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Preskušanje integracije omrežja med ISDN, PLMN in PSTN - 1. del: Zgradba preskuševalnega niza in namen preskušanja (TSS&TP) - Specifikacija

Network integration testing between ISDN, PLMN and PSTN - Part 1: Test Suite Structure and Test Purposes (TSS&TP) specification

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Foreword

This ETSI Guide (EG) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN) using information provided by EURESCOM P613.

The present document is part 1 of a multi-part EG covering the Network integration testing between ISDN, PLMN and PSTN, as identified below:

Part 1: Test Suite Structure and Test Purposes (TSS&TP) specification;

Part 2: Abstract Test Suite (ATS), Implementation Conformance Statement (ICS) and partial Implementation eXtra Information for Testing (IXIT) proformas.

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Introduction

The present document contains the Test Suite Structure and Test Purposes (TSS&TP) for Network Integration Testing Narrow-band Services for testing the European ISDN and PLMN, covering Network Integration Testing (NIT) between ISDN-PLMN, PSTN-PLMN, PLMN-ISDN, PLMN-PSTN and PLMN-PLMN networks. The objective is to verify the level of international end-to-end support of ISDN and PLMN services. Both bearer services (and associated teleservices) and supplementary services are checked for interworking capability and compatibility, in the European ISDN and PLMN.

The European ISDN and PLMN are made up by connecting the different national networks and End-to-end NIT covers all the testing activities necessary to assess the correct behaviour of the interconnected network from the point of view of access interfaces, network side.

1 Scope

The present document specifies the Test Suite Structure and Test Purposes (TSS&TP) for Network Integration Testing (NIT) to verify the overall compatibility of ISDN, PLMN and non-ISDN (PSTN) over the national or international ISUP between networks. Network Integration Testing will assure that the appropriate requested features passes between an ISDN subscriber and the PLMN subscriber across the national or international ISUP (ISUP V2) interface.

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, edition number, version number, etc.) or non-specific.
 - For a specific reference, subsequent revisions do not apply.
 - For a non-specific reference, 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] EN 300 403-1: "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), modified]".
 - [2] EG 201 018 (ETR 018): "Integrated Services Digital Network (ISDN); Application of the Bearer Capability (BC), High Layer Compatibility (HLC) and Low Layer Compatibility (LLC) information elements by terminals supporting ISDN services".
 - [3] ETS 300 267-1: "Integrated Services Digital Network (ISDN); Telephony 7 kHz and videotelephony tele services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
 - [4] ETS 300 080: "Integrated Services Digital Network (ISDN); ISDN lower layer protocols for telematic terminals".
 - [5] ETS 300 103: "Integrated Services Digital Network (ISDN); Support of CCITT Recommendation X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an ISDN Synchronous and asynchronous terminal adaptation functions".
 - [6] ETS 300 092-1: "Integrated Services Digital Network (ISDN); Calling Line Identification Presentation (CLIP) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
 - [7] ETS 300 093-1: "Integrated Services Digital Network (ISDN); Calling Line Identification Restriction (CLIR) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
 - [8] ETS 300 097-1: "Integrated Services Digital Network (ISDN); Connected Line Identification Presentation (COLP) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
 - [9] ETS 300 098-1: "Integrated Services Digital Network (ISDN); Connected Line Identification Restriction (COLR) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
 - [10] ETS 300 138-1: "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

