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Razvoj standardov za podporo odprtih medomrežnih vmesnikov in dostopa
ponudnika storitve**

Services and Protocols for Advanced Networks (SPAN) - Service Provider Access -
Development of standards to support Open Inter-Network Interfaces and Service
Provider Access

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ETSI Guide

**Services and Protocols for Advanced Networks (SPAN);
Service Provider Access;
Development of standards to support Open Inter-Network
Interfaces and Service Provider Access**

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

Introduction

The purpose of the present document is to provide a source of reference material to enable Service Providers and Network Operators to determine standardized facilities that are available in published ETSI protocols to support the introduction of services. The present document also validates a number of benchmark services initially identified by the European Commission [1] for third-party service provision using a generic capability set for Open Intelligent Network Interconnection and the Service Provider Access Requirements (SPAR) that are captured in clause 7.3.

A number of open network architectural solutions are assessed including IN, Mobile Networks, Internet and ISDN.

Following regulatory and commercial drivers to expand the range and geographical scope of telecommunications services, ETSI working groups are identifying new requirements and developing appropriate standards solutions to support open inter-network and service provider access. The present document covers the Open Inter-Network and Open Network Access Requirements for the Fixed Network, 2nd and 3rd Generation Mobility and Network Management. It addresses these requirements by taking a top down approach including Service requirements, Functional and Physical Architectures.

The present document commences with an introduction to the initial benchmark services to be provided by a Service Provider/Network Operator under European Commission mandate BC-T-305 [1] using Intelligent Network Interconnection. The present document then describes open access options via either Circuit Related and Non circuit related interfaces utilizing both direct service provider interconnection, via a SPAI, and indirect service provider interconnection via an intermediate Network.

The present document enumerates the activities in relation to the production of a set of open standards for internetwork control plane, management plane and service provider access interfaces. A Public Network Operator can also take the SP role, and indeed nothing in the present document should be taken as precluding such a possibility.

The Service Provider definition is not intended to map to certain country-specific meanings of the term, which are often taken as being "resellers", but is strictly intended in this context to cover the role of producing the telecommunications service.

