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Omrežni vidiki (NA) – Obseg razpoložljivosti potnih elementov na mednarodnih digitalnih poteh

Network Aspects (NA); Availability performance of path elements of international digital paths

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Network Aspects (NA); Availability performance of path elements of international digital paths

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Network Aspects (NA).

The present document specifies the availability performance of path elements for international digital paths.

The present document is the second version of the former I-ETS 300 416 which has been converted into an EN on request of the previous STC TM2 before its transfer to NA.

National transposition dates	
Date of adoption of this EN:	7 August 1998
Date of latest announcement of this EN (doa):	30 November 1998
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 1999
Date of withdrawal of any conflicting National Standard (dow):	31 May 1999

Introduction

The present document contains availability requirements for a structured approach, based on path elements, to be used for planning, designing and operating international transmission networks. The present document should be used:

- by transmission network planners to determine the required actions within the network (e.g. system reliability, maintenance organization, network protection techniques);
- by the organization responsible for the provision of a path to determine whether and which additional end-to-end actions (such as end-to-end protection switching) are necessary to satisfy quality of service objectives;
- by network operators providing path core elements which make up an international digital path, to ensure that availability requirements are met.

1 Scope

The present document is applicable to international constant bit rate digital paths at or above 64 kbit/s supported by digital networks. International constant bit rate digital paths may be based on the Plesiochronous Digital Hierarchy (PDH), the Synchronous Digital Hierarchy (SDH) or some other transport network such as cell-based. The present document is generic in that it defines parameters and requirements independent of the physical transport network providing the paths.

Two types of paths are considered; paths between International Switching Centres (ISCs) which consist of an international portion only and paths between Customer Premises (CP) which consist of national and international portions. These paths are referred to as "type a" and "type b" respectively (see figures 1 and 2).

Both the national and international portions are made up of Path Elements (PEs). For the national portion of paths of "type b", the present document specifies availability parameters and requirements for the portion as a whole. Subdivision of requirements to the respective PEs making up the national portion is under the responsibility of the network operator. For the international portion of paths of both types, the present document specifies availability parameters and requirements for the PEs making up the international portion.

NOTE: The international measurement point is located on the international side of the ISC.

The end-to-end availability performance of an international digital path can be calculated from the arrangement of the constituent PEs and their associated requirements. Annex A gives guidance on evaluating the end-to-end unavailability of a path, taking into account the unavailability of each PE.

In some countries the network may be subdivided into parts which are under the responsibility of different network operators. The partitioning of the requirements between these parts is outside the scope of the present document. Similarly, application of the present document to national paths which do not cross International Borders (IBs) is outside the scope of the present document.

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2 Normative 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.

- [1] ITU-T Recommendation G.826 (1993): "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".
- [2] ITU-T Recommendation G.821 (1993): "Error performance of an international digital connection operating at a bit rate below the primary rate and forming part of an integrated services digital network".
- [3] I-ETS 300 416: "Transmission and Multiplexing (TM); Availability performance of path elements of international digital paths".

3 Abbreviations

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

CP	Customer Premises
FS	Frontier Station
IB	International Border
ICPCE	Inter-Country Path Core Element
IG	International Gateway
IPCE	International Path Core Element
ISC	International Switching Centre
LT	Line Terminal
MUX	Multiplexer
NPCE	National Path Core Element
NPE	National Path Element
PAE	Path Access Element
PDH	Plesiochronous Digital Hierarchy
PE	Path Element
PEP	Path End Point
SDH	Synchronous Digital Hierarchy
SES	Severely Errored Second
SIE	Short Interruption Event
TIC	Terminal International Centre

4 Definitions

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

4.1 Definition of paths, path elements and path element categories

4.1.1 Path

A path is a transport entity responsible for the integrity of client network information transfer.

Paths are terminated at each end at the Path End Point (PEP). For paths of "type a", the exact location of the PEP is for further study, but is on the international side of the ISC. For paths of "type b", the PEP is located at the CP.

4.1.2 Path element

A PE is a portion of a path resulting from partitioning for the purpose of availability management.

NOTE: In the present document, paths are partitioned on the basis of geographical rather than architectural considerations. Therefore, PEs are considered to be logical elements of a path whose boundaries are not necessarily at the network level (i.e. bit rate) of the path under consideration. For example, on a 2 Mbit/s path, an international boundary may only physically exist at 140 Mbit/s. In such situations, the constituent 2 Mbit/s signal at the international boundary can only be observed by using additional equipment which passively analyses the embedded signal structure. However, availability performance may still be monitored using mechanisms at the layer of the supporting path.

The physical realization and topology of the PEs are under the responsibility of each network operator.