- [11] ETS 300 061-1: "Integrated Services Digital Network (ISDN); Subaddressing (SUB) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [12] ETS 300 055-1: "Integrated Services Digital Network (ISDN); Terminal Portability (TP) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [13] ETS 300 286-1: "Integrated Services Digital Network (ISDN); User-to-User Signalling (UUS) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [14] ETS 300 185-1: "Integrated Services Digital Network (ISDN); Conference call, add-on (CONF) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [15] ETS 300 207-1: "Integrated Services Digital Network (ISDN); Diversion supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [16] ETS 300 130-1: "Integrated Services Digital Network (ISDN); Malicious Call Identification (MCID) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [17] ETS 300 188-1: "Integrated Services Digital Network (ISDN); Three-Party (3PTY) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [18] ETS 300 141-1: "Integrated Services Digital Network (ISDN); Call Hold (HOLD) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [19] ETS 300 058-1: "Integrated Services Digital Network (ISDN); Call Waiting (CW) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [20] ETS 300 369-1: "Integrated Services Digital Network (ISDN); Explicit Call Transfer (ECT) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [21] ETS 300 195-1: "Integrated Services Digital Network (ISDN); Supplementary service interactions; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [22] TBR 008: "Integrated Services Digital Network (ISDN); Telephony 3,1 kHz teleservice; Attachment requirements for handset terminals".
- [23] ITU-T Recommendation I.112 (1988): "Vocabulary and terms for ISDNs".
- [24] ITU-T Recommendation I.210 (1988): "Principles of the telecommunication services supported by an ISDN and the means to describe them".
- [25] ITU-T Recommendation E.164 (1988): "Numbering plan for the ISDN era".
- [26] ISO/IEC 9646-1: "Information Technology-OSI Conformance Testing Methodology and Framework, Part 1: General Concepts".
- [27] ETS 300 502: "European digital cellular telecommunications system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN) (GSM 02.03)".
- [28] ETS 300 511: "European digital cellular telecommunications system (Phase 2); Man-Machine Interface (MMI) of the Mobile Station (MS)".
- [29] ETS 300 515: "Digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services; Stage 1 (GSM 02.82)".

- [30] ETS 300 518: "Digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services; Stage 1 (GSM 02.85)".
- [31] ETS 300 543: "Digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services; Stage 2 (GSM 03.82)".
- [32] ETS 300 544: "European digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services; Stage 2 (GSM 03.83)".
- [33] ETS 300 546: "Digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services; Stage 2 (GSM 03.85)".
- [34] ETS 300 548: "European digital cellular telecommunications system (Phase 2); Call Barring (CB) supplementary services; Stage 2 (GSM 03.88)".
- [35] ETS 300 557: "Digital cellular telecommunications system (Phase 2); Mobile radio interface; Layer 3 specification (GSM 04.08 version 4.23.1)".
- [36] ETS 300 565: "European digital cellular telecommunications system (Phase 2); Line identification supplementary services; Stage 3 (GSM 04.81)".
- [37] ETS 300 566: "Digital cellular telecommunications system (Phase 2); Call Forwarding (CF) supplementary services; Stage 3 (GSM 04.82)".
- [38] ETS 300 567: "Digital cellular telecommunications system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services; Stage 3 (GSM 04.83)".
- [39] ETS 300 569: "Digital cellular telecommunications system (Phase 2); Closed User Group (CUG) supplementary services; Stage 3 (GSM 04.85)".
- [40] ETS 300 582: "Digital cellular telecommunications system (Phase 2); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (GSM 07.01)".
- [41] ETS 300 599: "Digital cellular telecommunications system (Phase 2); Mobile Application Part (MAP) specification (GSM 09.02 version 4.17.1)".
- [42] ETS 300 604: "Digital cellular telecommunications system (Phase 2); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) (GSM 09.07 version 4.13.1)".
- [43] ITU-T Recommendation Q.764 (1993): "Specifications of Signalling System No.7; Signalling procedures".
- [44] ETS 300 587-2: "European digital cellular telecommunications system (Phase 2); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Interface principles (GSM 08.02)".
- [45] ETS 300 524: "European digital cellular telecommunications system (Phase 2); Signalling requirements relating to routing of calls to mobile subscribers (GSM 03.04)".
- [46] ETS 300 102-1: "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".
- [47] ITU-T Recommendation V.110 (1996): "Support by an ISDN of data terminal equipments with V-Series type interfaces".
- [48] ITU-T Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".
- [49] ITU-T Recommendation X.30 (1993): "Support of X.21, X.21 bis and X.20 bis based Data Terminal Equipments (DTEs) by an Integrated Services Digital Network (ISDN)".
- [50] ITU-T Recommendation F.721 (1992): "Videotelephony teleservice for ISDN".

