPL – MetroEthernet Capacity connection	Single Access Dual Access	10 Mbps, 20 Mbps, 30 Mbps, 50 Mbps, 100 Mbps, 200 Mbps, 300 Mbps, 500 Mbps, 1 Gbps, 2 Gbps, 4 Gbps, 6 Gbps, 8 Gbps, 10 Gbps
E-LAN (UNI)	– Ethernet Nordic EVP-LAN – Ethernet Nordic network bridge access	Single Access Dual Access	10 Mbps, 20 Mbps, 30 Mbps, 50 Mbps, 100 Mbps, 200 Mbps, 300 Mbps, 500 Mbps, 1 Gbps, 2 Gbps, 4 Gbps, 6 Gbps, 8 Gbps, 10 Gbps
		Mobile access	50 Mbps, 100 Mbps, 300 Mbps

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3.3 Optional supplementary services

Table 5: Optional extras for Telia Ethernet products

Optional supplementary services		
SLA	**CPE**	**CoS**
– Basic	– CPE 1GE Basic (default)	– Standard (CoS L) (default)
– Standard (default)	– CPE 1GE Premium	– OnlyBC+ (CoS M)
– Gold	– CPE 10GE	– Mix (CoS LMH)
– Platinum	– CPE 1GE LTE combo	– Mix Voice (CoS LMH)
– Diamond	– CPE 1GE LTE – Advanced combo	
	– CPE 1GE + LTE/5G	

3.4 Service levels

The desired service level is selected for each Telia Ethernet access. The service levels available are Basic, Standard, Gold, Platinum and Diamond. Different UNIs connected to one ENNI need not have the same service level: the service level of each access can be selected individually according to need.

The table below lists the basic features of each service level. Maintenance is described in greater detail in a separate service level description (service level description of Telia's ME/IP operator products).

Table 6: Service levels

Feature	Basic (A12h)	Standard (A8h)	Gold (C8h)	Platinum (C4h)	Diamond (D15)
Availability during service hours (SEA)	-	99.20%	99.60%	99.80%	99.98%
Availability calculation period	-	1 month	1 month	1 month	1 month
Reports on service availability	-	Upon request	Upon request	Upon request	Upon request
Maintenance window	-	Telia's nationwide	Telia's nationwide	Telia's nationwide	Telia's nationwide
The minimum time of advance notice to customers regarding planned maintenance measures	-	10 business days	10 business days	10 business days	10 business days
Fault report receipt hours	24/7	24/7	24/7	24/7	24/7
Service hours	Mon–Fri 7:30 a.m. to 6:00 p.m. (excluding public holidays)	Mon–Fri 7:30 a.m. to 6:00 p.m. (excluding public holidays)	24/7	24/7	24/7
Fault repair is started no later than (delay during service hours)	Following business day	4 h	Immediately upon receipt of the fault report	Immediately upon receipt of the fault report	Immediately upon receipt of the fault report
Access down time (ADT) during service hours	12h	8h	8h	4 h	15 min
Fault repair reports	No	When the fault has been repaired	When the status of the problem changes	When the status of the problem changes	When the status of the problem changes
Delivery time	Access-specific	Access-specific	Access-specific	Access-specific	Access-specific

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The access downtime of the Diamond service level is 15 minutes. This is achieved by providing redundancy for the access. The implementation of the redundancy is presented in table 4.7.

4 Technical implementations

4.1 MTU

In Telia's Ethernet service the MTU of the connection refers to the maximum allowed number of bytes in an Ethernet frame. By default, Telia's Ethernet service supports an MTU of 2000, including a 4-byte FCS error-correction checksum. When requested separately, an MTU size of 9100 can be implemented, subject to availability, for fibre-based access.

Table 7: Maximum transmission unit (MTU)

Type of connection	Maximum frame size (bytes)
Fibre access	2000 (9100)
Mobile access	2000

4.2 Service endpoints

The table below presents the Telia terminal devices used to produce the service.

Table 8: Service terminal devices

Subscription capacity	Access implementation method	Terminal device type	Telia terminal device
Max. 50 Mbps	Mobile	CPE 1GE LTE combo	OneAccess 1645, CAT6
Max. 100 Mbps	Mobile	CPE 1GE LTE – Advanced combo	OneAccess 1646, CAT12
Max. 300 Mbps	Mobile	CPE 1GE + LTE/5G	OneAccess 1646
Max. 300 Mbps	Fibre	CPE 1GE	Oneaccess 1645[1]
Max. 1 Gbps	Fibre	CPE 1GE	OneAccess 1646
Max. 1 Gbps	Fibre	CPE 1GE premium	Cisco ASR920
Max. 10 Gbps	Fibre	CPE 10GE	Cisco ASR920

4.3 Access implementation methods and interfaces

Depending on the speed, the implementation and interfaces of the Ethernet accesses are as listed below.