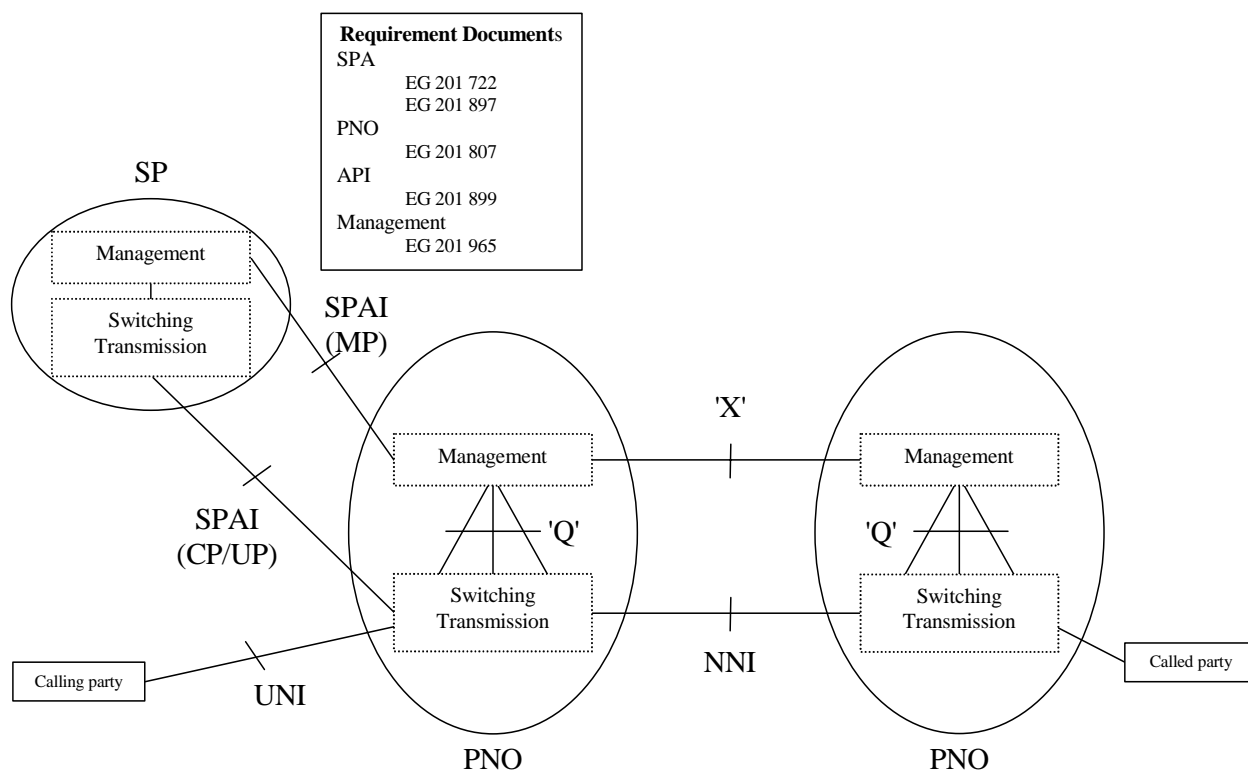


Figure 1: Reference Architecture for SP-PTN interfaces

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1 Scope

The present document aims to facilitate the technical introduction of open inter-network and service provider access. It includes architectural scenarios and guidelines, and identifies implementation requirements to support these more advanced services. The format is based on a staged approach, covering both circuit-related (CR) and non-circuit-related (NCR) interfaces, including IN-related signalling technologies. It commences with the definition of service provider architectural and implementation capabilities, the implementation of which is initially based on standards existing at the start of the work. ETSI TC SPAN (that has produced the present document) has also been responsible for co-ordination and the enhancement of protocols, where necessary, in order to meet the Service Provider Access Requirements (SPAR) as outlined in the present document. Open Service Provider access is enabled by means of enhanced User to Network and Network-to-Network Interfaces. A number of Initial benchmark Services together with Service support and network management requirements are also considered.

Cross-referencing of the SPAR requirements and the candidate protocols is detailed through sets of tables. Existing protocol standards are utilized in the analysis, and are considered as candidates for re-use. Emerging protocols and APIs were also considered.

The overall objective of the present document is to map out the facilities and protocols needed to allow delivery of telecommunications services across multiple networks, including networks that may be geographically or technically diverse in nature. Where lack of support in protocol capabilities has been identified, these deficiencies are noted as items for further work.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI ETR 244: "Intelligent Network (IN); ETSI workplan for IN; (Mandate BC-T-305, step 1)".
- [2] ETSI EG 201 722: "Intelligent Network (IN); Service provider access requirements; Enhanced telephony services".
- [3] ETSI EG 201 807: "Network Aspects (NA); Intelligent Network (IN); Network operators' requirements for the delivery of service provider access".
- [4] ETSI EG 201 897: "Services and Protocols for Advanced Networks (SPAN); Service Provider Access; Service Provider Access Requirements in a Fixed and Mobile Environment".
- [5] Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP).
- [6] Directive 98/10/EC of the European Parliament and of the Council of 26 February 1998 on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment.
- [7] ETSI ETS 300 208: "Integrated Services Digital Network (ISDN); Freephone (FPH) supplementary service; Service description".
- [8] ETSI ETS 300 712: "Integrated Services Digital Network (ISDN); Public Switched Telephone Network (PSTN); Premium Rate (PRM) service; Service description".
- [9] ETSI ETS 300 711: "Integrated Services Digital Network (ISDN); Public Switched Telephone Network (PSTN); Virtual Card Calling (VCC); Service description".

- [10] ETSI ETS 300 779 (Edition 1): "Network Aspects (NA); Universal Personal Telecommunication (UPT); Phase 1 - Service description".
- [11] ETSI EG 201 965: "Services and Protocols for Advanced Networks (SPAN); Service Provider Access; Service Provider Access Management Requirements for Open Network Access".
- [12] ETSI EN 300 403-1 through 7: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993/8) modified]". and subsequent parts.

NOTE: Supplementary Services (SS) are described elsewhere.

