



SLOVENSKI STANDARD

SIST EN 301 141-1 V1.2.2:2005

01-april-2005

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Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 1: NMDS interface specification

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Ta slovenski standard je istoveten z: **EN 301 141-1 Version 1.2.2**

ICS:

33.080

Digitalno omrežje z
integriranimi storitvami
(ISDN)

Integrated Services Digital
Network (ISDN)

SIST EN 301 141-1 V1.2.2:2005

en

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EN 301 141-1 V1.2.2 (1998-09)

European Standard (Telecommunications series)

Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 1: NMDS interface specification

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Reference

DEN/SPS-09054-1 (akc90ipc.PDF)

Keywords

access, basic, ISDN, NMDS, PSTN

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Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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Contents

Intellectual Property Rights.....	5
Foreword	5
Introduction	5
1 Scope.....	6
2 References.....	6
2.1 Normative references	6
2.2 Informative references	7
3 Definitions and abbreviations	7
3.1 Definitions	7
3.2 Abbreviations.....	7
4 General description	8
5 Layer 1 functions	8
5.1 Powering Aspects.....	9
5.1.1 Power available from the transmission system.....	9
5.1.2 NMDS behaviour under power fail conditions.....	9
6 Layer 2 functions	10
6.1 Overview.....	10
6.2 PSTN-GW layer 2 state machine modifications	10
6.3 PSTN layer 2 activation.....	11
7 Layer 3 messages	11
7.1 General.....	12
7.2 Error handling	12
7.3 Maintenance.....	12
7.3.1 The new STATUS ENQUIRY and STATUS messages	12
7.3.1.1 The STATUS ENQUIRY and STATUS messages for PSTN maintenance messages	12
7.3.1.1.1 The STATUS ENQUIRY message for PSTN maintenance.....	13
7.3.1.1.2 The STATUS message for PSTN maintenance.....	13
7.3.1.2 The STATUS ENQUIRY and STATUS messages for ISDN maintenance messages.....	14
7.3.1.2.1 The STATUS ENQUIRY message for ISDN maintenance	14
7.3.1.2.2 The STATUS message for ISDN maintenance	14
8 B-channel selection procedure	15
8.1 Introduction.....	15
8.2 B-channel selection.....	15

Annex A (normative):	B-channel selection	17
A.1	General	17
A.2	Outgoing calls (NTN to LE)	17
A.3	Call clearing	18
A.4	Incoming calls (LE to NTN)	18
A.5	PSTN-GW parked state	19
A.6	Clearing from parked state	20
Annex B (informative):	Background and motivation for NMDS	21
B.1	Transparent supplementary service operation	21
B.2	Operational benefits	21
Annex C (informative):	The PSTN protocol adopted for the NMDS	22
C.1	The V5 PSTN protocol	22
Annex D (informative):	The relationship between a directly connected NMDS and one supported via an access network.....	23
D.1	Introduction	23
Annex E (informative):	The reasons for the new information element values chosen.....	27
E.1	General	27
E.2	Specific coding rules for information elements in the V5 specifications	27
E.3	Specific codes used for the STATUS ENQUIRY information elements for NMDS	27
E.4	Specific codes used for the STATUS information elements for NMDS	27
Annex F (informative):	Permanent activation of basic access digital section.....	28
Annex G (informative):	Remote equipment - functional requirements	29
Annex H (informative):	Supplementary services useable at the NMDS	32
H.1	Applicability of PSTN supplementary services	32
H.2	Applicability of ISDN supplementary services.....	32
	Bibliography	33
	History	34

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocols and Switching (SPS).

The present document is part 1 of a multi-part EN covering Narrowband Multi-service Delivery System (NMDS), as identified below:

Part 1: "NMDS specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification".

iTeh STANDARD PREVIEW National transposition dates (standards.iteh.ai)

Date of adoption of this EN:	18 September 1998
Date of latest announcement of this EN (doa):	31 December 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 1999
Date of withdrawal of any conflicting National Standard (dow):	30 June 1999

Introduction

The present document specifies the provision of Public Switched Telephone Network (PSTN) services over an existing Integrated Services Digital Network - Basic Access (ISDN-BA) digital subscriber line (DSL). Today PSTN terminals - normal telephones - can be connected to the S/T-interface via a Terminal Adapter (TA) with the support of services that can be mapped at a feasible cost from ISDN (principally the basic call services).

1 Scope

The present standard defines requirements to support the Narrowband Multi-service Delivery System (NMDS) which provides interfaces connected via a Network Termination Node (NTN) to a Local Exchange (LE), in order to support existing PSTN and ISDN services over an existing ISDN-Basic Access digital subscriber line (DSL).

