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Transparent 2048 kbit/s digital leased lines

Table of Contents

1. Introduction

This document contains the technical specifications for the PROXIMUS 2 Mbit/s transparent leased lines service. These leased line specifications are based on a generic model as shown in annex 1. The central part of the model is the "connection". A connection includes a series of transmission channels or telecommunication circuits. It's set up to provide for the point-to-point transfer of signals between the terminal equipments of the customer.

The connection is presented to the user via an "interface presentation" at the Network Termination Point (NTP). The NTP comprises all physical connections and their technical access specifications that form part of the PROXIMUS transmission network. In some cases the NTP is presented by means of an electrical equipment referred to as the Network Termination Unit (NTU). For the description of the 2 Mbit/s transparent leased line service, the NTU is considered as being contained within the connection.

The 2048 kbit/s transparent leased line provides a bi-directional point-to-point digital circuit for which no structuring of the data is provided by the PROXIMUS network.

The network interface presentation offered to a 2048 kbit/s transparent leased line customer is based on the G703-interface; 120 Ohms is the standard version, but as an option the 75 Ohms-version can still be obtained.

Basically, the 2048 kbit/s transparent digital leased lines offered by PROXIMUS are at least conform to the ONP technical requirements ETS 300 246 and ETS 300 247.

2. Connection characteristics

2.1. Transfer rate

2.1.1. Leased line timing

There's no timing provided from the network connection; the provision of the circuit timing is the responsibility of the customer. On the other hand, the 2048 kbit/s transparent leased line is capable of carrying timing provided by the user (i.e. from the customer's terminal equipment) within the limits of 2048 kbit/s ± 50 ppm as specified by ITU-T Recommendation G.703.

2.1.2. Information transfer rate

The transparent 2048 kbit/s digital leased line connection is capable of transferring an information rate of 2048 kbit/s ± 50 ppm.

2.2. Information transfer susceptance

The transparent 2048 kbit/s digital leased line connection is capable of transferring unrestricted digital information.

2.3. Structure

The connection shall not be structured by PROXIMUS; the full bit rate of 2048 kbit/s shall be available to the user for unrestricted digital information transfer.

2.4. Establishment of communication

Establishment or release of the connection shall not require any protocol exchange or other intervention at the NTP by the customer.

2.5. Symmetry

The connection shall be symmetrical, i.e. each direction of transmission shall have the same nominal characteristics, although the actual values shall be independent.

2.6. Connection configuration

The connection configuration is point-to-point.

2.7. Network performance

2.7.1. Transmission delay

The one way end-to-end delay shall be less than (10 + 0.01G)ms, where G is the geographical distance in kilometers. (*In the exceptional case that a satellite transmission has to be involved for the realization of the leased line, the one way end-to-end delay shall be less than 350 ms).*

2.7.2. Jitter

2.7.2.1. Jitter tolerance at the network input port

The 2048 kbit/s transparent leased line shall function as specified with input jitter being the sum of two band limited components as defined in table 2.7.2.1-1. This requirement is taken from ETS 300 247.

filters for generation of jitter spectrum (first order)		bandpass filter for measurement of input jitter	input jitter measured by bandpass filter
lower cut-off (high pass)	**upper cut-off (low pass)**	**lower cut-off first order**	**UI peak-to-peak (maximum)**
only low pass	4 Hz	4 Hz to 100 kHz	1,1 UI
40 Hz	100 kHz	40 Hz to 100 kHz	0,11 UI

Table 2.7.2.1-1

2.7.2.2. Maximum jitter at the network output port

The maximum jitter at the output port from the network (i.e. at the NTP towards the customer's terminal equipment) shall not exceed the network limits for the maximum output jitter as specified in table 2.7.2.2-1, when measured with first order linear filters with the defined cut-off frequencies. This requirement is taken from ITU-T Recommendation G.823.

measurement filter bandwidth		output jitter
lower cut-off (high pass)	**upper cut-off (low pass)**	**UI peak-to-peak (maximum)**
20 Hz	100 kHz	1,5 UI
18 kHz	100 kHz	0,2 UI

Table 2.7.2.2-1

2.7.3. Slip

Slip occurs at a point between two parts of a communication link that are operating at similar but not identical bit rates (plesiochronously). The transparent 2048 kbit/s digital leased lines, offered by PROXIMUS, comply with ITU-T Recommendation G.822 which specifies controlled slip objectives for *international* digital connections, namely: "for at least one of two consecutive periods of 24 hours the number of octet slips shall be less than 5". Slips other than octet slips are considered as errors.

