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V interfaces at the digital Service Node (SN); Identification of the applicability of existing protocol specifications for a VB5 reference point in an access arrangement with Access Networks (ANs)

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Ta slovenski standard je istoveten z: ETR 257 Edition 1

ICS:

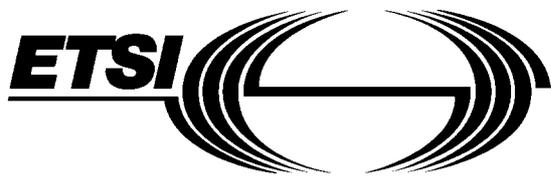
33.040.40	Podatkovna komunikacijska omrežja	Data communication networks
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ETSI
TECHNICAL
REPORT

ETR 257

March 1996

Source: ETSI TC-SPS

Reference: DTR/SPS-03040

ICS: 33.020, 33.080

Key words: V interface, VB5 interface, SN, AN

**V interfaces at the digital Service Node (SN);
Identification of the applicability of existing
protocol specifications for a V_{B5} reference point
in an access arrangement with Access Networks (ANs)**

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Foreword

This ETSI Technical Report (ETR) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

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1 Scope

This ETSI Technical Report (ETR) examines the functional requirements for a broadband reference point in conjunction with the previously defined V5, Narrowband Integrated Services Digital Network (N-ISDN), and Broadband Integrated Services Digital Network (B-ISDN) protocols in order to define a useful set of protocol component parts.

At this stage, the ETR does not attempt to define a unique protocol stack for a V_{B5} reference point, because many possible network architectures have been identified, some based on an integrated narrowband/broadband local exchange and others based on discrete local exchange architectures. All of these would require different protocol stacks. Within ITU-T Study Group 13 (WP 3) Question 14/13, the various architectures are being examined and provided in draft new ITU-T Recommendation G.902 [12]. It might be possible to reduce the options listed in this ETR and come to a definite list of requirements leading to definitive protocol stacks for the different types of interfaces at V_{B5} reference points (i.e., $V_{B5.1}$ and $V_{B5.2}$). However, this is left to the development of the individual ETSS.

It has been identified that the B-ISDN service will only be provided over an ATM transmission bearer, although that itself may be provided over a synchronous/plesiochronous data link network (e.g. Synchronous Digital Hierarchy (SDH)). This somewhat simplifies the possible permutations of options.

New protocols may be identified for the V_{B5} reference point as required.

Access types so far identified to be supported by the V_{B5} reference point include:

- analogue telephone access;
- ISDN basic access with a line transmission system conforming to ETS 300 297 [4] for the case with a NT1 separate from the Access Network (AN);
- ISDN basic access with a user network interface according to ETS 300 012 [2] at the user side of the AN, (i.e. the interface at the T reference point);
- ISDN primary rate access with a line transmission system conforming to ETS 300 233 [3] for the case with a NT1 separate from the AN;
- ISDN primary rate access with a user network interface according to ETS 300 011 [1] at the user side of the AN, (i.e. the interface at the T reference point);
- other analogue or digital accesses for semi-permanent connections without associated out-band signalling information;
- B-ISDN access;
- Non B-ISDN accesses supporting:
 - asymmetric services (i.e. Video on Demand) (if not part of B-ISDN);
 - broadcast services (if not part of B-ISDN);
 - LAN interconnect functionality (if not part of B-ISDN),

with either:

- flexible (provisioned) Virtual Path Connection (VPC) allocation but without concentration capability at the Virtual Channel (VC) level within the AN; or
- flexible (provisioned) VPC allocation and flexible Virtual Channel Connection (VCC) allocation on a connection by connection basis which provides concentration capability at VC level.

This ETR does not specify the implementation of the requirements within the AN and does not constrain any implementation alternative as long as the functionality at the V_{B5} reference point as specified in this ETR is met.

Analysis of network architecture aspects are included. In particular, the relationship between narrowband and broadband elements (ANs and SNs) are examined.

