proximus

ONP (D2048s) 2Mbit/s digital leased lines

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1. Introduction

This document contains the technical specifications for the ONP (D2048s) 2Mbit/s 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 ONP (D2048s) 2Mbit/s leased line service, the NTU is considered as being contained within the connection.

The ONP (D2048s) 2Mbit/s digital leased line provides a bi-directional point-to-point digital connection with an information transfer rate of 1984kbit/s without restriction on the binary content. The leased line operates at 2048kbit/s and provides an information transmission capability of 1984kbit/s; the remaining 64kbit/s provides a 8kHz framing structure in accordance with ITU-T Recommendation G.704. Any structuring of the data within the transparent 1984kbit/s part of the frame is the responsibility of the user.

The network interface presentation offered to an ONP (D2048s) 2Mbit/s leased line customer is based on the G703-interface (120 Ohms version).

Basically, the ONP (D2048s) 2Mbit/s digital leased lines offered by PROXIMUS are at least conform to the ONP technical requirements ETS 300 418 and ETS 300 419.

2. Connection characteristics

2.1. Transfer rate

2.1.1. leased line timing

By default, the ONP (D2048s) 2Mbit/s digital leased line carries the timing of the customer's terminal within the range 2048kbit/s $\pm$ 50 ppm.

2.1.2. information transfer rate

The connection is capable of transferring a nominal information rate of 1984kbit/s which is contained within the frame structure defined for the ONP (D2048s) 2Mbit/s digital leased line.

2.2. Information transfer susceptance

The connection is capable of transferring digital information with bit sequence integrity, and without restriction on the binary content, at the nominal rate of 1984kbit/s within the defined frame structure.

2.3. Structure

The ONP (D2048s) 2Mbit/s digital leased line requires a structure based on ITU-T Recommendations G.704 and G.706. The bit stream is divided into frames of 256 bits each; the frame repetition rate is 8000 Hz. The first eight bits of the frame mark the frame structure. Within these eight bits are defined the S_i-bit, the E-bits, the A-bit and the S_a-bits.

By default, the first bit of the frame (the S_i-bit) is used for the CRC-4 procedure, conform to ITU-T Recommendations G.704 and G.706. At each NTP of the leased line, the CRC-4 bits transmitted in the output bit stream (to the customer's terminal) are as defined in the tables 4a/G.704 and 4b/G.704 of ITU-T Recommendation G.704 and correspond to the data transmitted at the output of the leased line interface.

The purpose of the structure is to allow PROXIMUS to monitor the error performance of the leased line from NTP to NTP while the leased line is in service. The CRC-4 is therefore not necessary transmitted transparently from NTP to NTP; it may even be updated several times by PROXIMUS to determine quickly the location of errors.

By default, at each NTP of the ONP (D2048s) 2Mbit/s digital leased line, the E-bits transmitted in the output bit stream (to the customer's terminal) shall indicate errored sub-multiframes in the input bit stream at that NTP. One E-bit in each multiframe shall be set to binary ZERO for each errored sub-multiframe received in the input bit stream. The E-bits corresponding to non-errored sub-multiframes shall be set to binary ONE. Any delay between the detection of an errored sub-multiframe and the setting of the E-bit that indicates the errored sub-multiframe shall be less than 1 second.

With regard to the use of the A-bit, which is the "remote alarm indication"-bit contained within the frame alignment signal, the value is set to 0 in undisturbed operation and to 1 in alarm condition. Please note that the A-bit is not transmitted end-to-end since the complete frame signal is terminated at least once within the network, and the A-bit is used to indicate errors within those particular sections. By doing so, PROXIMUS is able to offer a better service to her customers.

The values of the S_a-bits are undefined at the output of the ONP (D2048s) 2Mbit/s digital leased line; in principle, they're set to 1, but in some cases they're used by PROXIMUS for message-based data links in order to allow a remote management of the complete leased line connection.

For each direction of transmission, the ONP (D2048s) 2Mbit/s digital leased line accepts an input bit stream (i.e. from the customer's terminal to the NTP) with a frame and multiframe structure as defined in ITU-T Recommendation G.704 paragraph 2.3. When the NTP of the ONP (D2048s) 2048kbit/s

digital leased line has the above mentioned frame structure as input from the customer's terminal and the connection is not in the unavailable state, the output at the other NTP of the leased line shall also conform to this frame and multiframe structure, with the structure having the same relationship to the information transferred as at the input; i.e. the ONP (D2048s) 2Mbit/s digital leased line maintains the frame structure integrity.

The loss and recovery of the frame alignment and the frame synchronization are conform to ITU-T Recommendation G.706. By default, the first bit of the frame (the S_i-bit) is used for the CRC-4 procedure; the CRC multiframe alignment, the CRC-bit monitoring and the monitoring for false frame alignment are also conform to ITU-T Recommendation G.706.

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 frame structure and information transfer capability.

2.6. Connection configuration

The connection configuration shall be 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 ONP (D2048s) 2Mbit/s 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 300 419.

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 ONP (D2048s) 2Mbit/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 ONP (D2048s) 2Mbit/s leased lines are at least conform to ITU-T Recommandation G.826 and ETS 300 419.

3. Network interface presentation

3.1. Physical characteristics

The physical connection arrangements for the *standard* NTP of an ONP (D2048s) 2Mbit/s 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.

table 3.1-1

However, with the agreement of the customer, a hardwired connection may be provided as an *option* by using insulation displacement connectors.

