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Ethernet link

Ethernet link

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0. Document history

Every update of this document results in a complete new version with new version number and release date.

Version	Date	Main or important changes since previous version
1.0	25 NOV 2001	<ul style="list-style-type: none">• First version
2.0	25 JUN 2002	<ul style="list-style-type: none">• Full VLAN supported, without fragmentation

1. Introduction

The goal of this document is to describe the access technical specifications for the Ethernet family services.

2. Basic Service Description

2.1. Introduction

In order to interconnect all sides involved by the LAN customer application, Belgacom offers an Ethernet data solution delivering bit rates up to 1 Gbit/s.

The Belgacom Lan Extension Solutions (BLES) uses a network built on local optical fibre rings interconnected by the Belgacom SDH or DWDM national backbone.

The proposed Ethernet interconnection service is limited at the OSI level 1.

The services Ethernet, Fast Ethernet and Gigabit Ethernet integrate reactive supervision and a basic Service Level Agreement (e.g. section or path securisation, equipment management supervised 24 hours a day and 365 days a year, single point of contact, immediate fault detection and correction, defined provisioning time, defined repair time).

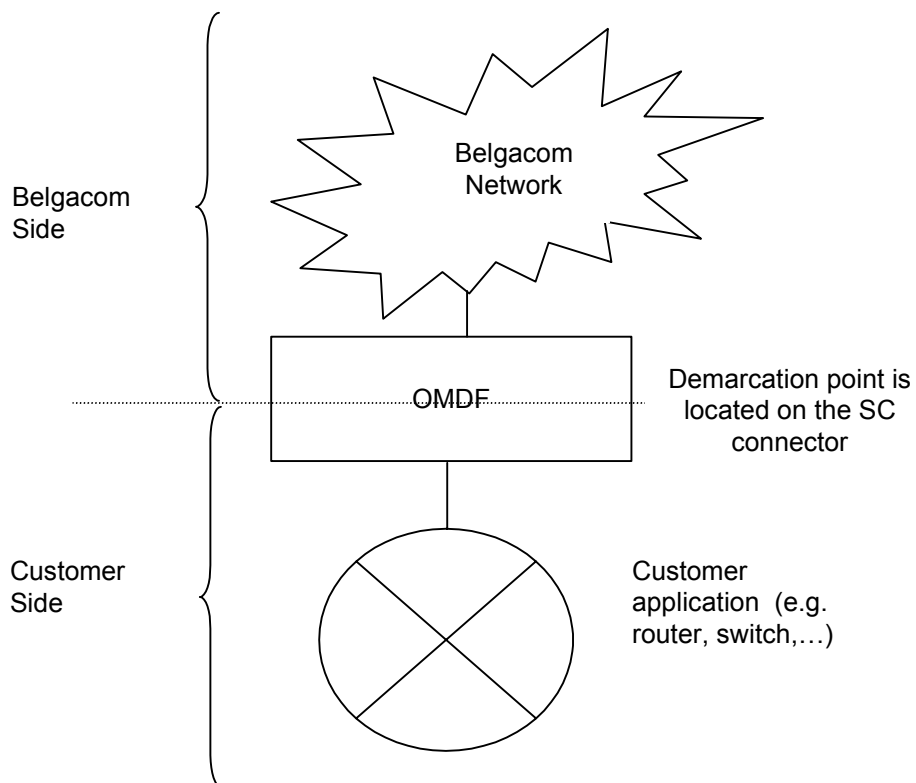
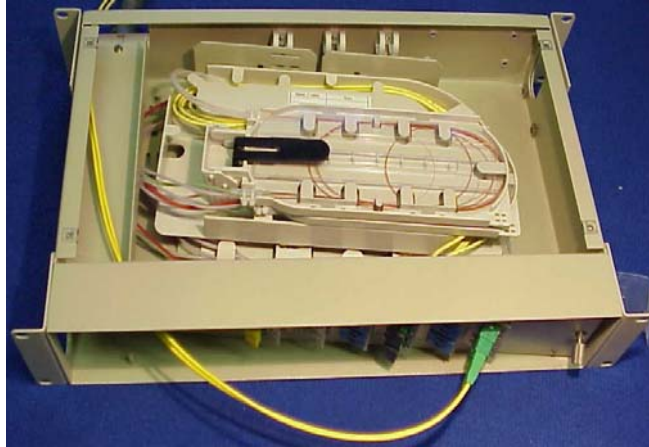
2.2. Available interfaces

The service interfaces proposed by Belgacom are the Ethernet, Fast Ethernet and Gigabit Ethernet.

- Ethernet: 10Base-TX
- Fast Ethernet: 100Base-TX, 100Base-FX (MM 1310 nm), 100Base-FX (SM 1310 nm)
- Gigabit Ethernet: 1000Base-SX (MM 850 nm), 1000Base-LX (MM 1310 nm), 1000Base-LX (SM 1310 nm)

3. Structure of network

The demarcation point is the (O)MDF with the SC/PC as customer's termination connector.