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETS 300 011: "Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles".
- [2] ETS 300 012: "Integrated Services Digital Network (ISDN); Basic user-network interface; Layer 1 specification and test principles".
- [3] ETS 300 233: "Integrated Services Digital Network (ISDN); Access digital section for ISDN primary rate".
- [4] ETS 300 297: "Integrated Services Digital Network (ISDN); Access digital section for ISDN basic rate".
- [5] ETS 300 324-1: "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); V5.1 interface for the support of Access Network (AN); Part 1: V5.1 interface specification".
- [6] ETS 300 347-1: "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); V5.2 interface for the support of Access Network (AN); Part 1: V5.2 interface specification".
- [7] ETS 300 125: "Integrated Services Digital Network (ISDN); User-network interface data link layer specification; Application of CCITT Recommendations Q.920/I.440 and Q.921/I.441".
- [8] ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".
- [9] ETS 300 443-1: "Broadband Integrated Services Digital Network (B-ISDN); Digital Subscriber Signalling System No. two (DSS2) protocol; B-ISDN user-network interface layer 3 specification for basic call/bearer control; Part 1: Protocol specification [ITU-T Recommendation Q.2931 (1995), modified]".
- [10] ITU-T Recommendation G.804 (1993): "ATM cell mapping into plesiochronous digital hierarchy (PDH)".
- [11] ITU-T Recommendation G.841 (1995): "Types and characteristics of SDH network protection architectures".
- [12] Draft new ITU-T Recommendation G.902: "Framework recommendation on functional access networks. Access networks; Architecture, services, management and service node aspects".
- [13] ITU-T Recommendation I.356 (1993): "B-ISDN ATM layer cell transfer performance".
- [14] Draft ITU-T Recommendation I.363.1 (July 1995): "B-ISDN ATM adaptation layer (AAL) specification, Types 1 and 2".
- [15] Draft ITU-T Recommendation I.371 (July 1995): "Traffic control and congestion control in B-ISDN".
- [16] Draft ITU-T Recommendation I.432 (Nov 1994): "B-ISDN user-network interface - Layer 1 specification".

- [17] Draft ITU-T Recommendation I.610 (Nov 1995): "B-ISDN operation and maintenance principles and functions".
- [18] CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2 (1993): "Information technology - Open systems interconnection - Systems management: State management function".
- [19] ITU-T Recommendation I.361 (1993): "B-ISDN ATM layer specification".
- [20] ITU-T Recommendation I.150 (1993): "B-ISDN asynchronous transfer mode functional characteristics".
- [21] Draft new ITU-T Recommendation I.432.1 (July 1995): "B-ISDN user-network interface - Physical layer specification for 155 520 kbit/s and 622 080 kbit/s".
- [22] Draft new ITU-T Recommendation I.432.2 (July 1995): "B-ISDN user-network interface - Physical layer specification for 1 544 kbit/s and 2 048 kbit/s".
- [23] Draft new ITU-T Recommendation I.432.3 (July 1995): "B-ISDN user-network interface - Physical layer specification for 51 840 kbit/s".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the following definitions apply, in addition to those given in the referenced standards:

Access Network (AN): An implementation comprising those entities (such as cable plant, transmission facilities, etc.) which provide the required transport bearer capabilities for the provision of telecommunications services between a Service Node Interface (SNI) and each of the associated User Network Interfaces (UNIs). An AN can be configured and managed through a Q3 interface. In principle there is no restriction on the types and the number of UNIs and SNIs which an AN may implement. The AN does not interpret (user) signalling (see ITU-T Recommendation G.902 [12]).

asymmetric services: Services requiring different bandwidths in each direction at the same point in time.

complete user port: The sum of the physical links at an ATM UNI.

logical user port: The set of VPs at the UNI carried on one or several physical access links associated by provisioning to one single VB5 reference point.

(semi)permanent connection: This is a connection which is set up via management (i.e. triggered via Q3_{AN} and/or Q3_{SN}).

NOTE: There may be connections through the AN which are established via management (Q3) which bypass the service node and which are routed e.g. to a dedicated "leased line service network". These connections shall have no impact on the V_{B5} specification and are out of scope of the ETR and the future V_{B5} ETSS.

Service Node (SN): A network element that provides access to various switched and/or permanent telecommunication services. In case of switched services the SN is providing access call and connection control signalling, and access connection and resource handling.

switched connection: This is a connection which is set up in response to user-to-network signalling.

user port function: This function adapts the specific UNI requirements into the core and system management functions (see ITU-T Recommendation G.902 [12]).

V_{B5}: The VB5 reference point.

V_{B5.1}: The VB5 reference point with flexible (provisioned) VPC allocation but without concentration capability at VC level within the AN.

V_{B5.2}: The VB5 reference point with flexible (provisioned) VPC allocation and flexible VCC allocation on a connection by connection basis which provides concentration capability at VC level.