- [51] ITU-T Recommendation F.182 (1996): "Guidelines for the support of the communication of documents using Group 3 facsimile between user terminals via public networks".
- [52] ISO/IEC 8208 (1995): "Information technology - Data communications - X.25 Packet Layer Protocol for Data Terminal Equipment".
- [53] ISO/IEC 7776 (1995): "Information technology - Telecommunications and information exchange between systems - High-level data link control procedures - Description of the X.25 LAPB-compatible DTE data link procedures".
- [54] ITU-T Recommendation V.120 (1996): "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".
- [55] ETS 300 578: "Digital cellular telecommunications system (Phase 2); Radio subsystem link control (GSM 05.08 version 4.22.0)".
- [56] ITU-T Recommendation G.101 (1996): "The transmission plan".
- [57] ETS 300 542: "Digital cellular telecommunications system (Phase 2); Line identification supplementary services; Stage 2 (GSM 03.81 version 4.8.1)".
- [58] ITU-T Recommendation H.221 (1999): "Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices".
- [59] ITU-T Recommendation H.242 (1999): "System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s".

3 Definitions

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

[SIST-V ETSI/EG 201 738-1 V1.1.1:2003](https://standards.iteh.ai/catalog/standards/sist/e8c9791a-e15c-4491-a170-dcb6271bce10/sist-v-etsi-eg-201-738-1-v1-1-1-2003)

3.1 Definitions related to conformance testing

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abstract test case: refer to ISO/IEC 9646-1 [26]

abstract test suite: refer to ISO/IEC 9646-1 [26]

implementation under test: refer to ISO/IEC 9646-1 [26]

lower tester: refer to ISO/IEC 9646-1 [26]

Implementation Conformance Statement (ICS) proforma: refer to ISO/IEC 9646-1 [26]

Implementation eXtra Information for Testing (IXIT) proforma: refer to ISO/IEC 9646-1 [26]

point of control and observation: refer to ISO/IEC 9646-1 [26]

protocol implementation conformance statement: refer to ISO/IEC 9646-1 [26]

protocol implementation extra information for testing: refer to ISO/IEC 9646-1 [26]

system under test: refer to ISO/IEC 9646-1 [26]

test purpose: refer to ISO/IEC 9646-1 [26]

3.2 Definitions related to EN 300 403-1

user: DSS1 protocol entity at the User side of the user-network interface where a T reference point or coincident S and T reference point applies

user (S/T): DSS1 protocol entity at the User side of the user-network interface where a coincident S and T reference point applies

user (T): DSS1 protocol entity at the User side of the user-network interface where a T reference point applies (User is the Private ISDN)

Integrated Services Digital Network (ISDN): see ITU-T Recommendation I.112 [23], subclause 2.2 definition 308

service: telecommunications service: see ITU-T Recommendation I.112 [23], subclause 2.2 definition 201

supplementary service: see ITU-T Recommendation I.210 [24], subclause 2.4

ISDN number: number conforming to the numbering and structure specified in ITU-T Recommendation E.164 [25]

3.3 Configuration of the mobile network

3.3.1 The entities of the mobile system

To provide the mobile service as it is defined, it is necessary to introduce some specific functions. These functional entities can be implemented in different equipment's or integrated. In any case, exchanges of data occur between these entities.

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3.3.1.1 The Home Location Register (HLR)

This functional entity is a data base in charge of the management of mobile subscribers. A PLMN may contain one or several HLRs; it depends on the number of mobile subscribers, on the capacity of the equipment and on the organization of the network. All subscription data are stored there. The main information stored there concerns the location of each mobile station in order to be able to route calls to the mobile subscribers managed by each HLR. All management interventions occur on this data base. The HLRs have no direct control of MSCs.