3.2. Electrical characteristics

The electrical characteristics of the NTP of an ONP (D2048s) 2Mbit/s digital leased line are in accordance with ITU-T Recommendation G.703 (120 Ohms), and with paragraph 4.2 of ETS 300 418.

3.3. Safety

Regarding the safety, the NTP complies with EN 60950 (IEC 950) and with the paragraphs 4.3 (safety) and 4.4 (overvoltage protection) of ETS 300 418.

3.4. ElectroMagnetic Compatibility (EMC)

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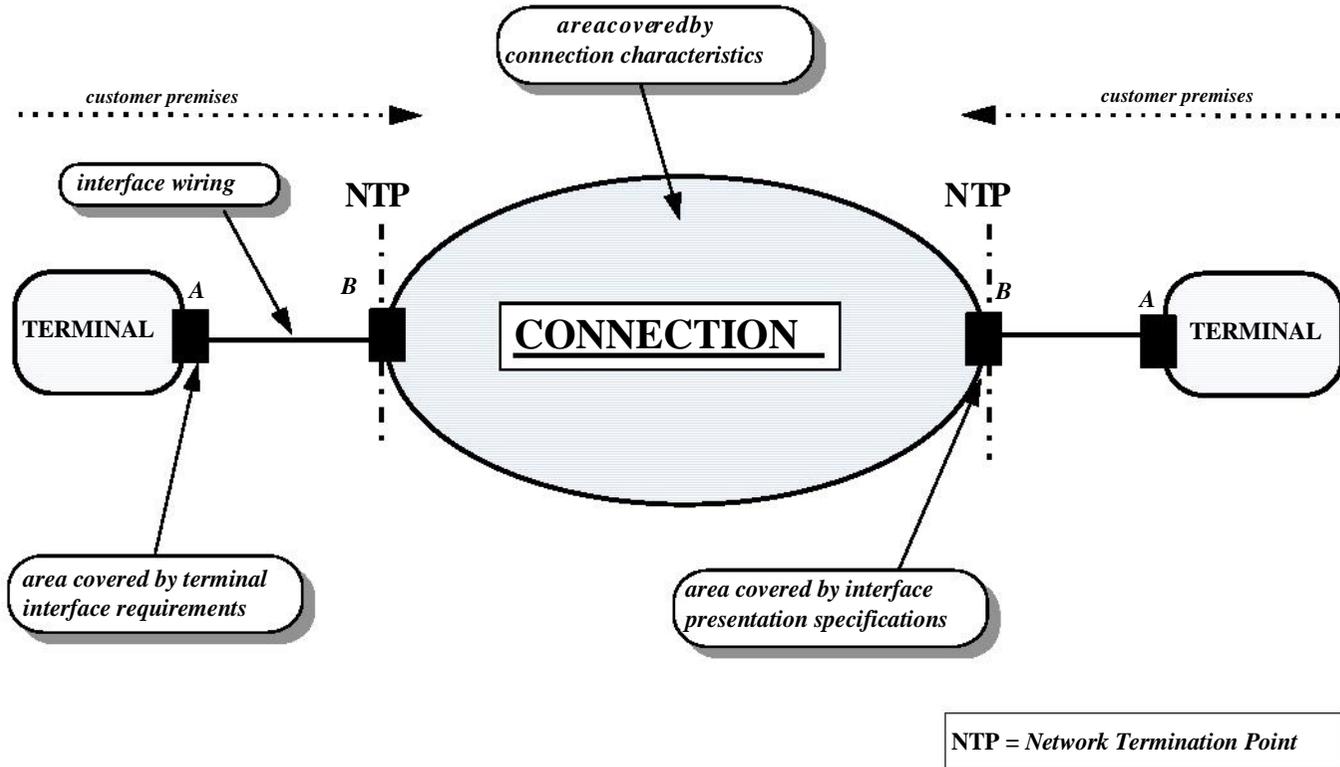
4.   Terminal equipment

For connection to the NTP of an ONP (D2048s) 2Mbit/s digital leased line, the terminal of the customer has to be approved to *CTR 13*.

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.

Please note that conformance to CTR 13 does not guarantee an end-to-end interoperability; only the essential (minimum) requirements for access to the ONP (D2048s) 2Mbit/s digital leased lines are described in CTR 13. To ensure that the interface of the terminal equipment is compatible with the ONP (D2048s) 2Mbit/s digital leased line, the terminal has also to be conform to ETS 300 420; however, these ETS standards, describing the full technical specifications for this interface, are voluntary.

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[1] RGIE: Réglement Général des Installations Electriques

ANNEX 1

Generic model for leased lines specifications

area covered by
connection characteristics

customer premises ....➤

interface wiring

NTP

NTP

customer premises ◄......................

_B_

_A_

_B_

_A_

TERMINAL

CONNECTION

TERMINAL

area covered by terminal
interface requirements

area covered by interface
presentation specifications

NTP = _Network Termination Point_

ONP (D2048s) 2Mbit/s digital leased lines

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.

Octet slip
A slip of one complete octet. In a structured communication channel, the slips can be controlled such that either a frame of data is inserted or lost; this is known as a controlled slip or frame slip. Where a slip is not a complete frame (typically one bit), this is known as an uncontrolled slip.

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.

Unavailable time
A period of time beginning at the first of 10 consecutive severely errored seconds and ending immediately before the first following period of 10 consecutive seconds none of which are severely errored.

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. Parts per million.*
ONP:	*Réglement Général des Installations Electriques*
ppm:	*Severely Errored Seconds. Unit Interval.*
RGIE:	
SES:	
UI:	