3.2 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

AAL	ATM Adaptation Layer
AN	Access Network
ATM	Asynchronous Transfer Mode
BA	Basic Access
BCC	Bearer Channel Connection
B-AN	Broadband Access Network
B-BCC	Broadband BCC
B-ISDN	Broadband ISDN
CBR	Constant Bit Rate
CLP	Cell Loss Priority (bit)
ET	Exchange Termination
GFC	Generic Flow Control
HDLC	High level Data Link Controller
ILMI	Interim LMI
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LAPD	Link Access Protocol for the D-channel
LE	Local Exchange
NB	Narrowband
N-ISDN	Narrowband ISDN
NNI	Network Node Interface
NPC	Network Parameter Control
NT	Network Termination
PDH	Plesiochronous Digital Hierarchy
PNOs	Public Network Operators
POTS	Plain Old Telephony Service
PRA	Primary Rate Access
PSTN	Public Switched Telephone Network
QOS	Quality Of Service
SAAL	Signalling ATM Adaptation Layer
SDH	Synchronous Digital Hierarchy
SN	Service Node
SNI	Service Node Interface
TE	Terminal Equipment
TMN	Telecommunications Management Network
TV	Television
UNI	User Network Interface
UPC	Usage Parameter Control
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VC Sw	Virtual Channel Switching function
VP	Virtual Path
VPC	Virtual Path Connection
VPCI	Virtual Path Connection Identifier
VPI	Virtual Path Identifier
VP XC	Virtual Path Cross Connect function
XC	Cross Connect

4 Electrical, physical and procedural interface requirements

It is outside the scope of this ETR to specify the electrical and physical interfaces for the V_{B5} reference point. The physical interface shall however be a standard interface (e.g. SDH or PDH). Future ETSs may provide a limited list of options for physical interfaces in order to restrict the choice of the physical interface to a reasonable number of possibilities. This is to avoid unnecessary diversity of physical implementations, which would increase development costs and would threaten connectivity in multi-vendor environments. This will allow manufacturers and purchasers to develop the most flexible designs from the standards without having to modify the European standards every time a new access mechanism across the V_{B5} reference point is specified.

It has been accepted that an indication of the range of rates to be supported should be indicated as this is likely to affect the addressing range required by V_{B5} -related protocols.

It is suggested that the V_{B5} reference point should be applicable for data rates in the range 1,5 Mbit/s to 2,488 Gbit/s (STM16) although other rates are not excluded.

Draft new ITU-T Recommendations I.432.x ([21] to [23]) provide in a flexible form the B-ISDN user-network (UNI) physical layer specifications which cover:

- a) cell based and SDH-based UNIs at 155 520 kbit/s and 622 080 kbit/s (ITU-T Recommendation I.432.1 [21]);
- b) PDH based UNIs at 1 544 kbit/s and 2 048 kbit/s (ITU-T Recommendation I.432.2 [22]);
- c) UNIs at S_B reference point at 51 840 kbit/s (ITU-T Recommendation I.432.3 [23]).

Reference is made to ITU-T Recommendation G.804 [10] for other interfaces, for national use. ITU-T Recommendation G.804 [10] covers the PDH-based physical layers which are defined for ATM transmission.

It could be appropriate to have maximum commonality between the physical layer functions at the V_{B5} SNIs (and NNIs) and the physical layer functions at the UNI defined in ITU-T Recommendations I.432.x ([21] to [23]).

No V_{B5} specific protection switching mechanism will be defined for the V_{B5} reference point or interface. Existing or future mechanisms defined for the physical layer shall be used for V_{B5} (see e.g. ITU-T Recommendation G.841 [11]).

5 Services and architecture aspects and requirements

5.1 General discussion on services

The broadband architectures defined for use under the general title of B-ISDN should become the predominant telecommunications services at some point in the future. At present, the narrowband services such as Public Switched Telephone Network (PSTN), ISDN-BA and ISDN-PRA are the predominant service offerings by telecommunications operators. There will need to be an interim changeover period when broadband and narrowband services co-exist over the same Access Network infrastructure. It was originally anticipated that V_{B5} would only be of use during this interim period although this assumption is under review.

What is more certain is that there is now a need for Access Networks supporting both narrowband and broadband services over common transmission systems and that this situation is likely to persist for some time.

The services to be supported across the V_{B5} reference point include all those supported by V5.2 with the addition of symmetrical and asymmetric broadband services, broadcast services, and a LAN interconnect function. However, it is not the intention of this reference point specification to restrict any implementation of ANs or SNs to support the full set or a subset of the services listed in this ETR.