3.3.1.2 The Visitor Location Register (VLR)

An MS roaming in an MSC area is controlled by the Visitor Location Register in charge of this area. When an MS appears in a location area it starts a location updating procedure. The MSC in charge of that area notices this registration and transfers to the Visitor Location Register the identity of the location area where the MS is situated. A VLR may be in charge of one or several MSC areas.

The VLR also contains the information needed to handle the calls set up or received by the MSs registered in its data base (in some cases the VLR may have to obtain additional information from the HLR).

3.3.1.3 The Mobile-services Switching Centre (MSC)

The Mobile-services Switching Centre is an exchange which performs all the switching functions for mobile stations located in a geographical area designated as the MSC area. The main difference between an MSC and an exchange in a fixed network is that the MSC has to take into account the impact of the allocation of radio resources and the mobile nature of the subscribers and has to perform, for example, the following procedures:

- procedures required for the location registration;
- procedures required for hand-over.

3.3.1.4 The Base Station System (BSS)

The BSS is the sub-system of Base Station equipment (transceivers, controllers, etc.) which is viewed by the MSC through a single interface (A-interface) with the functionality described in ETS 300 587-2 [44] (GSM 08.02).

3.3.1.5 The Gateway MSC (GMSC)

In the case of incoming calls to the PLMN, if the fixed network is unable to interrogate the HLR, the call is routed to an MSC. This MSC will interrogate the appropriate HLR and then route the call to the MSC where the mobile station is located. The MSC which then performs the routing function to the actual location of the mobile is called the Gateway MSC. The choice of which MSCs can act as Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

3.3.1.6 The SMS Gateway MSC

The SMS GMSC is the interface between the Mobile Network and the network which provides access to the Short Message Service Centre, for short messages to be delivered to mobile stations. The choice of which MSCs can act as SMS Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

3.3.1.7 The SMS Interworking MSC

The SMS IW MSC is the interface between the Mobile Network and the network which provides access to the Short Message Service Centre, for short messages submitted by mobile stations. The choice of which MSCs can act as SMS Interworking MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

3.3.1.8 The Equipment Identity Register (EIR)

This functional unit is a data base in charge of the management of the equipment identities of the mobile stations; see also GSM 02.16.

3.3.2 Configuration of a Public Land Mobile Network (PLMN)

The basic configuration of a Public Land Mobile Network is presented in figure 2.2/1. In this figure the most general solution is described in order to define all the possible interfaces which can be found in any PLMN. The specific implementation in each network may be different: some particular functions may be implemented in the same equipment and then some interfaces may become internal interfaces. In any case the configuration of a PLMN has no impact on the relationship with the other PLMNs. In this configuration, all the functions are considered implemented in different equipment's. Therefore, all the interfaces are external and need the support of the Mobile Application Part of the Signalling System No. 7 to exchange the data necessary to support the mobile service. From this configuration, all the possible PLMN organizations can be deduced.

3.3.3 Interconnection between PLMNs

Since the configuration of a PLMN does not have any impact on other PLMNs, the signalling interfaces specified can be implemented both between the entities within a PLMN and between different PLMNs.

3.3.4 The interfaces within the mobile service

3.3.4.1 Interface between the HLR and the VLR (D-interface)

This interface is used to exchange the data related to the location of the mobile station and to the management of the subscriber. The main service provided to the mobile subscriber is the capability to set up or to receive calls within the whole service area. To support that purpose the location registers have to exchange data. The VLR informs the HLR on the registration of a mobile station managed by the latter and provides it with the relevant location information. The HLR sends to the VLR all the data needed to support the service to the mobile station. The HLR then calls the previous VLR to inform it that it can cancel the location registration of this station because of the roaming of the mobile.

Exchanges of data may also occur when the mobile subscriber requires a particular service, when he wants to change some data attached to his subscription or when some parameters of the subscription are modified by administrative means.

3.3.4.2 Interface between the VLR and its associated MSC(s) (B-interface)

The VLR is the location and management data base for the mobile stations roaming in the area controlled by the associated MSC(s). Whenever the MSC needs data related to a given mobile station currently located in its area, it interrogates the VLR. When a mobile station initiates a location updating procedure with an MSC, the MSC informs its VLR which stores the relevant information in its tables. This procedure occurs whenever a mobile roams to another location area. Also, for instance when a subscriber activates a specific supplementary service or modifies some data attached to a service, the MSC transfers (via the VLR) the request to the HLR, which stores these modifications and updates the VLR if required.

However, this interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

3.3.4.3 Interface between VLRs (G-interface)

When an MS initiates a location updating using TMSI, the VLR can fetch the IMSI and authentication set from the previous VLR.

3.3.4.4 Interface between the HLR and the MSC (C-interface)

When the fixed network is not able to perform the interrogation procedure needed to set up a call to a mobile subscriber, the Gateway MSC has to interrogate the HLR of the called subscriber to obtain the roaming number of the called MS (see ETS 300 524 [45] (GSM 03.04)).

To forward a short message to a mobile subscriber, the SMS Gateway MSC has to interrogate the HLR to obtain the MSC number where the MS is located.

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3.3.4.5 Interface between MSCs (E-interface)

When a mobile station moves from one MSC area to another during a call, a handover procedure has to be performed in order to continue the communication. For that purpose the MSCs involved have to exchange data to initiate and then to realize the operation.

<https://standards.iteh.ai/catalog/standards/sist/e8c9791a-e15c-4491-a170-dcb6271bce10/sist-v-etsi-eg-201-738-1-v1-1-1-2003>

This interface is also used to forward short messages.

3.3.4.6 Interface between the MSC and Base Station Systems (A-interface)

The description of this interface is contained in the GSM 08-series of Mobile stations.

The BSS-MSC interface carries information concerning:

- BSS management;
- call handling;
- location management.

3.3.5 Access reference configuration

3.3.5.1 Mobile Termination (MT)

Mobile Termination (MT) performs the following functions:

- radio transmission termination;
- radio transmission channel management;
- terminal capabilities, including presentation of a man-machine interface to a user;
- speech encoding/decoding;
- error protection for all information sent across the radio path. This includes FEC (forward error correction) and, for signalling and user data (except for transparent data services), ARQ (automatic request fore transmission);
- flow control of signalling and mapping of user signalling to/from PLMN access signalling;
- flow control of user data (except for transparent data services) and mapping of flow control for asynchronous transparent data services;
- rate adaptation of user data between the radio channel rate and user rates;
- multiple terminal support;
- mobility management.

There are three types of MT:

- MT0 includes functions belonging to the functional group MT, with support of no terminal interfaces;
- MT1 includes functions belonging to the functional group MT, and with an interface that complies with the GSM recommended subset of the ISDN user-network interface specifications;
- MT2 includes functions belonging to the functional group MT, and with an interface that complies with the GSM recommended subset of the ITU-T X or V series interface recommendations.

The MT plus any TE/(TE + TA) constitutes the Mobile Station, MS.

3.3.5.2 Physical Realization

In a GSM PLMN, the reference point Um is a GSM interface point, i.e. it is always implemented as a physical interface. The reference points S and R may be optionally implemented as physical interfaces.

3.4 Definitions related to test purpose descriptions

BC=speech: Bearer capability information element with its information transfer capability field set to "speech" and its user information layer one protocol field set to "ITU-T Recommendation G.711 [48] A-law"

BC=3,1 kHz audio: Bearer capability information element with its information transfer capability field set to "3,1 kHz Audio" and its user information layer one protocol field set to "ITU-T Recommendation G.711 [48] A-law"

BC=UDI: Bearer capability information element with its information transfer capability set to "unrestricted digital information" [1]

BC=UDI/TA: Bearer capability information element with its information transfer capability set to "unrestricted digital information with tones/announcements" and its user information layer one protocol field set to "ITU-T Recommendations H.221 [58] and H.242 [59]"

BC= V110/X30: Bearer capability information element with its information transfer capability set to "unrestricted digital information" and its user information layer 1 field set to "ITU-T standardized rate adaption V.110/X.30", including sync/async and user rate values [1]