- [13] ETSI ETS 300 356-1 through 19: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1994)]", and subsequent parts. ISUP Version 2.
- [14] ETSI EN 300 356-1 through 36: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997) modified]", and subsequent parts. ISUP Version 3.
- [15] ETSI EN 300 356-1 through 21: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 4 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (2000) modified]", and subsequent parts; ISUP Version 4.
- [16] ETSI ETS 300 121 (Edition 1): "Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)". (Based on ITU-T recommendation Q.767)
- [17] ETSI TS 129 002: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Mobile Application Part (MAP) specification (3GPP TS 29.002)". <https://standards.iteh.ai/catalog/standards/sist/c0a52481-9747-4dd0-873c-37441c100000/etsi-ts-129-002-2001>
- [18] ETSI ETS 300 374-1: "Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: Protocol specification".
- [19] ETSI EN 301 140-1 (V1.3.4): "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 1: Protocol specification".
- [20] ETSI TS 122 078: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1(3GPP TS 22.078)".
- [21] ETSI EG 201 899 (V1.1.1): "Services and Protocols for Advanced Networks (SPAN); Service Provider Access; Modelling service provider access requirements using an API approach".
- [22] ETSI ES 201 915-1 through 12: "Open Service Access; Application Programming Interface; Part 1: Overview".
- [23] ETSI EG 201 988-1: "Services and Protocols for Advanced Networks (SPAN); Service Provider Access Requirements (SPAR); Open Service Access for API requirements version 1".
- [24] ETSI EG 201 988-2: "Services and Protocols for Advanced Networks (SPAN); Service Provider Access Requirements (SPAR); Open Service Access for API requirements version 2".
- [25] ETSI ES 201 296: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Signalling aspects of charging".
- [26] ETSI ETR 172: "Business Telecommunications (BTC); Virtual Private Networking (VPN); Services and networking aspects; Standardization requirements and work items".
- [27] ETSI EG 201 367: "Intelligent Network (IN); Number Portability Task Force (NPTF); IN and Intelligence Support for Service Provider Number Portability".

- [28] ETSI TR 101 917-1 through 12: "Services and Protocols for Advanced Networks (SPAN); API mapping for Open Service Access; Part 1: General issue on API mapping".
- [29] ETSI EG 201 988-3: "Services and Protocols for Advanced Networks (SPAN); Service Provider Access Requirements (SPAR); Mapping of Open Service Access for API version 1 to SPA requirements".
- [30] ETSI EN 300 650: "Integrated Services Digital Network (ISDN); Message Waiting Indication (MWI) supplementary service; Service description".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions of Service Provider related terms given in [2], [3] and [4] apply.

3.2 Abbreviations

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

API	Application Programme Interface
BICC	Bearer Independent Call Control
CAMEL	Customized Application for Mobile networks Enhanced Logic
CdPy	Called Party
CgPy	Calling Party
CS-1	IN Capability Set 1
CUSF	Call Unrelated Service Function
DSS1	Digital Subscriber Signalling System No. 1
GMSC	Gateway Mobile Switching Centre
HLR	Home Location Register
IN	Intelligent Network
INAP	Intelligent Network Application Part
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MAP	Mobile Application Part
NNI	Network-Network Interface
ONP	Open Network Provision
PTN	Public Telecommunications Network
PTNorig	Public Telecommunications Network originating
PTNterm	Public Telecommunications Network terminating
SCF	Service Control Function
SP	Service Provider
SPAI	Service Provider Access Interface
SPorig	Service Provider originating
SPterm	Service Provider terminating
SS	Supplementary Service
SSF	Service Switching Function
SSL	Secure Sockets Layer
TC	Transaction Capabilities
UNI	User-Network Interface
UPT	Universal Personal Telecommunications
UUS	User User Signalling
VMSC	Visited MSC
VPN	Virtual Private Network

4 History and Regulatory Background

4.1 Development of the Market

In the original European work done in the 1980s, a clear link was drawn between the availability of economically efficient telecommunications services and the development of the economy of the region as a whole. Stimulating competition to enable these services was seen as key.

The development of competition in the telecommunications market in Europe has been characterized, initially, by the liberalization of services, at the beginning of the 1990s. This was followed in 1998 by the liberalization of the provision of infrastructure.

However, for a provider to deliver services where they do not themselves have control of the access network, this will necessitate interconnection with and access to the network of a relevant network operator. This access has been limited to ordinary user plane interconnection (call origination, transit and call termination), with the attendant limitations on the type of services that can be delivered using this mechanism.

In order to enable advanced services, enhanced forms of access are required. These forms fall into two generic types - control plane access and management plane access. It is in this context that the current work has been progressed.

4.2 EC Directives

EC directives 97/33/EC [5] and 98/10/EC [6] require reasonable requests for access to the networks of operators with Significant Market Power (SMP) to be met. In order to reduce the costs for all parties concerned, this work is aimed at standardizing as many of the envisaged capabilities as possible.

5 Service aspects

In developing the present document, five initial benchmark services have been identified, see [1]. These are currently supported under IN and terminal mobility signalling protocols. The benchmark services will be utilized to test the extension of the signalling protocols in support of open network access.

5.1 Service Definition.

Services, as defined by current ETSI Standards, are taken within the present document as a benchmark for consideration of protocol support - see Benchmark IN services as listed in clause 5.1.2. Service Providers have the opportunity to develop these or create their own services to meet specific user requirements. Such services may be developed by utilizing the flexibility offered through an API or by an IN.

5.2 Benchmark Services

A list of benchmark services are listed in table 1 as defined in ETR 244 [1].

The identified services all have existing service definition for either the PSTN or the ISDN, as defined in table 1.

Table 1: Identification of service definitions for benchmark services (see note)

Identified service	PSTN service definition	ISDN service definition
Freephone	---	ETS 300 208 [7]
Premium rate	ETS 300 712 [8]	ETS 300 712 [8]
Virtual card calling	ETS 300 711 [9]	ETS 300 711 [9]
Virtual private network	ETR 172 [26] (see note)	ETR 172 [26] (see note)
Universal personal telecommunications	ETS 300 779 [10]	ETS 300 779 [10]
NOTE:	This is not a service, but an alternative means of provision of existing services defined for the private network. ETR 172 [26] identifies the work items required for this definition.	

The benchmark services have been used to specify the Open-INAP Protocol work being developed by ETSI WG-SPAN12 as a special PICS Proforma (DEN/SPAN-120084 (see bibliography)) to accompany IN CS-3, and they have also been mapped in the present document against the capabilities noted in the requirements clause 7.3 of the present document.

NOTE: ETSI WG-SPAN12 are also using the number portability service as defined in EG 201 367 [27] as an additional benchmark service for OPEN-INAP.

5.3 Service Provider Access Management

Network Management requirements to support Service Provider Access are listed in the companion Guide EG 201 965 [11].

6 Architectural Aspects

A signalling connection between a public telecommunications network operator and a service provider is shown below in figure 2. The physical connection of the call is only extended from the public telecommunications network to the service provider's equipment for circuit related (CR) access.

For calls from a calling party (CgPy) in the originating PTN (PTNorig) to a called party (CdPy) in the terminating PTN (PTNterm), in which both PTNs and SPs are involved, various call connection scenarios are possible. Figure 2 visualizes two examples of a call connection scenario from the viewpoint of the requirements of the SPs of the originating- and terminating-call-related services, called SPorig and SPterm, respectively.

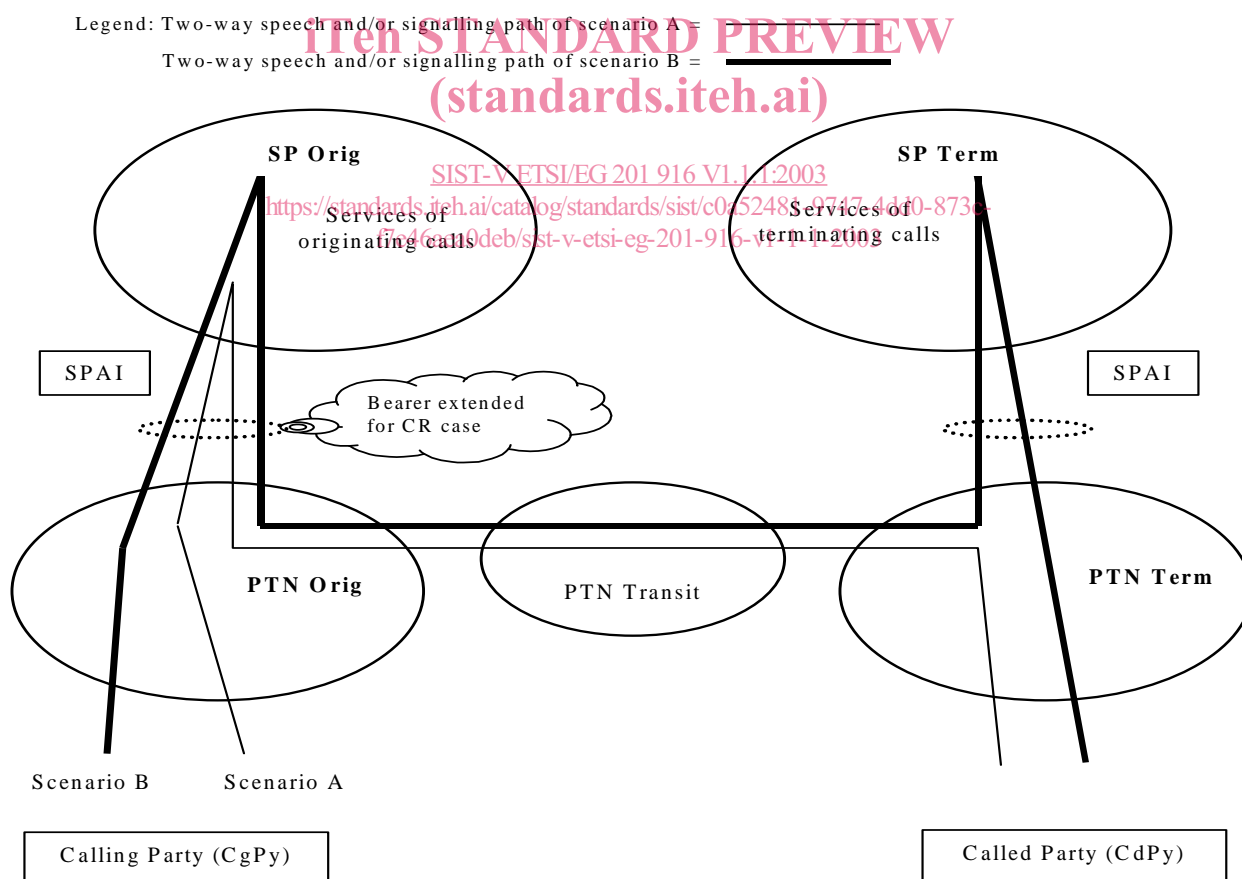


Figure 2: Examples of call connection scenarios for circuit related SP access

Scenario A is an example of a call in which SPorig is involved. In this scenario A, the call is forwarded from the PTNorig to SPorig which provides a service to the call. SPorig returns the call to the PTNorig. The call is then forwarded from the PTNorig, eventually via a transit network (PTNtran), to the PTNterm in which the call is terminated at the called party's (CdPy) line.

Scenario B is an example of a call in which both the SPorig and the SPterm are involved. In this scenario, the call is forwarded from the PTNorig to SPorig which provides a service to the call. SPorig returns the call to the PTNorig. The call is then forwarded from the PTNorig, eventually via a transit network (PTNtran), to the PTNterm. Then, from the PTNterm the call is forwarded to SPterm which provides a service to the call. SPterm returns the call to the PTNterm, in which the call is terminated at the called party's (CdPy) line.

For calls from a calling party (CgPy) in the originating PTN (PTNorig) to a called party (CdPy) in the terminating PTN (PTNterm), in which both PTNs and SPs are involved, various call connection scenarios are possible. Figure 3 visualizes two examples of a call connection scenario in the NCR case from the viewpoint of the requirements of the SPs of the originating- and terminating-call-related services, called SPorig and SPterm, respectively.