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[1] Full connection capacity is achieved using a frame size of at least 256 bytes at speeds above 300Mbps

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Table 9: Access implementation methods and interfaces

Subscription capacity	Access implementation method	Interface
Max. 300 Mbps	Mobile + Telia's CPE	1000BASE-T (1000BASE-BX10-D) (1000BASE-LX)
Max. 1 Gbps	Fibre	1000BASE-BX10-D
Max. 1 Gbps	Fibre + Telia's CPE	1000BASE-T (1000BASE-BX10-D) (1000BASE-LX)
Max. 10 Gbps	Fibre	10GBASE-BX10-D (10GBASE-LR)
Max. 10 Gbps	Fibre + Telia's CPE	10GBASE-BX10-D (10GBASE-LR)

The customer's interface to the Telia Ethernet service depends on the capacity and on whether the access is delivered with or without a Telia terminal device. By default, fibre accesses without a terminal device are implemented as single-fibre solutions with a 1000BASE-BX10-D or 10GBASE-BX10-D interface.

The Rx/Tx wavelengths of single-fibre connections are:

- 1000BASE-BX10-D/10GBASE-BX10-D: Tx 1490 nm, Rx 1310 nm
- 1000BASE-BX10-U/10GBASE-BX10-D: Tx 1310 nm, Rx 1490 nm

In a single-fibre solution, the interface provided by Telia is always 1000BASE-BX10-D or 10GBASE-BX10-D, and the customer must use the 1000BASE-BX10-U or 10GBASE-BX10-U connection.

4.4 Other Telia Ethernet parameters

Table 10: Other Telia Ethernet customer interface parameters

Feature	Default value	Note:
Ethertype	0x8100	Other values can be used by separate agreement.
Autonegotiation	yes	Other fixed values can be used by separate agreement

4.5 Layer 2 management protocols (L2CP)

The Telia Ethernet service passes through the following L2 control protocols: STP/RSTP/MSTP, CDP, VTP and LACP. Currently, support for the following MACsec encryption versions has been confirmed: Static Connectivity Association Key (CAK) and Static Secure Association Key (SAK).

It is not recommended to use LACP with UNIs connected to Dual Home ENNIs. LLDP pass-through is possible with accesses that have been implemented with a Telia terminal device.

The ENNI for the E-Access service accepts L2CP frames marked with an S-tag, and they are transmitted untagged to the specified Access EPL UNI. Untagged frames are rejected at the ENNI. Access EPL and E-Line EPL UNIs also accept and forward untagged L2CP frames.

4.6 IPv6 pass-through

By default, a Telia Ethernet access is IPv6-enabled. However, prioritisation of traffic based on IPv6 cannot be guaranteed. Therefore, if the customer wishes to use CoS classes other than

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Standard (CoS L) or ONLYBC+ (CoS M) in IPv6 traffic, then the prioritisation of traffic must be configured using L2 PCP bits.

4.7 Access redundancy

4.7.1 Backing up ENNIs

Redundancy is provided for an ENNI between Telia's ME equipment facility and the customer's equipment facility by the use of the Multichassis LAG protocol (MC-LAG) (figure 4). If the customer's equipment facilities are located in different Telia ME areas, the redundancy is implemented as a Dual Home service, in which case a UNI ordered for an ENNI is implemented as a 3-point VPLS service. Both sides of the ENNI are then active at the same time

If the service level selected for the connection is Diamond, then a redundant fibre route is implemented along two physically separate routes leading to one or two Telia Metro Ethernet PoPs. The primary and secondary connection are provided with a unique connection ID (e.g., MNNI<10 digits>). If there is one PoP comprising at least two Metro Ethernet devices, the mutually redundant fibre connections can be routed to different Metro Ethernet devices (device redundancy). In case of an ENNI connection backed up to two PoPs with MC-LAG, the mutually redundant PoPs may be located in physically separate places within one ME area.