2.7.4. Error parameters

2.7.4.1. Performance level

The error performance level for the 2048 kbit/s transparent leased lines are at least conform to ITU-T Recommandation G.826 and ETS 300 247.

3. Network interface presentation

3.1. Physical characteristics

The physical connection arrangements for the *standard* NTP of a 2048 kbit/s transparent digital leased line (120 Ohms version of the G.703-interface) is provided by means of a RJ45 socket and with contact assignments as specified in table 3.1-1.

contact	network interface
1&2	transmit pair
3	shield reference point
4&5	receive pair
6	shield reference point
7	unused
8	unused

The transmit pair is the output from the Proximus network to the customer's terminal.

[redacted]

table 3.1-1

However, with the agreement of the customer, an alternative means of connection may be provided as an *option*:

- by means of a hardwired connection (120 Ohms version of the G.703-interface), by using insulation displacement connectors;
- by means of two 1,6/5,6 coax-connectors (75 Ohms-version of the G.703-interface), by using one coaxial pair in each transmission direction.

3.2. Electrical characteristics

The electrical characteristics of the *standard* NTP of a 2048 kbit/s transparent digital leased line are in accordance with ITU-T Recommendation G.703 (120 Ohms) and with paragraph 5.2 of ETS 300 246.

As an *option*, the 75 Ohms-version of the G.703-interface can still be offered (as specified in ITU-T Recommendation G.703).

3.3. Safety

Regarding the safety, the NTP complies with EN 60950 (IEC 950). In addition, the NTP of the 2048 kbit/s transparent digital leased line complies with the paragraphs 5.3 (safety) and 5.4 (overvoltage protection) of ETS 300 246.

3.4. ElectroMagnetic Compatibility (EMC)

The network interface presentation fulfils to the EMC requirements which are imposed under the EMC Directive 89/336/EEC.

4. Terminal equipment

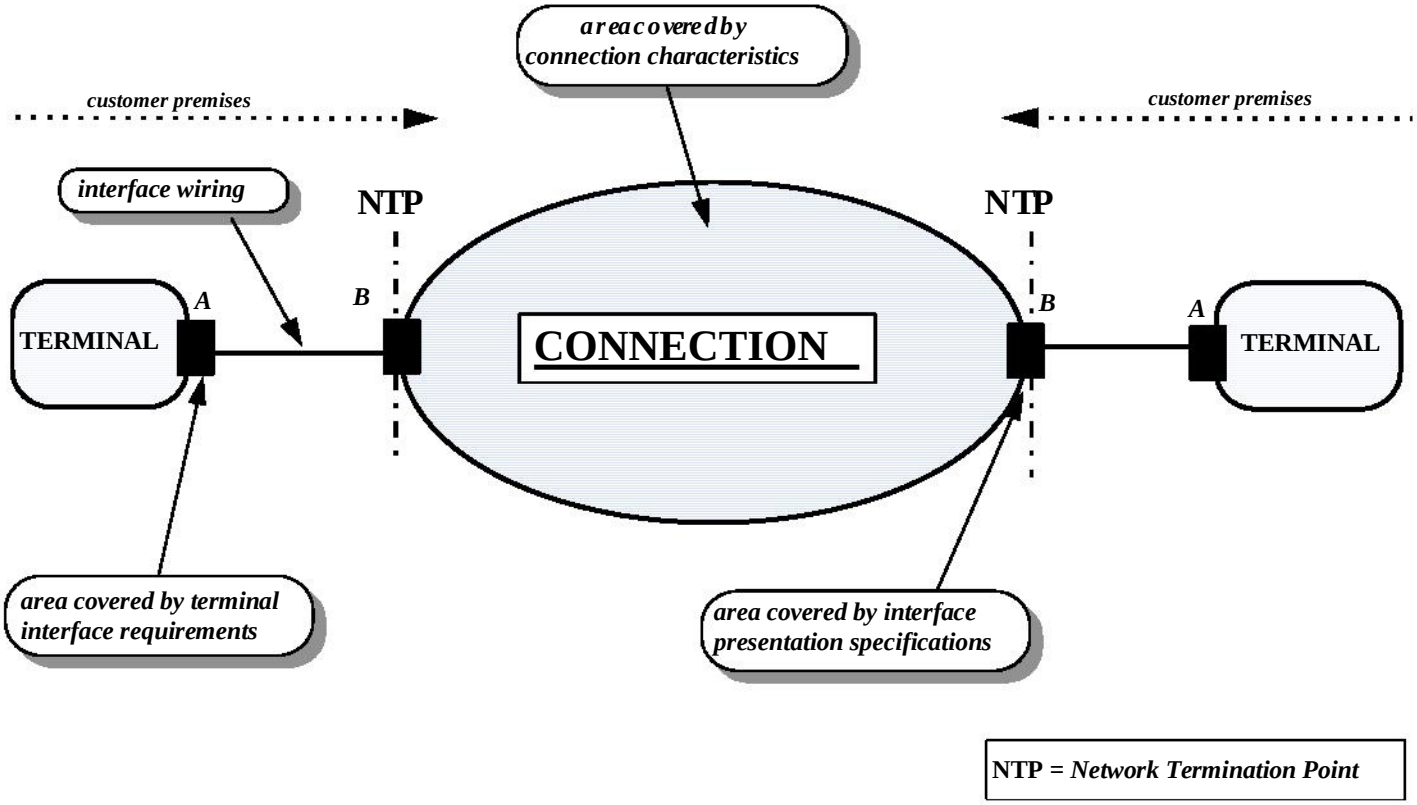
For connection to the NTP of a transparent 2048 kbit/s digital leased line, the terminal of the customer has to be approved to CTR12.