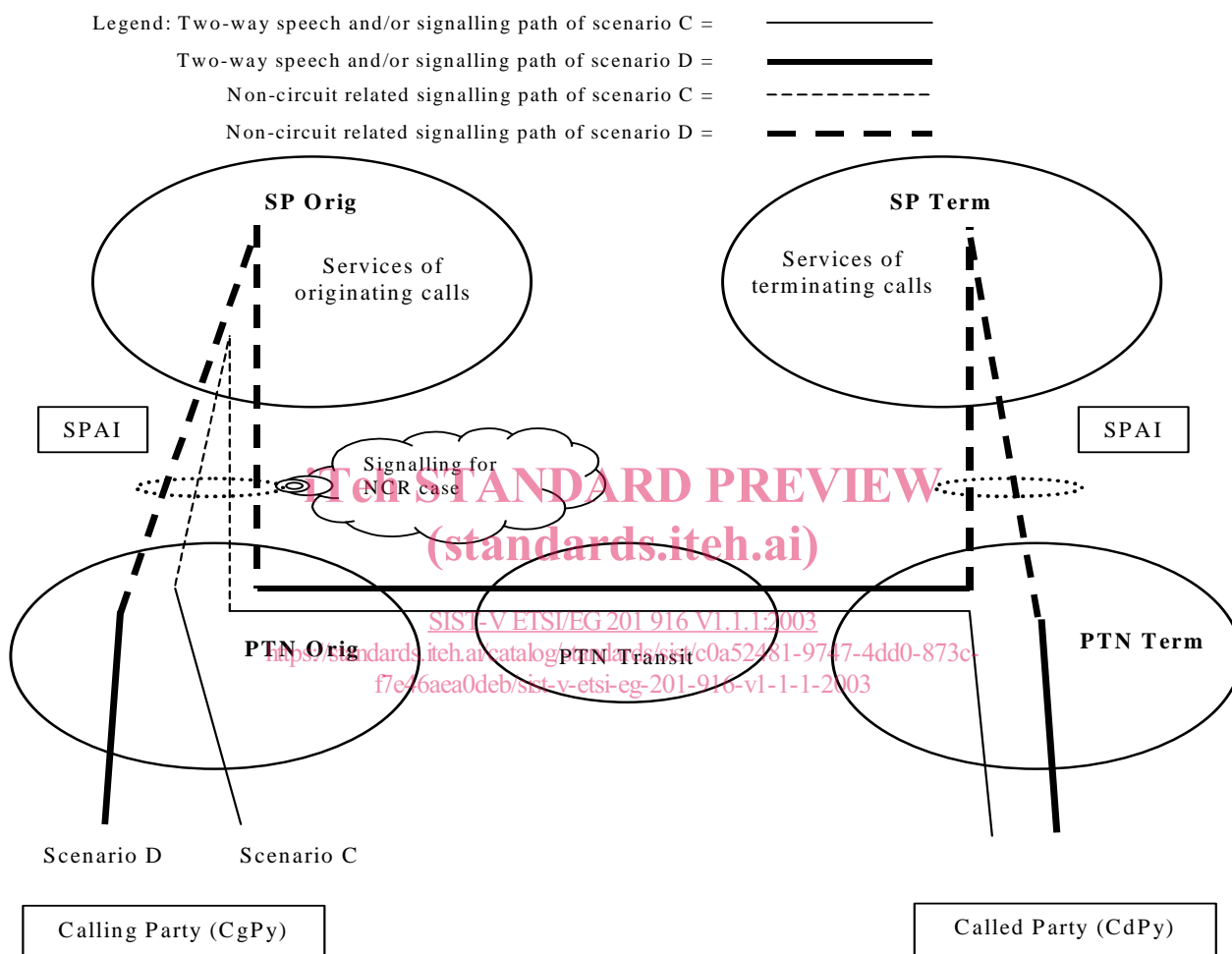


Figure 3: Examples of call connection scenarios in the case of a non-circuit-related SP Access

Scenario C is an example of a call in which SPorig is involved. In this scenario, the signalling in the control plane is forwarded from the PTNorig to SPorig which provides a service to the call. Then, the signalling in the control plane is returned to the PTNorig, which forwards the call to the PTNterm, eventually via a transit network (PTNtran), in which the call is terminated at the called party's (CdPy) line.

Scenario D is an example of a call in which SPorig is involved. In this scenario, the signalling in the control plane is forwarded from the PTNorig to SPorig which provides a service to the call. The signalling in the control plane is then returned to the PTNorig, which forwards the call to the PTNterm, eventually via a transit network (PTNtran). Then, the control plane signalling is forwarded from the PTNterm to SPterm which provides a service to the call. The signalling in the control plane is then returned to the PTNterm, in which the call is terminated at the called party's (CdPy) line.

It is evident that a range of ETSI standards need to be invoked for the provision of the SPAI supporting UNI and NNI configurations e.g. DSS1 [12], ISUP [13], [14], [15], [16], GSM MAP [17], INAP CS1, CS2, CS3 [18], [19], CAMEL [20]). Implementation of these standards will lead to protocol-specific implementations of SP applications.

6.1 API - Architectures

EG 201 899 [21] models service provider requirements using an API approach that leads to API definitions in ES 201 915-1 [22] and documents EG 201 988-1 [23] and EG 201 988-2 [24] cover open service access API requirements.

An API modelling approach is referenced in the architecture under consideration in EP TIPHON. API modelling is being developed in the JAIN and PARLAY consortia and standardized in ETSI WG SPAN12 and 3GPP WG CN5. The following figure shows how different network technologies existing in today's networks can be integrated through API to the application control plane.

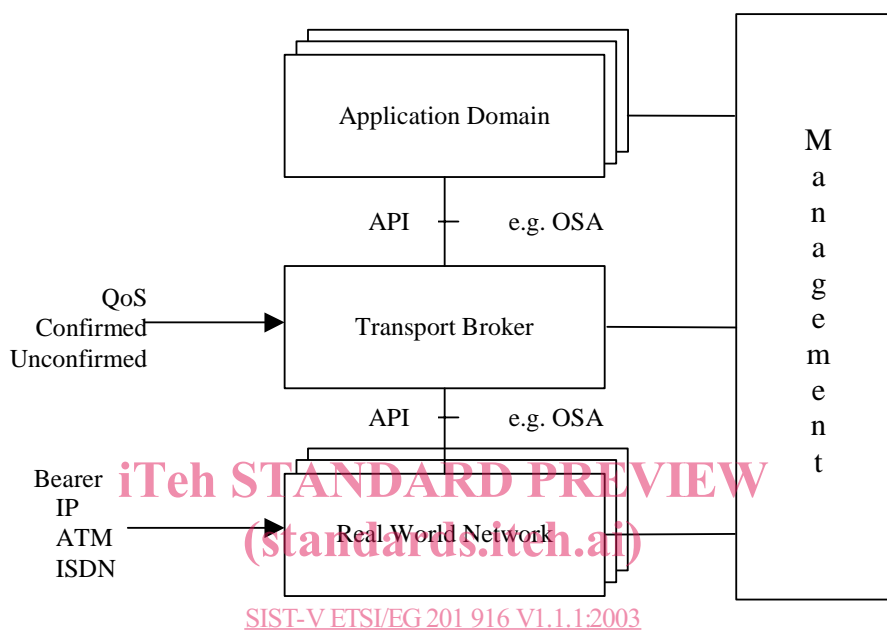


Figure 4: Proposed conceptual model to support IP under consideration by EP TIPHON
<http://standards.it-eetech.ai/standards/standards/ETSI/EG/201/916/v1-1-1-2003/f7e46aea0deb/sist-v-etsi-eg-201-916-v1-1-1-2003>

6.2 Management Architecture

The management function interface is shown in the following protocol stack allowing current tried and tested signalling layers to be used.