A redundantly secured ENNI is implemented from two physical ports to the customer equipment. The ports on the customer equipment must be configured as a link aggregation group (LAG), and the active port is determined by the use of the LACP protocol. The autonegotiation setting for client devices must be set to "off". Normally in a multi-chassis LAG (MC-LAG) implementation, the primary interface is active and the secondary interface is passive. If the primary route malfunctions, it is automatically disconnected and the secondary route is activated. The customer can thus identify a functioning route by checking which interface is active. In case of malfunction, active connections are re-routed within five seconds.
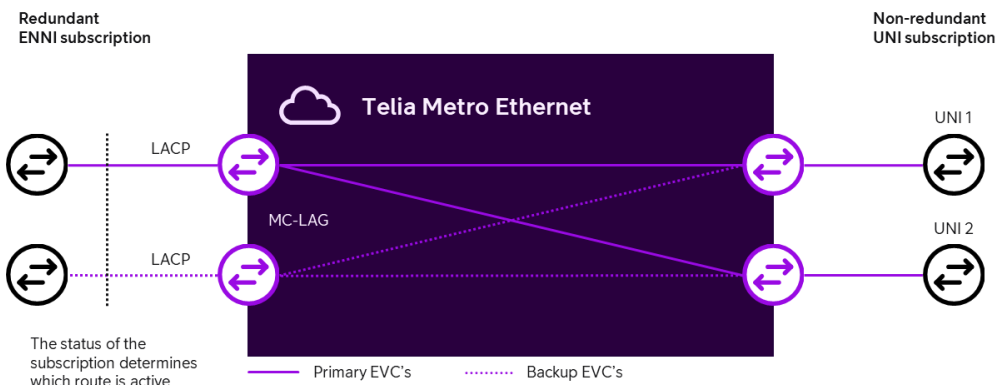

Figure 4: Implementation of a redundantly secured ENNI with two interfaces (customer terminal devices).

4.7.2 Backing up an E-Access UNI

A backed-up UNI in E-Access is implemented to either a non-redundant or redundant ENNI using one VLAN tag (S-tag). The access is duplicated and the service is carried in Telia's Metro Ethernet network as a VPLS Hub & Spoke service, whereby both connections are active simultaneously. Both connections are assigned a connection ID of their own.

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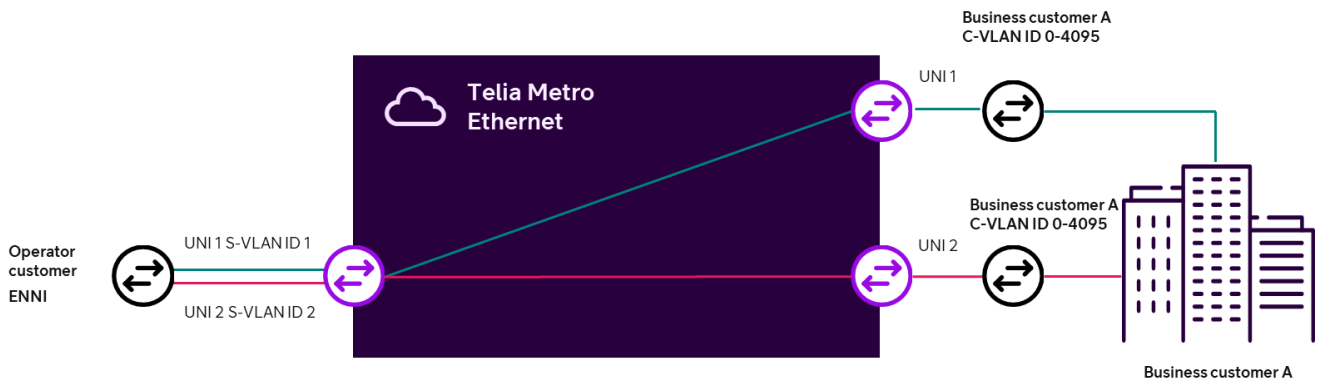Public

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Figure 5: Implementation of a redundant Metro Ethernet access

4.7.3 Backing up an E-Line UNI

Redundancy can be provided for accesses of all service levels, but only accesses of the Diamond level are provided with two separate routes.. A redundant E-line UNI is provided as two separate point-to-point connections (EVC), to which a unique connection ID is assigned (e.g., TSEN<10 digits>). The connections are carried through Telia's redundant MPLS network as separate services, but the service routes within the network are not specified.
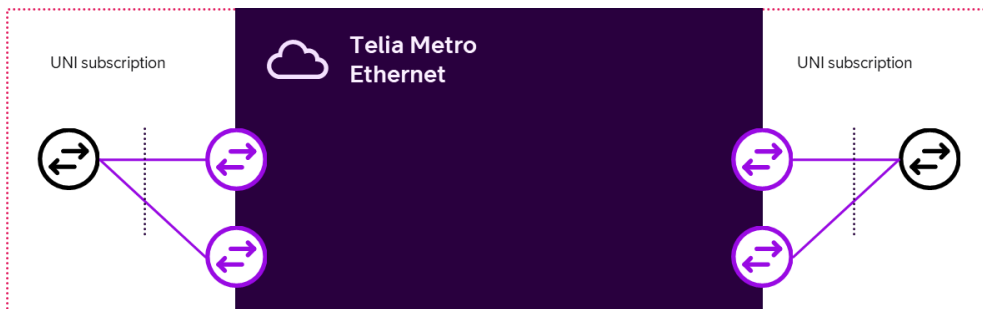
Figure 6: E-line service with a redundant UNI

4.7.4 Redundancy solutions and service levels of Telia Ethernet accesses

Redundancy solutions and service levels of the Telia Ethernet accesses are presented in the table below.

Table 11: Redundancy solutions and service levels of Telia Ethernet accesses

SLA class	Card redundancy	Device redundancy	Route redundancy
Basic	✓		
Standard	✓		
Gold		✓	
Platinum		✓	
Diamond		✓	✓

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4.7.5 Redundant Mobile access (Mobile backup)

Mobile backup is an easy way to ensure the functionality of a fixed fibre connection. The connection consists of a primary fixed fibre connection and a secondary mobile connection, both of which are connected to a Telia terminal device, with only one interface for the client. The solution enables convergent configurations for primary and secondary connectivity. No changes are required at the customer end for VLAN or ENNI settings as traffic transitions to a secondary connection. The solution is implemented as a VPLS service.

The Telia terminal device monitors the main connection status and automatically switches traffic to the secondary connection, and no further customer action is required. The terminal device and SIM card are automatically supplied with the subscription. Typically, the secondary connection is in stand-by mode and is automatically activated in the event of a fault condition (the redirection time is 30 seconds), allowing traffic to be routed to the Mobile access When the primary connection works again, traffic is automatically routed back to the fixed connection.

A mobile backup connection is available for fibre connections up to 1Gbps. Fixed fibres are offered with all CoS profiles, while the Mobile Access service does not have separate CoS profiles.

－	All standard service classes (SLAs) and CoS profiles are available for the primary fixed connection

－	The redundant mobile connection's service speed is limited to the Mobile Access service selected at the time

－	There are no separate CoS classes on the mobile connection and the traffic class is always Standard (CoS L)
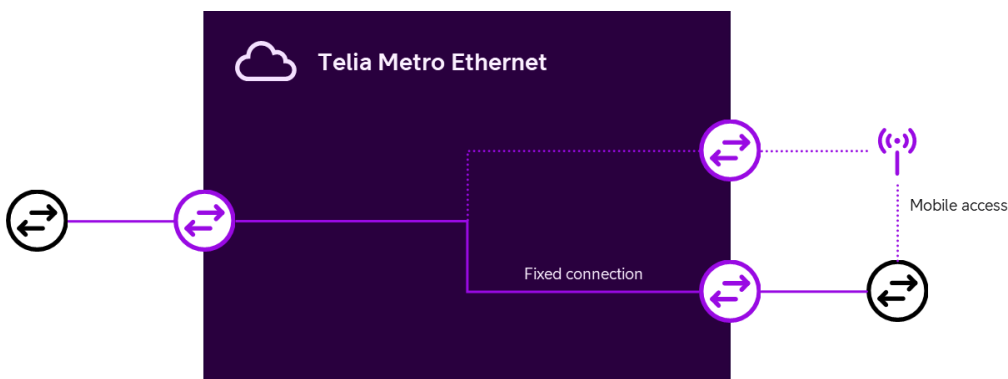

Figure 7: Implementation of a Mobile backup solution.

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5 The CoS profiles and configuration of the Ethernet service

Upon ordering the Ethernet service, the customer selects a traffic class profile for the access. The profile determines the traffic classes – and their capacity – available to the customer access. The customer can select one CoS profile per Ethernet service ordered. The CoS profile of the ENNI is determined automatically on the basis of the UNI profiles.

Classes of service (CoS) are used to prioritise customer traffic to different classes according to the importance of traffic and latency requirements. Each CoS can be used when supported by both endpoints.

The CoS names used in this document are based on MEF class-of-service names. MEF23 defines three class-of-service identifiers: H, M, and L.

Telia Ethernet connections support the following four (4) CoSes:

CoS L (BE+) Best Effort+

- Default category that applies to non-critical applications such as email and web browsing.

CoS M (BC+) Business Class+

- Suitable for most business-critical data applications such as customer server applications for enterprises.

CoS H (RT1), Real Time

- Suitable for VoIP applications and Ethernet synchronisation.

CoS H (RT2), Real Time

- Suitable for high-definition video conferencing applications.

All access technologies support traffic class CoS L (BE+), and the availability of other classes of service depends on bandwidth and the access capacity media. Only CoS BE+ is available for mobile accesses.

No connection or port is permitted to use BC+-class traffic faster than 1200 Mbps and total RT-class traffic (RT1+RT2) faster than 700 Mbps at any time without a specific request to Telia.

5.1 Bandwidth profiles for CoS categories

To facilitate the selection and delivery of CoS profiles, various bandwidth profiles have been preset for them. Bandwidth profiles allow customers to determine only what types of applications (data/video/call) are used and whether data traffic is prioritised or not.