4.1.3 Path element categories

PEs are categorized according to their location in the network, their length and their performance level.

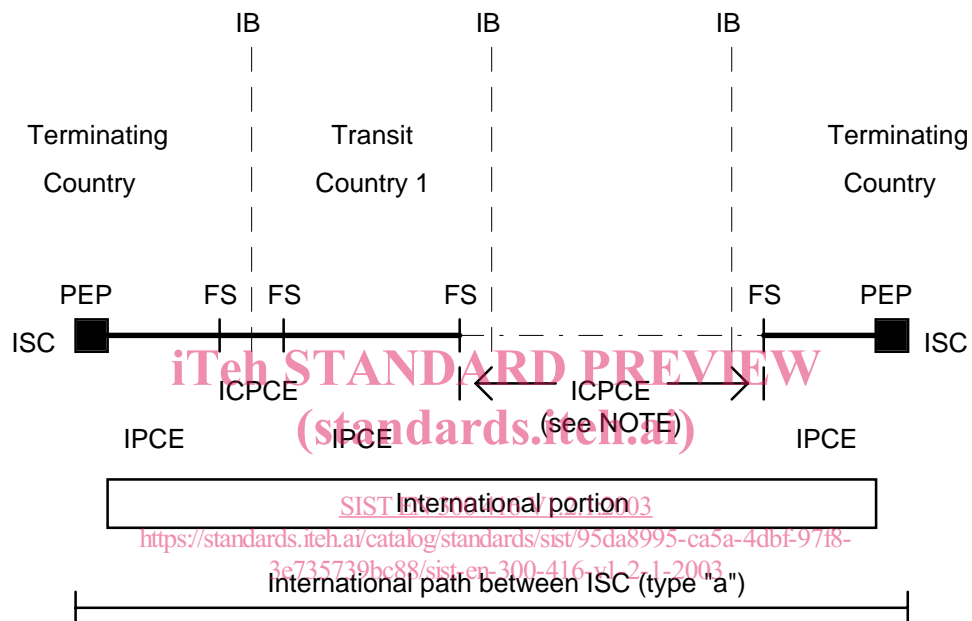
4.1.3.1 Network location categories

Paths may traverse different portions of networks having significantly different availability performance characteristics. For the purpose of the present document, three different portions are distinguished and accordingly three categories of PEs are defined:

- Inter-Country Path Core Element (ICPCE);
- International Path Core Element (IPCE);
- National Path Element (NPE).

The conceptual location of these path element types is shown in figures 1 and 2.

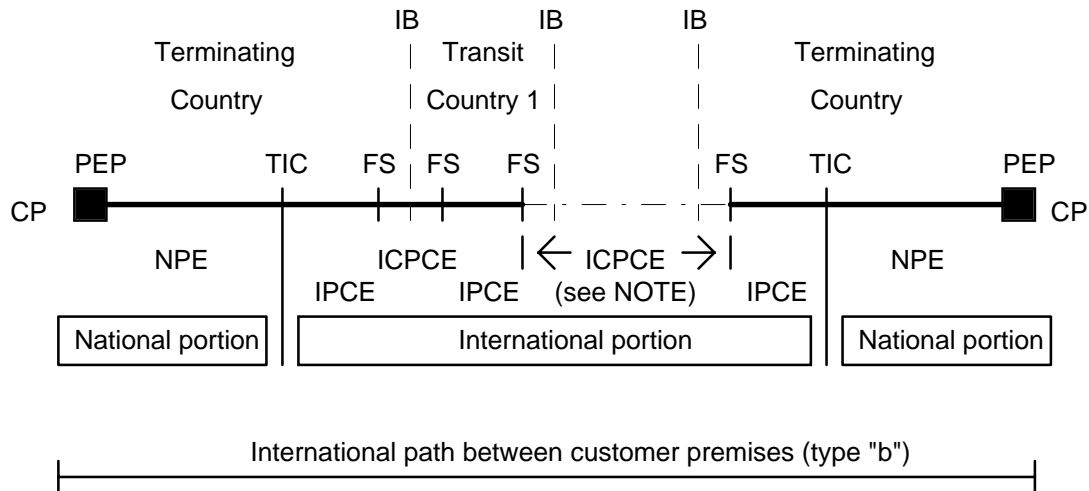
NOTE: The NPE is only applicable to paths of "type b".



NOTE: This ICPCE crosses two IBs and is typically supported by a satellite or undersea transmission system.

PEP: Path End Point	ICPCE: Inter-Country Path Core Element
ISC: International Switching Centre	IPCE: International Path Core Element
FS: Frontier Station	IB: International Border

Figure 1: Conceptual location of the elements of an international path between ISCs



NOTE: This ICPCE crosses two IBs and is typically supported by a satellite or undersea transmission system.