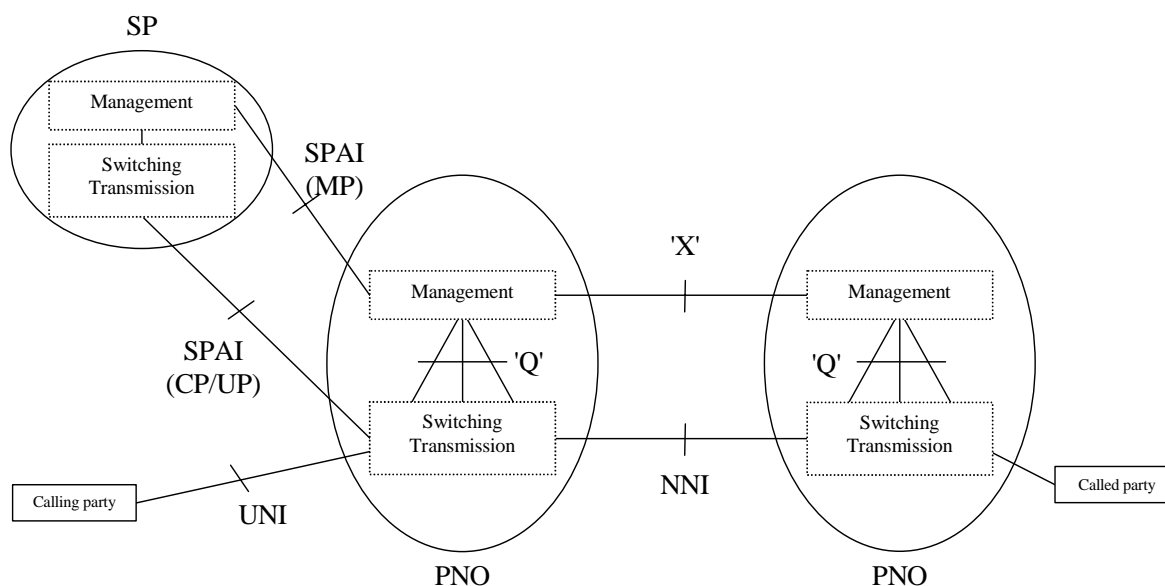


Figure 5: Reference Architecture for SP-PTN management requirements

7 Interfaces

7.1 Open Access using the User to Network Interface

Figures 6 and 7 illustrate the SPAI for circuit related and non-circuit-related access using the UNI interface configuration respectively.

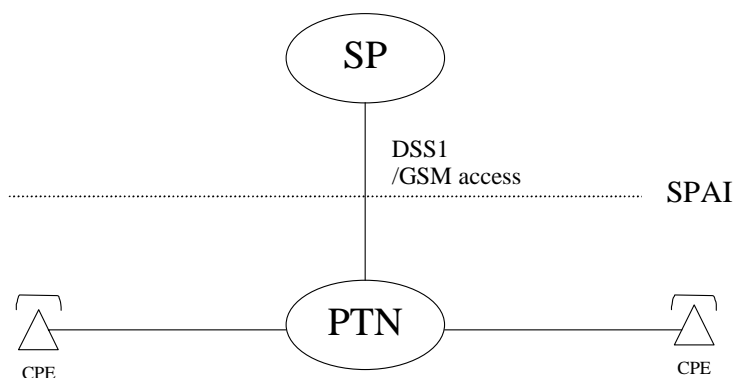


Figure 6: Circuit-related service provider access using UNI

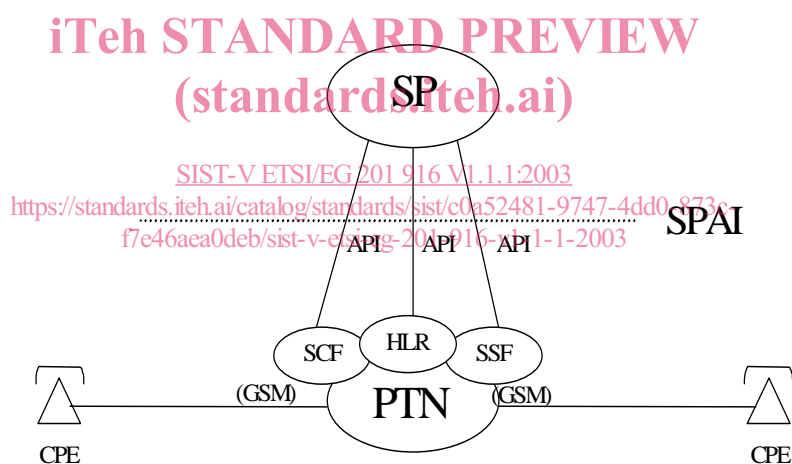


Figure 7: Non-circuit-related service provider access using UNI