The following profiles are available:

- Standard, CoS L (only BE+ traffic in the class)
- ONLY BC+, CoS M (only prioritised BC+ traffic in the class)
- MIX, CoS LMH (call/video applications and prioritised traffic)
- MIX Voice, CoS LMH (call applications and prioritised traffic)

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5.1.1 CoS profile Standard (CoS L)
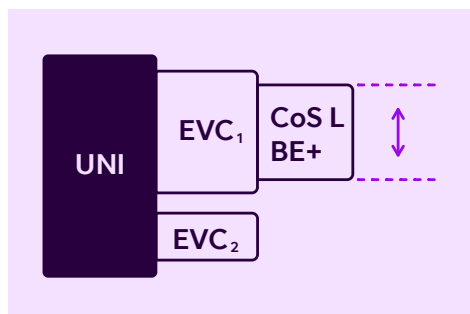
This bandwidth profile is used in standard data applications such as web browsing and email. All EVC/OVC traffic is done with priority BE+.

CoS Standard (CoS L) options

Table 12: Bandwidth profiles Standard (CoS L) Mbps

Standard CoS L	Fibre	Mobile[2]
10	10	-
20	20	-
30	30	-
50	50	50
100	100	100
200	200	-
300	300	300[3]
500	500	-
1,000	1,000	-
2,000	2,000	-
4,000	4,000	-
6,000	6,000	-
8,000	8,000	-
10,000	10,000	-

The actual speed of the mobile connection service depends on the availability of the 4G/5G network capacity at the site

[3] The actual service bandwidth is 300M/100M.

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5.1.2 CoS profile ONLY BC+ (CoS M)
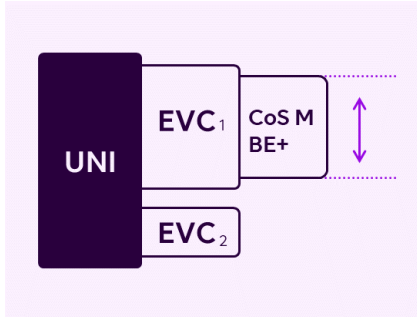
This traffic class profile is used for prioritised data traffic. All EVC/OVC traffic is done with priority BC+.

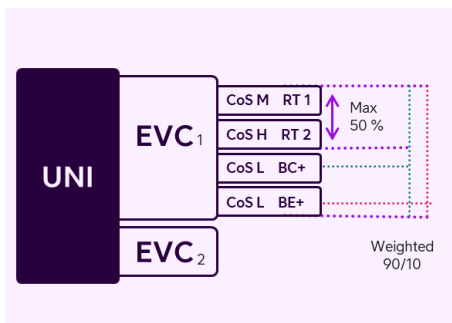**CoS profile ONLY BC+ (CoS M) options**

The following table shows the maximum bandwidth for prioritised data traffic.

Table 13: Bandwidth profiles ONLY BC+ (CoS M) Mbps

ONLY BC+	Fibre
10	10
20	20
30	30
50	50
100	100
200	200
300	300

5.1.3 CoS profile MIX (CoS LMH)

This CoS profile is used when different combinations of prioritised traffic are required, such as call, video, prioritised data, and normal data.

For real-time applications (RT1 and RT2), fixed values are specified for each selected bandwidth. The maximum bandwidth for real-time traffic is 50% of the total bandwidth. The remaining bandwidth is used for prioritised data traffic and normal data.

Traffic is classified/tagged as RT1, RT2, BC+ and BE+ based on the current priority. The BC+ and BE+ categories are prioritised in a 90/10 ratio. Real-time RT1 or RT2 traffic can never exceed the fixed bandwidth allocated to it. BC+ and BE+ traffic may use the bandwidth up to the maximum bandwidth (the maximum BC+ bandwidth for 500 Mbps and above is specified in table 14).

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5.1.4 CoS profile MIX Voice (CoS LMH)
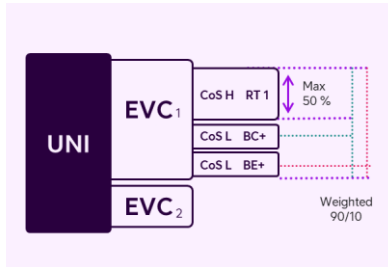

This CoS profile is used when different combinations of priority traffic are required, such as call, prioritised data, and normal data.

A fixed value is set for each selected bandwidth for the real-time application (RT1). The maximum bandwidth for real-time traffic is 50% of the total bandwidth. The remaining bandwidth is used for prioritised data traffic and normal data.

Traffic is classified/tagged as RT1, BC+ and BE+ based on the current priority. The BC+ and BE+ categories are prioritised in a 90/10 ratio. Real-time RT traffic can never exceed the fixed bandwidth allocated to it. BE+ traffic may use the bandwidth up to the maximum bandwidth (the maximum BC+ bandwidth for 500 Mbps and above is specified in table 14).

CoS Profile MIX (CoS LMH) options

The following table presents the bandwidth available for real-time traffic (RT1 and RT2) across different connections. Maximum BE+ and BC+ bandwidth: see CoS Standard and/or ONLY BC+ table (the maximum bandwidth is available for BE+ and BC+ traffic only if there is no outgoing real-time traffic).

Table 14: CoS profiles MIX (CoS LMH) Mbps

EVC/OVC capacity	Maximum real-time traffic capacity	RT class	MIX Voice	MIX	Maximum BC+ capacity
10,000	700	RT1 RT2	- -	200 500	1200
8,000	700	RT1 RT2	- -	200 500	1200
6,000	550	RT1 RT2	- -	150 400	900
4,000	400	RT1 RT2	- -	100 300	600
2000	200	RT1 RT2	- -	50 150	300
1,000	200	RT1 RT2	200 0	50 150	300
500	200	RT1 RT2	200 0	50 150	300
300	150	RT1 RT2	150 0	50 100	300
200	100	RT1 RT2	100 0	25 75	200
100	50	RT1 RT2	50 0	10 40	100
50	25	RT1 RT2	25 0	10 15	50
30	15	RT1 RT2	15 0	5 10	30
20	10	RT1 RT2	10 0	5 5	20

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EVC/OVC capacity	Maximum real-time traffic capacity	RT class	MIX Voice	MIX	Maximum BC+ capacity
10	6	RT1	6	3	10
		RT2	0	3	

5.2 Classification

To use classes of service, the customer must select the correct values as the priority bits for Ethernet frames sent over the UNI/ENNI. The value determines the traffic class with which the frame is sent.

There are two classification methods:

1) The P bit classifies priority on the transmission layer (Layer 2).

2) IP Precedence classifies priority on the network layer (Layer 3).

Classification is required when multiple CoSes are used for non-tagged frames.

In order for the product to support IP Precedence, IPv4 must be used.

Classification is as per the following table:

Table 15: Categorisation of P bit

CoS profile	Class of service	IP Precedence/PCP
Standard	BE+	0-7
ONLYBC+	BC+	0-7
MIX	BE+	0–1, 6–7
MIX Voice	BC+	2–3
MIX	RT1	5
MIX	RT2	4
MIX Voice	RT1	4–5

IP Precedence values are passed through the connection unmodified.

If the value entered by the customer as a PCP bit at the trunk port differs from the below, the values of the customer-premises equipment will be changed to P bit values according to the rules below:

- **BE+** set p=1
- **BC+** set p=3
- **RT+** set p=5

If the customer uses an MPLS connection for the service, the following policy applies:

- The CoS classification of untagged frames is not supported for profiles with multiple CoS categories.

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- The customer must copy the MPLS-EXP field to the PCP bits with the PCP bit value as in the table above.

- Classification is done for PCP bits only.

5.3 Latency variation and packet loss

Latency is measured as a 15 min average with a data packet size of 1,000 bytes. The quality criteria apply to connections implemented with a fibre-based transmission solution. The dimensioning of the transmission network ensures that the quality criteria are met within the nominal capacity of the connections.

Table 16. Typical values for quality criteria in classes of service.

Queue	Latency ms	Jitter ms	Packet loss %
RT	≤ 12	≤ 5	< 0.01%
BC	≤ 14	≤ 5	< 0.01%
BE	≤ 16	not specified	not specified

6 Supplementary services

6.1 In-house cabling

If the customer orders the in-house cabling of the property that enables the delivery of the Ethernet service, Telia will have the missing cabling built as a separate service at an additional charge.

6.2 Customer-premises equipment installation

When delivering the service, the Telia engineer may install the customer's own equipment at the same time. The customer's equipment must be delivered to the installation site, or a location designated for pick-up may be agreed upon separately.

6.3 Customer-premises equipment looping (UNI loopback)

The MAC looping function of the customer's UNI is an optional service that allows the customer to test the service with their own measuring hardware: This option is only supported if the access has been provided with a Telia terminal device.

Loopback tests are performed from the customer's ENNI towards the UNI using the service OVC channel. Test traffic must be generated using a MAC destination address (02:02:02:02:02:02) dedicated to this purpose.

The UNI loopback will be connected when the delivery is complete and will be automatically decommissioned ten (10) days after the completion date. UNI loopback may be removed earlier or activated separately later for troubleshooting purposes at the customer's request.