The Narrowband Multi-Service Delivery System (NMDS) may also be connected via a V5 interface Access Network (AN) to a Local Exchange (LE) in order to provide existing PSTN and ISDN services. This optional arrangement is described in annex D which identifies two alternative methods to provide the same overall functionality.

The present document also contains requirements which relate to the functionality of a (new) Network Termination Node (NTN) for supporting both Public Switched Telephone Network (PSTN) access and Integrated Services Digital Network - Basic Access (ISDN-BA) S/T reference point interfaces over a single (digital section) transmission system as used for existing ISDN-BA. The NTN encompasses NT2-like (noted NT2*) functionality, physical PSTN user port(s) and PSTN protocol functionality.

An NMDS implementation may contain one ISDN-BA port and/or a limited number of PSTN ports. Typically one or two PSTN ports would be supported.

In order to maintain an evolutionary path for PSTN services, the national V5 PSTN protocol mapping is assumed to exist and forms an integral part of this specification.

NOTE: It is an underlying principle of the present document that, wherever practicable, steps may be taken to minimize the cost of the NTN, subject to maintaining the required functionality.

2 References

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References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

- [1] ETR 080 (1996): "Transmission and Multiplexing (TM); Integrated Services Digital Network (ISDN) basic rate access; Digital transmission system on metallic local lines".
- [2] ETS 300 012-1 (1996): "Integrated Services Digital Network (ISDN); Basic User Network Interface (UNI); Part 1: Layer 1 specification".
- [3] ETS 300 324-1 (1994): "V interfaces at the digital Local Exchange (LE); V5.1 interface for the support of Access Network (AN); Part 1: V5.1 interface specification".
- [4] ETS 300 347-1 (1994): "V interfaces at the digital Local Exchange (LE); V5.2 interface for the support of Access Network (AN); Part 1: V5.2 interface specification".
- [5] ETS 300 402-2: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 2: General protocol specification [ITU-T Recommendation Q.921 (1993), modified]".

- [6] ITU-T Recommendation I.412 (1988): "ISDN user-network interfaces - Interface structures and access capabilities".

2.2 Informative references

- [7] EN 301 141-2 (V1.2): "Narrowband Multi-service Delivery System (NMDS); Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Narrowband Multi-service Delivery System: A system that provides an interface to the network directly to the LE or via an AN to support existing PSTN and ISDN services over an ISDN-BA DSL.

Network Termination Node: The functional group on the user side of the digital section (NMDS interface noted T* reference point) that includes functionality to support an ISDN-BA port and/or one or more PSTN ports.

Network Termination Type 2*: The functional group within the NTN which, at the user side of the T* reference point, performs the PSTN layer 2 and the ISDN layer 2 multiplexing and demultiplexing over the D channel, and only interprets (and then relays) the layer 3 messages to switch the B channels to the ISDN access and the PSTN Gateways as instructed by the signalling messages.

PSTN-Gateway: The functional group within the NTN which terminates the PSTN interface at the NTN.

T* reference point: The reference point which provides access to the NMDS, between the network termination of the digital section (NT1) and the Network Termination Node functional group.

V1* reference point: The V1 reference point with the addition of PSTN functionality required to support the NMDS.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AN	Access Network
BCC	Bearer Channel Control
CPE	Customer Premises Equipment
DLCI	Data Link Connection Identifier
DSL	Digital Subscriber Line
DTMF	Dual Tone Multi-Frequency
ISDN	Integrated Services Digital Network
ISDN-BA	Integrated Services Digital Network - Basic Access
LE	Local Exchange
NMDS	Narrowband Multi-service Delivery System
NT	Network Termination
NT1	NT type 1 (see ETR 080 [1])
NT2*	Network Termination Type 2* (see the definition in subclause 3.1 above)
NTN	Network Termination Node
NWK	Network Layer
PSTN	Public Switched Telephone Network
PSTN-GW	PSTN Gateway
SAPI	Service Access Point Identifier
TA	Terminal Adapter
TE	Terminal Equipment
TEI	Terminal Endpoint Identifier

4 General description

The purpose of the NMDS is to support both ISDN-BA and one or more PSTN user ports in the same manner such that they appear to the user as if they were directly connected to the LE. The support of ISDN-BA user ports utilizes the same type of functions as used by an NT1 defined in ETR 080 [1], whilst PSTN user ports are supported using the same PSTN protocol as defined in the V5.1 interface standard ETS 300 324-1 [3] with some modifications.

The LE is service responsible for and controls the tones (voice messages etc.) sent and received over the NMDS. See figure 1 for the functional architecture of NMDS.