PEP: Path End Point	ICPCE: Inter-Country Path Core Element
TIC: Terminal International Centre	IPCE: International Path Core Element
FS: Frontier Station	NPE: National Path Element
IB: International Border	CP: Customer Premises

Figure 2: Conceptual location of the elements of an international path between customer premises

4.1.3.1.1 Inter-country path core element

The ICPCE is the PE carried on the highest order digital path across the geographical border between two countries.

This element is limited by the Frontier Stations (FSs) where the highest order inter-country path may be terminated. When the highest order inter-country path is not terminated in the FS, the ICPCE is limited by the supporting inter-country section access point. An example of an ICPCE is given in figure 3.

An ICPCE may be transported on a satellite, terrestrial or undersea cable transmission system. In the case of a satellite transmission system, the FS is considered to be located in the earth station.

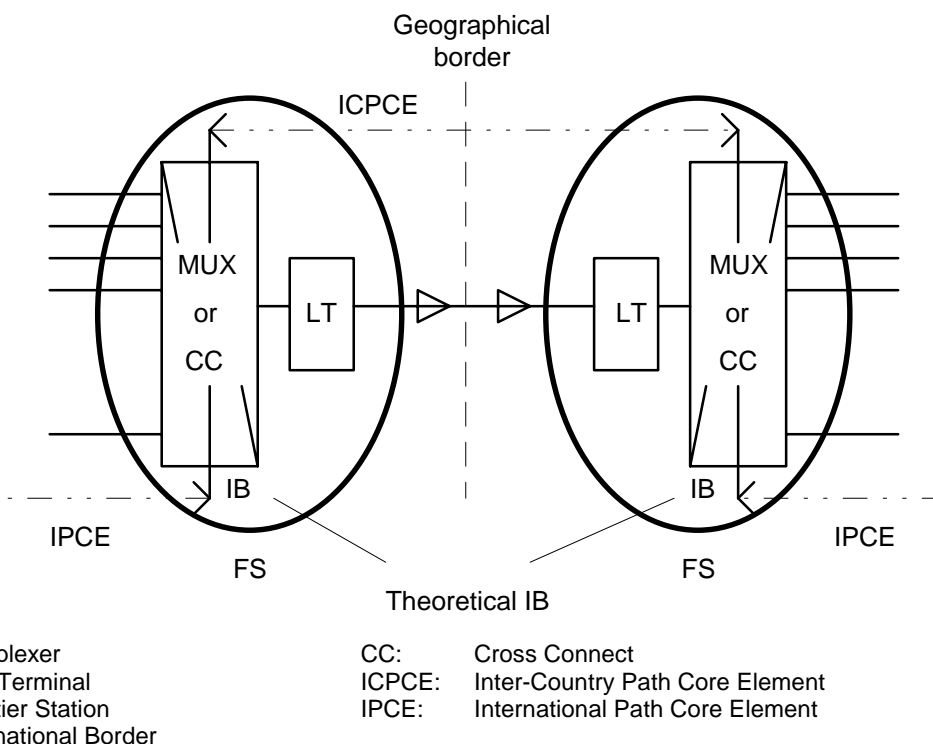


Figure 3: Example of an ICPCE
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4.1.3.1.2 International path core element

The IPCE is the PE used in the core network within one country. The boundary of this element depends on its application. For a transit country, this element is limited by the two FSs. For a terminating country, this element is limited by the International Gateway (IG) and the FS. In particular:

- in a "type a" path: this element is delimited by the ISC and the FS;
- in a "type b" path: this element is limited by the Terminal International Centre (TIC), which corresponds to the end of the international portion, and the FS. The TIC is defined in ITU-T Recommendation M.1010.

NOTE: The ISC and the TIC may be in the same location.

4.1.3.1.3 National path element

The NPE is a PE used in a terminating country to connect the international portion and the PEP for "type b" paths only. Although the NPE includes both Path Access Elements (PAEs) and National Path Core Elements (NPCEs), the present document provides only a national requirement applicable to the NPE. Sub-allocation of this requirement to the PAE and NPCE is outside the scope of the present document.

4.1.3.2 Length categories

Length categories are defined by the following rules:

$$500 \cdot (i-1) \leq L < 500 \cdot i \quad \text{where } i = 1, 2, \dots, 5$$

This formula specifies 5 length categories, in 500 km intervals, in the range 0 to less than 2 500 km. Each category is represented by variable « i », which is used in the formula to determine the availability performance objectives for a PE of length L.

Except for PEs carried on undersea cables, the lengths refer to the actual route lengths or the air-route distance multiplied by a routing factor, whichever is less. The routing factor is as follows: