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**PSTN: Subscriber line protocol
for display (and related) services**

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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
3.0	29 JUN 2000	...
3.1	25 JAN 2001	Introduction of new service (CNIP)
3.2	13 FEB 2002	Change of ETSI reference documents ==> new lay-out and new references § 4.2 : terminology Table 1 : "Ringing pulse" replaced by "Ring pattern"
3.3	10 JAN 2003	Ch 1, Ch 8.3: EWSD V16B added Ch 5, § 4.6, § 4.11, § 4.18 : modified Ch 7, table 3, annex B: modified Ch 8, § 8.1, 8.4: note added related to the applicability of the parameters (see tables with heading 'Parameter')

1. Scope

This document gives technical information about the Proximus network implementation of the "subscriber line protocol for display (and related) services" on analog lines. This protocol is accomplished by using asynchronous voice-band Frequency-Shift Keying (FSK) signalling.

The document is applicable for the following Proximus digital exchanges and software packages:

- S12 - P7 and P8
- EWSD - V14B and V16B

The document describes:

- The technical specifications applicable to the user-network interface in order to support and interpret the PSTN subscriber line protocol correctly.

Terminal equipment can be in the On-hook state or in the Off-hook state.

The requirements imposed on the FSK signalling-based subscriber line protocol deal with data encoding, data transmission requirements and the three layers of the protocol at the network side of the interface: presentation layer, data link layer and physical layer.

Some typical applications of the Proximus network that use the subscriber line protocol are mentioned.

- The interworking with other networks.

2. References

Whenever a date of edition is mentioned, the document with this date should be consulted. If no date is present, the latest version of this document should be consulted.

Ref. #	Document	Title	Comments
1	ETSI ETS 300 659-1	Subscriber line protocol over the local loop for display (and related) services; Part 1: On-hook data transmission - February 1997	Base for version 3.1 of the present document
2	ETSI EN 300 659-1, version 1.3.1.	Subscriber line protocol over the local loop for display (and related) services; Part 1: On-hook data transmission - January 2001	Replaces § 1 to 6 of Ref. (1)
3	ETSI ETS 300 659-2	Subscriber line protocol over the local loop for display (and related) services; Part 2: Off-hook data transmission - September 1997	Base for version 3.1 of the present document
4	ETSI EN 300 659-2, version 1.3.1.	Subscriber line protocol over the local loop for display (and related) services; Part 2: Off-hook data transmission - January 2001	Replaces § 1 to 6 of Ref. (3)
5	ETSI EN 300 659-3, version 1.3.1.	Subscriber line protocol over the local loop for display (and related) services; Part 3: Data link message and parameter codings - January 2001	Replaces § 7 of Ref. (1) and Ref. (3)
6	ETSI ETS 300 001 (NET4)	Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN	
7	BGC/SP-201	Spécification technique générale d'agrément des équipements terminaux destinés à être connectés à une interface analogique d'abonné du réseau téléphonique public commuté belge (accès au RTPC) (document available from Belcomlab)	
8	ETSI ETS 300 648	PSTN - Calling Line Identification Presentation supplementary service - Service Description	
9	ETSI ETS 300 649	PSTN - Calling Line Identification Restriction supplementary service - Service Description	

3. General description

The user-network interface is described in Ref. (6), §1 and §8, and is amended and corrected in Ref. (7).

The requirements described in those documents shall be respected.

The requirements imposed on the modem based subscriber line protocol comply with ETSI standards Ref. (2), Ref. (4) and Ref. (5). The network provider options are described in the present document.

Typical uses of FSK protocol in the Proximus network (on analog lines) are:

- in on-hook state
 - CLIP (Calling Line Identification Presentation): the calling number is displayed on an adapted called terminal during the ringing phase;
 - Visual MWI: a variant of the Message Waiting Indication service, where the network informs the terminal equipment that a new message has been deposited for the customer; the adapted terminal equipment may display the information or turn on a dedicated light (used in "non associated with ringing" mode).
 - CNIP (Calling Name Information Presentation): a calling name information (CNI) is delivered next to the calling number.

- in off-hook state
 - CIDCW (Calling Identity Delivery on Call Waiting): the calling number is displayed on an adapted called terminal during alerting of the new incoming call.
 - CNIP (Calling Name Information Presentation): a calling name information (CNI) is delivered next to the calling number provided by CIDCW.

4. Abbreviations and terminology

4.1. Abbreviations

PSTN	Public Switched Telephone Network
OLO	Other Licensed Operator
CLI	Calling Line Identity
CLIP	Calling Line Identification Presentation
CIDCW	Calling Identity Delivery on Call Waiting
MWI	Message Waiting Indication
CNI	Calling Name Identification
CNIP	Calling Name Identification Presentation
DT-AS	Dual Tone-Alerting Signal
RP-AS	Ringing Pulse-Alerting Signal
TAS	TE Alerting Signal
TE	Terminal Equipment
SAS	Subscriber Alerting Signal
LE	Local Exchange
TE-ACK	Terminal Equipment Acknowledge

4.2. Terminology

Following abbreviations are used in the tables:

S	'Supported'	That means that the Proximus network supports the feature in a uniform way for the whole network.
US/NU	'Under study' / 'Not uniform'	That means that: the Proximus network does not generally support the feature, but Proximus studies the implementation for a later phase; some Proximus switches may already support the feature. <u>OR</u> the Proximus network does not support the feature in a uniform way for the whole network
NS	'Not supported'	That means that the Proximus network does not support the feature.
GID	'General Information and Definitions'	

5. Subscriber line protocol over the local loop for display (and related) services - ON-HOOK data transmission

Normative reference: Ref. (2). The numbering is according to that ETSI document.

Table 1

Ref. (2): ETSI EN 300 659-1, version 1.3.1.	PROXIMUS STATUS	REMARKS
1 Scope	GID	The DTMF-based subscriber line protocol is not supported. Terminal equipment can be connected by analog access directly to the local exchange or through an Access Network. In the latter case, transmission path establishment is ensured by Proximus.
2 References	GID	Cf. § 2 of the present UNI specification
3 Definitions and abbreviations	GID	
4 Data encoding		Cf. § 7 of the present UNI specification
5 Protocol requirements	S	
5.1 Presentation layer	S	Some messages sent by the Proximus network may have the maximum length (253 parameter data octets)
5.2 Data Link layer	S	The Mark Signal consists of a block of 180 ± 25 mark bits.
5.3 Physical layer	S	
6 Data transmission requirements: signalling, timing and tolerance	S	
6.1 Data transmission associated with ringing	S	Data transmission during ringing is supported. Data transmission prior to ringing is not supported.
6.1.1 Data transmission during ringing	S	The first ring pattern has a duration of minimum 340 ms and maximum 1200 ms. The first long silent period between the first and the second ring pattern has a maximum length of 4400 ms. The second ring pattern has a duration of minimum 400 ms. After the first long silent period, the normal procedure of ringing applies, that means possible immediate ring pattern followed by periodic ring patterns.
6.1.2 Data transmission prior to ringing	NS	
6.2 Data transmission not associated with ringing	S	The TAS is a DT-AS. Only used by Visual MWI service.
6.3 TAS physical characteristics		
6.3.1 DT-AS	S	
6.3.2 RP-AS	NS	

Ref. (2): ETSI EN 300 659-1, version 1.3.1.	PROXIMUS STATUS	REMARKS
Annex A (normative): TE connected to the LE via a pair gain system - considerations for the Z' interface.	S	In case the Terminal Equipment is connected to the Local Exchange via a pair gain system, Proximus will guarantee the correct functioning of the PSTN protocol (possibly by updating or removing the pair gain system). At interface Z', the time T5 (between end of first ring pattern and start of FSK transmission) is guaranteed to be higher than 500 ms. Remark : terminology of Z and Z': Cf. Annex C of Ref. (2)
Annex B (normative): DTMF based subscriber line protocol	NS	
Annex C (informative): Reference configurations	GID	
Annex D (informative): Data transmission format	GID	

6. Subscriber line protocol over the local loop for display (and related) services - OFF-HOOK data transmission

Normative reference: Ref. (4). The numbering is according to that ETSI document.

Table 2

Ref. (4): ETSI EN 300 659-2, version 1.3.1.	PROXIMUS STATUS	REMARKS
1 Scope	GID	
2 References	GID	Cf. § 2 of the present UNI specification
3 Definitions and abbreviations	GID	
4 Data encoding	S	Cf. § 7 of the present UNI specification
5 Protocol requirements		
5.1 Presentation layer	S	
5.2 Data Link layer	S	The Mark Signal consists of a block of 80 ± 25 mark bits.
5.3 Physical layer	S	
6 Data transmission requirements: signalling, timing and tolerance		
6.1 Off-hook data transmission	S	The SAS-signal is the Call Waiting Tone. The TE-ACK is a DTMF 'D' signal received from the TE. The LE does not block the speech path for more than 1.2 seconds, the time needed for the FSK data-transmission and the SAS excluded.
6.1.1 TAS physical characteristics	S	
6.1.2 Timing	S	The maximum time of speech path blocking in case of unsuccessful attempt is 470 ms.
6.1.3 TE-acknowledgement signal	S	

7. Data link layer

Normative reference: Ref. (5). The numbering is according to that ETSI document.

Table 3

Ref. (5): ETSI EN 300 659-3, version 1.3.1.	PROXIMUS STATUS	REMARKS
1 Scope	GID	
2 References	GID	Cf. § 2 of the present UNI specification
3 Definitions and abbreviations	GID	
4 Data encoding	S	Cf. § 8.4 of the present UNI specification
5 Data Link message and parameter codings		
5.1. Data Link message and general parameter requirements		
5.1.1 Data Link message	S5.1.2	
Parameter	S	
5.1.3 TE considerations		This § applies to the TEs, not to the network. For correct working, TEs must be compliant to this §.
5.2 Data Link message types	S	Supported: "Call Set-up" message and "Message Waiting Indicator" message.
	NS	Not supported: "Advice of Charge" message and "Reserved for Network Operator use" message.
	USNU	In case of launching of a short message service by Proximus, the FSK protocol will be described in a separate Proximus User Network Interface specification.
5.2.1 Call Setup message	S	
5.2.2 Message Waiting Indicator message	S	
5.2.3 Advice of Charge message	NS	
5.2.4 Short Message Service message	USNU	Cf. 5.2 above.
5.3 Parameter types	S	Cfr. 5.4 below
5.4 Parameter coding		
5.4.1 Date and time parameter	S	
5.4.2 Calling Line Identity parameter	S	Cf. § 8.1 of the present UNI specification
5.4.3 Called Line Identity parameter	USNU	Supported by EWSD switches. Not supported by S12 switches.

Ref. (5): ETSI EN 300 659-3, version 1.3.1.	PROXIMUS STATUS	REMARKS
5.4.4 Reason for Absence of Calling Line Identity parameter	S	Cf. § 8.1 of the present UNI specification
5.4.5 Calling Party Name parameter	S	Cf. § 8.4 of the present UNI specification
5.4.6 Reason for Absence of Calling Party Name parameter	US/NU	Supported by EWSD switches
5.4.7 Visual Indicator parameter	S	Cf. § 8.3 of the present UNI specification
5.4.8 Message Identification parameter	NS	
5.4.9 Last Message CLI parameter	NS	
5.4.10 Complementary Date and Time parameter	NS	
5.4.11 Complementary Calling Line Identity parameter	NS	
5.4.12 Call Type parameter	US/NU	Supported by EWSD switches. Not supported by S12 switches.
5.4.13 First Called Line Identity parameter	US/NU	Supported by EWSD switches. Not supported by S12 switches.
5.4.14 Number of Messages parameter	US/NU	Cf. § 8.3 of the present UNI specification
5.4.15 Type of Forwarded Call parameter	US/NU	Supported by EWSD switches. Not supported by S12 switches.
5.4.16 Type of Calling User parameter	US/NU	Supported by EWSD switches. The delivered information is not guaranteed to be uniform for the whole network, e.g. in case of calls from OLOs Not supported by S12 switches.
5.4.17 Redirecting Number parameter	US/NU	Supported by EWSD switches. Not supported by S12 switches.
5.4.18 Charge parameter	US/NU	Supported by EWSD switches for AOC-E
5.4.19 Additional Charge parameter	NS	
5.4.20 Duration of the Call parameter	NS	
5.4.21 Network Provider Identity parameter	NS	
5.4.22 Carrier Identity parameter	NS	
5.4.23 Selection of Terminal Function parameter	NS	
5.4.24 Display information parameter	NS	
5.4.25 Service Information parameter	NS	

Ref. (5): ETSI EN 300 659-3, version 1.3.1.	PROXIMUS STATUS	REMARKS
5.4.26 Extension for network operator use parameter	NS	
Annex A (normative): PSTN CLIP service parameter list	S	<p>The Proximus network supports at least the following parameters:</p> <ul style="list-style-type: none"> - Date and Time - Calling Line Identity or Reason for Absence of Calling Line Identity <p>Calling Party Name is added, if the customer has subscribed to the CNIP (complementary option of the CLIP service).</p>
Annex A (normative): PSTN CLIP service parameter list <i>(continued)</i>	US/NU	EWSD switches send additional parameters (Call type, Type of calling user, First called line id, Type of forwarded call, Redirecting number, etc.)
Annex B (normative): Parameter list per service	S	<p>CLIP/CLIR: Cf. above and § 8.1 of the present UNI specification. CNIP: Cf. above and § 8.4 of the present UNI specification. SMS: Cf. separate ad-hoc UNI specification. CCBS, CCNR: Call type parameter is only supported by EWSD switches. MWI: Cf. above and § 8.3 of the present UNI specification. Alarm call (wake-up): on the called access side, the same parameters as for a normal call are supported. If the called has subscribed to CNIP, a particular calling party name characters string is sent</p>
Annex C (informative): International reference alphabet - 7-bit basic code table	S	Cf. § 8.4 of the present UNI specification
Annex D (informative): Examples for charge parameter use	NS	

8. PSTN display services using the subscriber line protocol

8.1. Calling Line Identification Presentation (CLIP)

CLIP provides a user with the possibility of receiving identification of the calling party. The network delivers the information to the user during call establishment, regardless of the terminal capability to handle it. The on-hook data transmission subscriber line protocol is applicable. Provisioning and activation of the CLIP supplementary service is subject to an agreement between the user and Proximus.

When CLIP is active on a line and whenever the line is in the idle state, the following information will be delivered with every incoming call, apart from exceptional cases (for instance network congestion):

Parameter
Calling Line Identity
Reason for Absence of CLI
Date and Time

Note that the parameters 'Calling Line Identity' and 'Reason for Absence of CLI' are mutually exclusive, i.e. one or the other is applicable, not both at the same time.

Two Reasons for Absence of the CLI are supported:

- Unavailable
- Private (CLIR involved)

Callers may have legitimate reasons for withholding their CLI from the called party. At the same time as the introduction of the CLIP service, Proximus has introduced the Calling Line Identification Restriction (CLIR) service allowing callers to withhold CLI. Cf. ETSI ETS 300 649.

The use of the CLIR service will not prevent operation of the malicious call trace capability of the network.

Format of the "Calling Line Identity" parameter

A. The served user is a public user with analog line:

TYPE OF CALL	FORMAT OF INFORMATION SENT TO THE USER ACCESS
National incoming call	the full national number (for instance: 0PQXXXXXX or 0PYYYYYYY)
International incoming call	the international prefix (00) followed by the Country Code (CC) and the national number (for instance: 00CCXX..XX)

B. The served user is a Centrex user (Business Communication Group) with analog line:

TYPE OF CALL	FORMAT OF INFORMATION SENT TO THE USER ACCESS
National incoming call	OAC + the full national number (for instance: 00PQXXXXXX or 00PYYYYYYY)
International incoming call	OAC + international prefix + Country Code + national number (for instance: 000CCXX..XX)
PNP incoming call:	
- local PNP call	the local PNP number
- national / international PNP incoming call	national / international PNP access code + national location number + local PNP number.

The strings OPQXXXXXX, OPYYYYYY, OOPQXXXXXX and OOPYYYYYYY refer to the numbering plan with 8 significant digits.

OAC = Outgoing Access Code, also called Escape Code.
 PNP = Private Numbering Plan.
 No interspersing is used.

8.2. Calling Identity Delivery on Call Waiting (CIDCW)

CLIP can be combined with Call Waiting (CW) to provide identification of the calling party when a second telephone call arrives during an existing call. The off-hook data transmission subscriber line protocol is applicable. Provisioning and activation of the CIDCW supplementary service is subject to an agreement between the user and the service provider.

When CIDCW is active on a line and whenever the line is in the active state, the same information as described for the CLIP service will be delivered with every incoming call, apart from exceptional cases (for instance network congestion).

The CLIR service and its impact on the malicious call trace is the same as described for the CLIP service.

8.3. Message Waiting Indication

The Visual MWI supplementary service allows the users connected to the Proximus PSTN via an analog access to receive Visual MWI signals.

The actual method of informing the user depends of the Customer Premises Equipment (CPE). In practice, the Visual MWI consists of a message on the display of the terminal.

Additional info can be sent to the analog user's terminal.

The supported parameters are:

Parameter
Date and Time
Visual indicator
Number of messages (*)

For each new voice mail message, the messaging server shall send an MWI activation to the LEX. The MWI activation command contains the number of new messages and the date and time. An MWI deactivation command is sent by the messaging server when the voice mail subscriber has listened to all his new messages. If he only listens to a part of the messages, after the retrieval session, the messaging server will send again an MWI activation message with as number of new messages the number of unread messages.

MWI-FSK messages are only sent in on-hook state.

(*) Supported by the following exchanges software versions: S12-P8 and EWSD-V14B/V16B. Not supported by S12-P7.

8.4. Calling Name Identification Presentation (CNIP)

CNIP provides a user with the possibility of receiving, next to the CLI, date and time of the call, also the name information of the calling party (or an indication of unavailability).

As for the CLIP service, the CNI information may be received in on-hook state and in off-hook state.

CNI is not delivered when the Calling Line Identification Restriction (CLIR) is active.

CNI may not be delivered with CLI in case of occasional failure of the Calling Name database query, or when it is not allowed by the source database. In these case, the "reason of absence of CNI" parameter is not used, but a particular characters string is sent by the network, replacing the CNI.

Parameter
Calling Line Identity
Reason for Absence of CLI
Calling Party Name
Date and Time

Note that the parameters 'Calling Line Identity' and 'Reason for Absence of CLI' are mutually exclusive, i.e. one or the other is applicable, not both at the same time.

The Proximus network is conceived to handle a maximum length of 50 characters for the CNI. However, in the present phase, the Proximus network will send only 20 characters on the subscriber line, due to the limited display length of some existing terminals.

The names characters are actually coded as follows (ITU-T.50):

Character	Decimal	Binary
SPACE	32	01000000
!	33	01000001
"	34	01000010
#	35	01000011
\$	36	01001000
%	37	01001001
&	38	01001010
(39	01001011
)	40	01010000
*	41	01010001
+	42	01010010
,	43	01010011
-	44	01011000
.	45	01011001
/	46	01011010
	47	01011011

Character	Decimal	Binary
0	48	0110000
...	...	
9:	57	0111001
;	58	0111010
<	59	0111011
=	60	0111100
>	61	0111101
?	62	0111110
@	63	0111111
A	64	1000000
B	65	1000001
...	66	1000010
Y	...	
Z[89	1011001
\]	90	1011010
^	91	1011011
_	92	1011100
`	93	1011101
not used	94	1011110
not used	95	1011111
...	96	1100000
not used	97	1100001
not used	98	1100010
{	...	
	121	1111001
}	122	1111010
~	123	1111011
	124	1111100
	125	1111101
	126	1111110

That means that for CNIP service no small letters (codes 97 to 122) will be used.

9. Interworking with other networks

When the calling user is connected to another network and the call terminates in the Proximus network:

- The transfer of the CLI between the networks is regulated in the interconnection agreements between Proximus and the other operator.
- If the CLI of the calling party is available and allowed to be presented, the information will be made available to the called party. The network does not explicitly inform the called party about the nature of the calling party.

In case of calls from other networks, the CNI will be delivered to the user access if the pair CLI/CNI is present in the source names data base (depends on interconnection agreements).