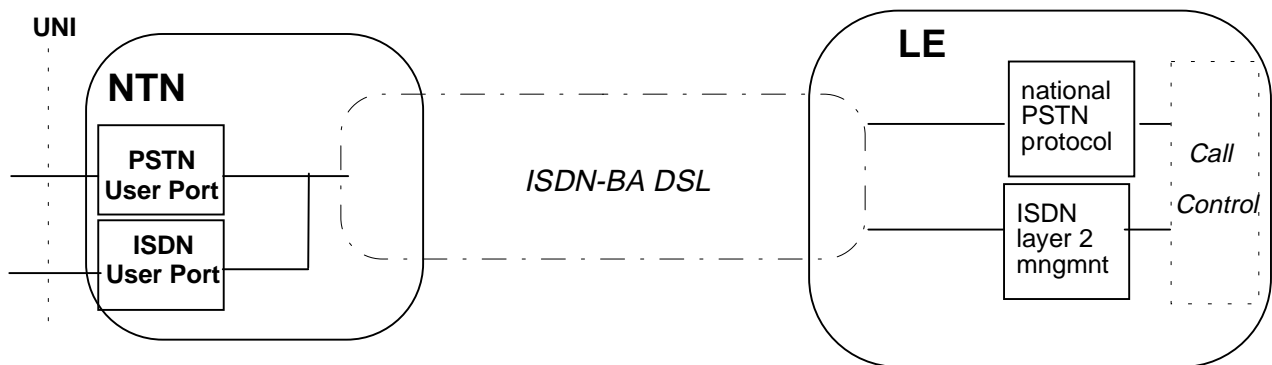


Figure 1: General NMDS functional diagram

The Narrowband Multi-service Delivery System (NMDS) is defined at the T* reference point and the complementary V1* reference point as shown in figure 2.

On any NMDS, the LE may support up to 10 PSTN (analogue) lines and the NTN may provide up to 10 PSTN (analogue) access ports. The provision of PSTN and ISDN access ports in the LE requires a bilateral agreement between the user and the service provider at subscription time.

5 Layer 1 functions

In order to permit transparent operation via an AN, there shall be no changes to the ISDN-BA digital section layer 1 protocols.

Layer 1 at the ISDN-BA UNI shall be in accordance with ETS 300 012-1 [2].

The NTN shall permit layer 1 activation from the ISDN UNI and layer 1 activation/deactivation from the network. In order to keep the NTN simple, the PSTN gateway shall not require "user side" activation procedures and the network shall maintain the digital section in a permanently activated state whenever the PSTN protocols are to be supported.

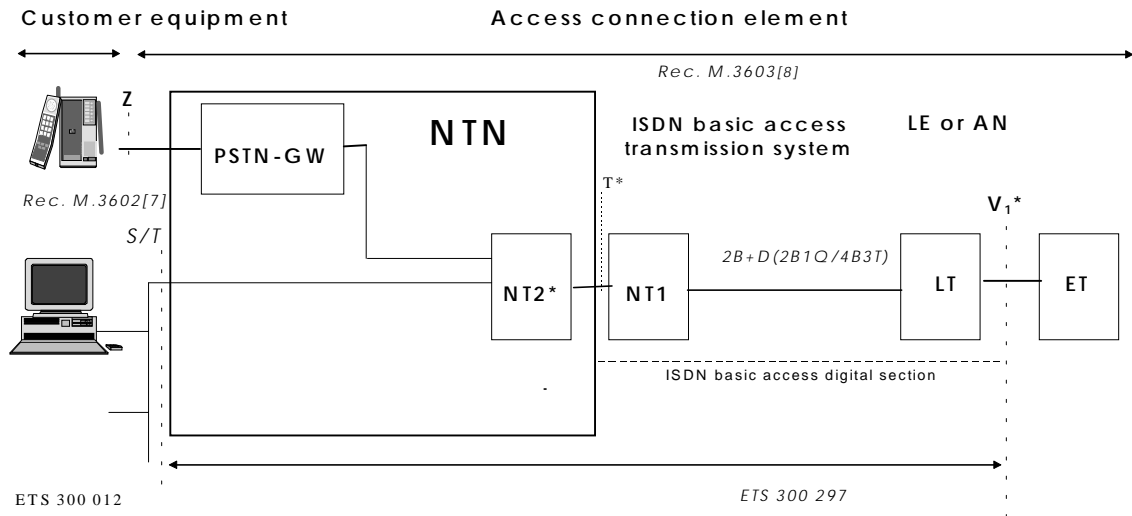
The NTN shall also allow the digital section to be activated regardless of the electrical conditions prevailing at the ISDN UNI and PSTN port.