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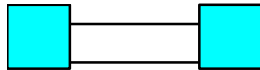
4. Topologies

Belgacom offers the Ethernet service only for the Point to Point topology up to 20 km maximum (City-to-City).

In case of other distances, the Fast Ethernet and Gigabit Ethernet are offered in Point to Point, Ring or meshed topologies.

4.1. Point to Point configuration

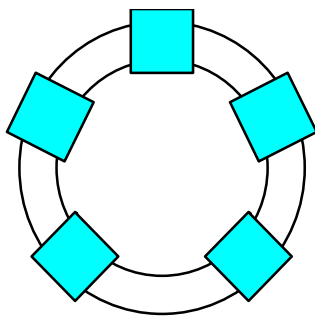
In the Point to Point topology, the nodes are connected directly to each other.



P-to-P Topology

4.2. Ring configuration

In the Ring topology, the network nodes are located in one or several optical fibre ring(s).

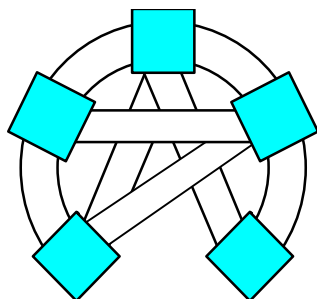


Ring Topology

4.3. Meshed configuration

In the meshed topology the network nodes are directly connected to each other by fibre links. This topology is usually used in the critical parts of the network, i.e. in order to connect the network main nodes to each other.

The most current meshed topology is the basic Point to Point topology which consist of only two nodes in the network.



Meshed Topology

5. Description Service interface

Belgacom offers different services:

Services	Length range
Intra-city	0 – 5 km
City-to-City	5 – 20 km
Inter-city short	20 – 50 km
Inter-city long	50 – 100 km
Extra-city	> 100 km

The table here above describes the basic interface:

Protocols	Bit rate interface	Physical interface	Full duplex	VLAN reference
Ethernet	10 Mbit/s	10Base-TX	802.3u	No
Fast Ethernet	100 Mbit/s	100Base-TX	802.3u	802.1Q
Fast Ethernet	100 Mbit/s	100Base-FX	802.3u	802.1Q
Gigabit Ethernet	1000 Mbit/s	1000Base-SX	802.3z	802.1Q
Gigabit Ethernet	1000 Mbit/s	1000Base-LX	802.3z	802.1Q

5.1. Ethernet Interface

The Ethernet frame coming from the customer must comply with the IEEE 802.3 and IEEE 802.3u.

The 802.3 specification mentions a maximum length for the 10Base-TX: 100 meters for the UTP 3-5.

The connector used for the 10Base-TX is a RJ45 (MDI (Medium Dependant Interface) or MDI-X (crossover)).

5.2. Fast Ethernet Interface

The Fast Ethernet frame coming from the customer must comply with the IEEE 802.3 and IEEE 802.3u.

The full duplex mode coming from customer application must comply with the IEEE 802.3u

The VLAN protocol supported by the equipment must comply with the IEEE 802.1Q

The 802.3 specification mentions a maximum length for the

- 100Base-TX: maximum 100 meters for the UTP 5.
- 100Base-FX: about 200 meters for the multimode 1310 nm.
- 100Base-FX: about 2000 meters for the singlemode 1310 nm.

The connector used for the 100Base-TX is a RJ45 MDI (Medium Dependant Interface).
The connector used for the 100Base-FX is a "SC/PC".

Caution: the support for the 50/125 μ or 62,5/125 μ multimode optical fibre is the "SC/PC".

5.3. Gigabit Ethernet Interface

The first IEEE standard (802.3z) dealing with the Gigabit Ethernet defined a use over multimode optical fibre providing full-duplex mode.

The VLAN protocol supported by the equipment must comply with the IEEE 802.1Q

The connector used for the 1000Base-SX and 1000Base-LX is an "SC/PC".

Gigabit Ethernet characteristics:

- 1000Base-SX 850 nm laser on multimode fibre
- 1000Base-LX 1310 nm laser on multimode fibre
- 1000Base-LX 1310 nm laser on singlemode fibre

Cable type	Type	Wavelength Laser	Distance
Single mode fibre (9 micron)	SM	1310 nm	5000 m
Multi mode fibre (62,5 micron)	MM	850 nm	300 m
	SM	1310 nm	550 m
Multi mode fibre (50 micron)	MM	850 nm	550 m
	SM	1310 nm	550 m

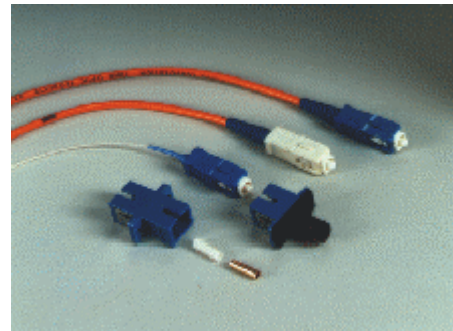
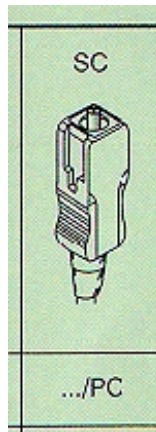
6. Description of MDI interfaces and “SC/PC”

6.1. Interface 1000Base-SX

The interface relevant for 1000Base-SX full duplex IEEE 802.3z is characterised by:

Technology: Laser VCSEL 850 nm
Support: 62,5/125 micron or G.651 Optical fibre multimode 50/125 micron.
Customer side: The current local level values depend on the selected interface card (a lot of interfaces are available in the BLES products). Belgacom suggests its customers and CPE providers to contact it in order to receive additional information about the interface characteristics.

Connector SC/PC:

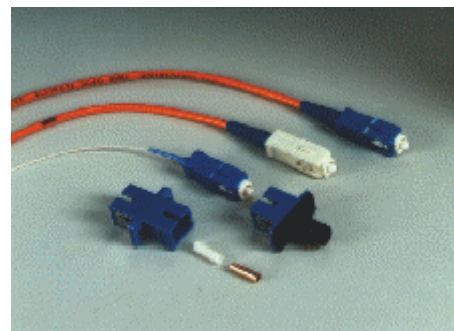
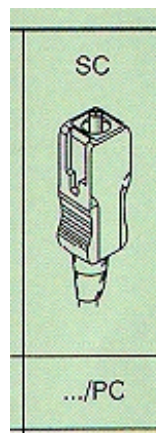


6.2. Interface 1000Base-LX

The interface relevant for 1000Base-LX full duplex IEEE 802.3z is characterised by:

Technology: Laser 1310 nm
Support: G.652, G.653 and G.655 Optical fibre single mode 9 micron.
Customer side: The current local level values depend on the selected interface card (a lot of interfaces are available in the BLES products). Belgacom suggests its customers and CPE providers to contact it in order to receive additional information about the interface characteristics.

Connector SC/PC:

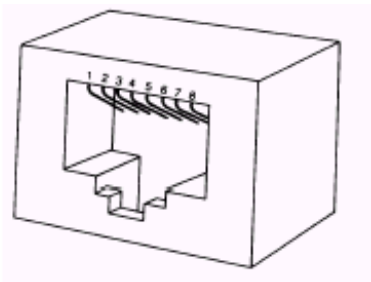


6.3. MDI Interface

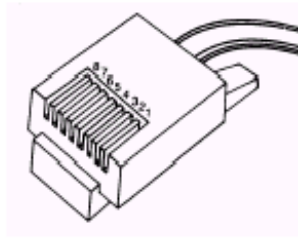
The interface relevant for the 10Base-TX and 100Base-TX physical layer specifications is to be found in the IEEE 802.3u.

Ethernet Interface (10Base-TX):

PIN	Signal	Direction	Description
1	TxD+	←	Data Out +
2	TxD-	←	Data Out -
3	RxD+	→	Data In +
4	NC	--	No connected
5	NC	--	No connected
6	RxD-	→	Data In -
7	NC	--	No connected
8	NC	--	No connected

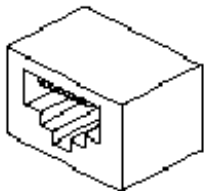


DTE and hub connector

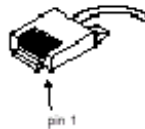


Cable connector

Fast Ethernet (100Base-TX):



MDI connector



Balanced cabling connector

Contact	MDI labeling requirement
1	Tx D1+
2	Tx D1-
3	Rx D2+
6	Rx D2-
4	B1 D3+
5	B1 D3-
7	B1 D4+
8	B1 D4-

7. Service description for the Ethernet family

Interface	Characteristics	Topology
Ethernet	Transparent 10 Mbit/s Ethernet	Point to Point
Fast Ethernet	Transparent 100 Mbit/s Ethernet	Point to Point, Ring and meshed
Gigabit Ethernet	Transparent 1000 Mbit/s Ethernet	Point to Point, Ring and meshed

Interface service	Length (km)	Connector	Type of cable	Impedance
Ethernet (10Base-TX)	0,1	RJ 45 (ISO 8877)	>= UTP 3	100 ohms
Fast Ethernet (100Base-TX)	0,1	RJ 45 (ISO 8877)	UTP 5	100 ohms
Fast Ethernet (100Base-FX)	0,3	SC/PC	optical fibre multimode 50/125 μ or 62,5/125 μ >=G.652 for single mode fibre SM	N.A
Gigabit Ethernet (1000Base-SX)	0,5	SC/PC	optical fibre multimode 50/125 μ or 62,5/125 μ	N.A
Gigabit Ethernet (1000Base-LX)	3	SC/PC	50/125 μ or 62,5/125 μ for multi mode fibre >=G.652 for single mode fibre SM	N.A

8. Norms to be respected by the customer

The Ethernet frame coming from the customer application must comply with the IEEE 802.3.

The Fast Ethernet frame coming from the customer application must comply with the IEEE 802.3u.

The Ethernet and Fast Ethernet full duplex transmission mode coming from the customer application must comply with the IEEE 802.3x

The VLAN frame length is defined within the IEEE 802.1Q.