At the NTP the customer shall provide Proximus with a grounding connection point. This grounding connection point should be easily accessible, located near the NTP, and shall enable Proximus to attach a 4 mm^2 (minimum section) ground cable with lug, bolt and washer. The characteristics of the grounding connection point provided by the customer must be conform to article 69 of the actual RGIE[1]; this grounding point shall have a resistance value not exceeding 30 Ohms.

[1] RGIE: Réglement Général des Installations Electriques

ANNEX 1

Generic model for leased lines specifications



ANNEX 2

Definitions, symbols and abbreviations.

A) Definitions

For the purpose of these technical specifications, the following definitions apply:

Background block error ratio
The ratio of errored blocks over all blocks within a specified measuring period, where neither are counted during unavailability periods nor during severely errored seconds.

Errored block
A block with one or more bit errors.

Errored second
A second in available time with one or more bit errors.

Leased lines
The telecommunications facilities provided by the PROXIMUS public telecommunications network that provide defined transmission characteristics between network termination points (NTP) and that do not include switching functions that the user can control.

Network Termination Point (NTP)
All physical connections which form part of the PROXIMUS telecommunications network and which are necessary for access to and efficient communication through the PROXIMUS network.

Open Network Provision (ONP)
Open Network Provision (ONP) is a regulatory concept introduced by the Commission of the European Communities. It is intended to ensure "harmonized conditions for open and efficient access to and use of public telecommunications networks and, where applicable, public telecommunications services." In particular, ONP specifies a set of harmonized conditions which govern the technical interfaces (including the definitions of network termination points), conditions of use, and tariff principles of the network or service to which they are applied. The general principles of ONP are contained in the Council Directive 90/387/EEC, the "ONP Framework Directive". These principles are applied to a number of areas of telecommunications, including leased lines. In addition, the leased lines are specifically covered by the Directive 92/44/EEC, the "ONP leased line Directive".

Severely errored second
A second in available time where at least 0,1% of the bits are errored.

Slip
One or more extra or missing consecutive unit intervals in the bit stream. Slip occurs at a point between two pieces of the communication link that are operating at similar but not identical bit rates (plesiochronously). If a piece of equipment is transmitting data at a rate X towards another piece of equipment which is operating at a rate Y, then depending on whether X is greater or less than Y, there will be either a loss of, or a gain of data at the received piece of equipment. The addition or loss of bits in a bit stream is referred to as slip.

B) Symbols and abbreviations

For the purpose of these technical specifications, the following abbreviations apply:

CRC-4:	*Cyclic Redundancy Check-4 bit.*
CTR:	*Common Technical Regulations.*
DCE:	*Data Circuit-terminating Equipment. Data*
DTE:	*Terminal Equipment. Errored Seconds.*
ES:	*International Telecommunication Union.*
ITU:	*Network Termination Point. Open Network*
NTP:	*Provision.*
ONP:	*Parts per million*
ppm:	*Réglement Général des Installations Electriques.*
RGIE:	*Severely Errored Seconds. Unit Interval.*
SES:	
UI:	