To prevent the possibility of the exchange/multiplexer deactivating the digital section as part of the recovery actions resulting from an ISDN UNI error, the NTN shall always present a UNI "no error" indication to the network.

The permanent activation of the digital section may interfere with certain maintenance operations normally provided over the embedded operations channel. To overcome any difficulties, the exchange shall be able to detect the activation state of the ISDN UNI which would have prevailed if the PSTN ports had not been present, using a message-based maintenance mechanism at layer 3. The ISDN UNI status information element is used for this purpose and is described elsewhere in the present document.

The NTN shall support full ISDN layer 1 diagnostic loop capability.

The general access structure is described in ITU-T Recommendation I.412 [6]. The access structure for ISDN-BA in ITU-T Recommendation I.412 [6] is valid also for the PSTN application. The layer 1 transporting the full NMDS functionality from the NTN to the LE shall be an ISDN-BA layer 1.



NOTE: The functionality and layout shown in figure 2 can only be one particular example and is not representative of all architectures where NMDS can be applied. In actual implementations the NT1 functional group is likely to be physically integrated in an equipment realizing the NTN functionality.

Figure 2: An example of an NMDS scenario for NMDS

5.1 Powering Aspects

5.1.1 Power available from the transmission system

The power available for NMDS support is the actual power budget provided by the existing ISDN-BA digital section. Additional power is expected to be provided locally to the NTN. What may happen under local power fail conditions with respect to NTN user ports is described below. Hence there are no deviations from the requirements specified in the ISDN-BA standards in order to support NMDS.

5.1.2 NMDS behaviour under power fail conditions

The ISDN-BA standards mandate that a designated instrument may be made available on an S/T Interface. If this designated instrument is available, then it shall be capable of (at least) making emergency telephone calls.

For the PSTN, the situation is not mandated on a European wide basis and depends upon nationally agreed regulations which are outside the scope of the present document.

The NMDS may be comprised of one or more PSTN ports, potentially as well as an ISDN-BA port. Hence it is not possible to define in a standard mandatory behaviour under power-fail conditions. What is more relevant is that manufacturers are able to adequately define their system's behaviour under power failure conditions. For this reason, a clause has been inserted into the Protocol Implementation Conformance Statement (PICS) document, EN 301 141-2 [7], where such behaviour may be explained.

6 Layer 2 functions

6.1 Overview

The layer 2 used within the NMDS system, used for both PSTN and ISDN-BA services, shall be in accordance with ETS 300 402-2 [5] but with the following restrictions.

The LE layer 2 state machine shall be as per ETS 300 402-2 [5].

The PSTN gateway layer 2 state machine shall be as defined in subclause 6.2 of the present document, providing a restricted functionality version of the state machine in ETS 300 402-2 [5].

The PSTN gateway shall use a single permanently activated data link with a fixed Data Link Connection Identifier (DLCI) for all communication with the network. The DLCI shall consist of a PSTN Terminal Endpoint Identifier (TEI) allocated from the automatic TEI values (i.e. 64-126) and Service Access Point Identifier (SAPI) set equal to 0. TEI values 117 to 126 shall be reserved for PSTN use when NMDS is implemented on an access.

The first PSTN gateway to be fitted shall use TEI 126 and be identified as Line 1. TEI values 117 to 125 are reserved for further PSTN gateways, lines 2 to 10, as shown in the table 1.

Table 1: Allocation of TEI to PSTN ports

TEI value	Line number
126	1
125	2
124	3
123	4
122	5
121	6
120	7
119	8
118	9
117	10

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The PSTN gateway shall not support the broadcast data link, or TEI management procedures, and shall not initiate layer 2 establishment, i.e. the DL_ESTABLISH_REQUEST primitive in the TEI assigned state shall not be supported.

On the ISDN port, point-to-point (i.e. TEI 0) or point-to-multipoint procedures may be supported using the full ISDN TEI assignment procedures as currently defined. These includes TEI assignment and removal procedures. However, some previously available values are now reserved (see table 1).

It is expected that some implementations may provide additional PSTN-GWs either as separate equipment connected to the S/T Interface or as further integrated entities. In each case the TEI allocations shall comply with those shown in table 1. The TEI associated with each external PSTN-GW shall be preprovisioned.

6.2 PSTN-GW layer 2 state machine modifications

The modifications required to the BA layer 2 state machine for the PSTN-GW are specified below as a list of differences to the state machine contained in annex D of ETS 300 402-2 [5].

Delete states 1, 2, 3, 5.0, 5.2 and 6.

Delete the following input events:

- DL-ESTABLISH-REQUEST;
- DL-RELEASE-REQUEST;
- DL-UNIT DATA-REQUEST;
- UI FRAME IN QUEUE;