6.4 Additional antennas for mobile connection

An omnidirectional or directional antenna is available as an option for Mobile Access service orders.

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1) The omnidirectional antenna (Package 1) is a strongly amplifying wide-beam antenna that connects to multiple access points.

2) The directional antenna (Package 2) is a strongly amplifying narrow-beam antenna for directing traffic to a single access point.

The installation of the antenna is always included in the add-on. The service includes up to 1.5 hours of installation work at an installation height of up to three (3) metres. Additional work will be invoiced according to the completed installation work and the conditions agreed on a case-by-case basis.

It is the customer's responsibility to obtain all necessary permits for antenna installations from the property owner.

7 Availability, delivery and maintenance

7.1 Availability and feasibility of the service

The Telia Ethernet service is available throughout Finland. The country is divided into 13 ME areas, which are shown on the map below (figure 8). The service is additionally available extensively in other Nordic and Baltic countries:

– Sweden

– Denmark

– Norway

– Estonia

– Latvia

– Lithuania

Final availability and feasibility of the interface must always be determined in advance by an availability inquiry.

UNIs can be located anywhere in the service availability range, independent of each other. ENNIs can be located freely in any of the four Nordic countries (Finland, Sweden, Denmark and Norway) included in the scope of service, subject to network availability.

The availability of the Mobile Access service can be checked on the coverage area map here:
Ethernet 4G- and 5G Mobile Access coverage map | Telia Wholesale

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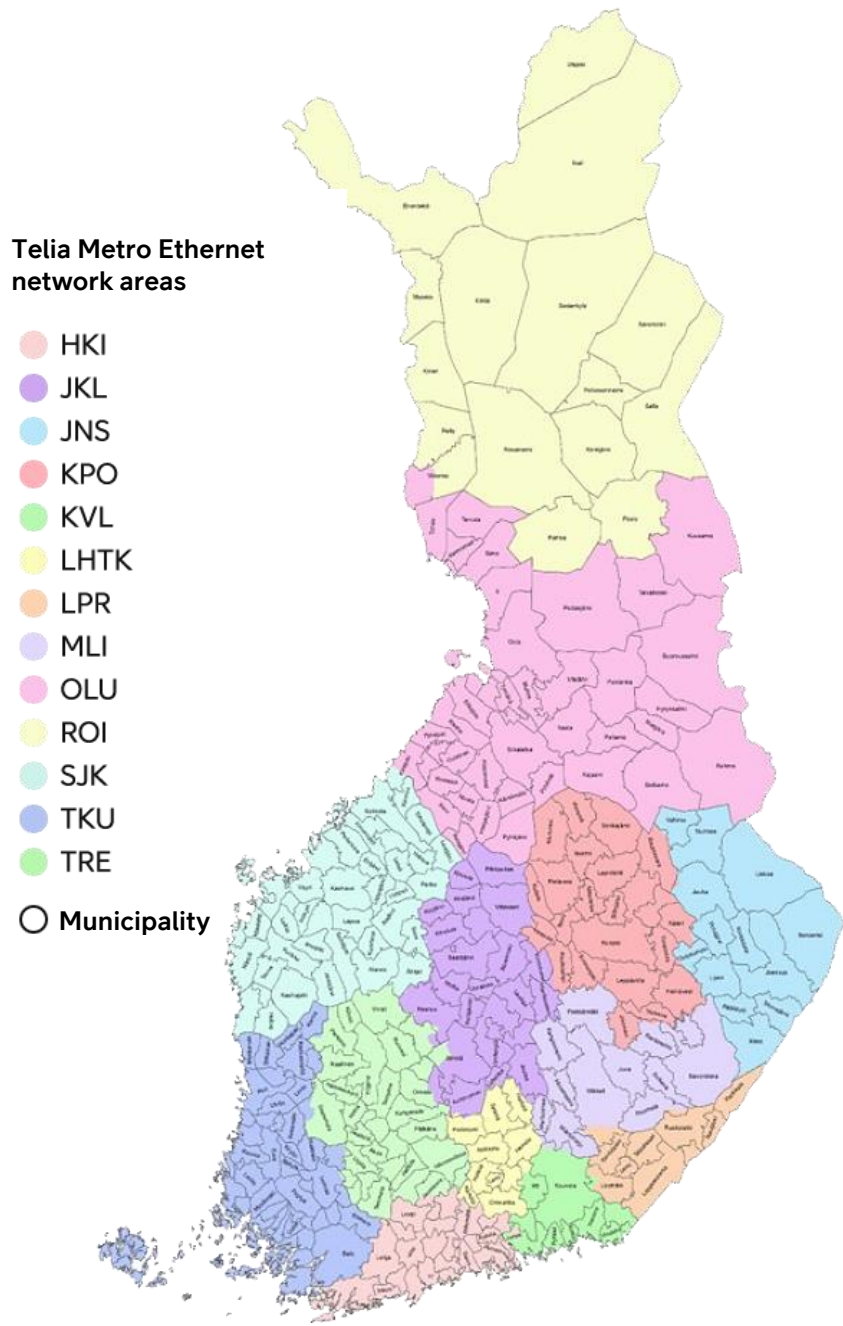Public

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Telia Metro Ethernet network areas

- ⬤ HKI
- ⬤ JKL
- ⬤ JNS
- ⬤ KPO
- ⬤ KVL
- ⬤ LHTK
- ⬤ LPR
- ⬤ MLI
- ⬤ OLU
- ⬤ ROI
- ⬤ SJK
- ⬤ TKU
- ⬤ TRE
- ◯ **Municipality**

Figure 8: ME areas

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7.2 Order and delivery procedure

Order

Before submitting an order, the availability of the product must always be checked. An operator customer requests an offer and submits an order either through Telia's online order system or with an order form available from Operator Sales.

Delivery

The Ethernet Operator Product's target delivery time for accesses in Finland is two (2) weeks or according to agreement. The delivery time for international connections is agreed separately in each case.

> The deliveries are subject to Telia's General delivery terms for business customers concerning services valid at any given time.

The Telia Ethernet product is always delivered in accordance with Telia's operator delivery process. The Telia Ethernet product is always delivered to the site's building distribution frame unless otherwise agreed.

Invoicing

The billing of the product starts on the delivery completion date announced by Telia. Access rent is invoiced monthly in advance. The first invoice includes a one-off access set-up charge.

7.3 Availability management

Maintenance breaks

Service downtime is Mondays from 00:00 to 04:00 (UTC+2).

Telia reserves the right to carry out network maintenance and alteration work also at other times. Telia strives to minimise the inconvenience the network maintenance and change 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. The customer's technical contact person (and control centre) is informed of a service break ten (10) business days in advance. The services or connections affected are specified insofar as possible.

Maintenance and monitoring

Telia's network is monitored 24/7. The fibre access between the ME switch and the customer is, however, only monitored if the customer has chosen to include a Telia-managed terminal device in the delivery.

Problem management

In the event of a fault, the customer contacts Telia's customer service point, Wholesale Technical Services (WTS).

Contacts can be made i) via an online fault reporting system, ii) by email, or iii) by telephone.

(i) Online fault reporting system: The customer can record fault reports directly in the incident management system and track the status of the fault ticket and the related actions. The management service also enables the submission of service requests, such as RFO, escalation and complaints.

(ii) E-mail: wholesale-cc@telia.fi

(iii) Telephone: 0800 174344

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Fault detection and repair follow the following procedure

1. Fault repairs of customer connections commence on receipt of the customer's fault report.
2. When reporting a fault, the customer must provide the name of a contact person that can provide further details and to whom the progress and completion of the repair of the incident can be reported. In addition, the customer must state the service ID (e.g., MEL<10 digits>, MEC<10 digits> or TSEN <10 digits>), fault start time, customer's reference, fault description and, if necessary, contact information for the contact person of the customer's end customer.
3. When Telia's network control centre has detected a fault or received a fault report, a ticket will be created. When the ticket is created, the fault is assigned a Telia contact person who is responsible for repairing the fault or coordinating the fault repair.
4. If the network control centre can repair the fault by remote configuration, the fault will be repaired, insofar as possible, in accordance with the priority pertaining to its maintenance class.
5. If the network control centre has pinpointed the fault and discovered that remote repair is not possible, then a technician will be sent to repair it on-site.
6. The customer's contact person will be notified of potential fault escalation, the reason for the fault and the estimated repair time within the limits of the maintenance class.
7. Telia informs the customer's contact person of the completion of fault repair.
8. After receiving a notification that the fault repair has been completed, the customer can make a complaint within 24 hours. After that, the ticket will be closed.

Troubleshooting and complaint reports

A troubleshooting report is available from Telia upon separate request. The troubleshooting report is delivered within five (5) business days from the completion of fault repair.

Customer complaints are replied to within ten (10) business days at the latest from the reception of the complaint.

7.4 Changes to the service

Change requests to an existing Service and orders required by the changes should be made either through the online order system or by submitting the Telia Ethernet Product order form to a salesperson who will forward it to Telia's delivery process. The customer can also contact their own account manager at Telia and negotiate the changes they want to make in more detail.

8 Changes to the service description

Telia has the right to amend this service description. If the service description is changed significantly to the detriment of the customer, the customer will be notified at least one month prior to the entry into force of the change. In other cases, Telia will announce the changes in the manner and schedule it considers appropriate.