ETSI TS 182 012 V2.1.4 (2008-03)

Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation Sub-system (PES); Functional architecture

Reference

RTS/TISPAN-02044-NGN-R2

Keywords

architecture, IMS, ISDN, PSTN

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document describes an IMS-based functional architecture for the PSTN/ISDN Emulation Subsystem (PES) of the ETSI TISPAN NGN overall architecture. The IMS-based PSTN/ISDN Emulation Subsystem described herein supports the emulation of PSTN services for analog terminals and ISDN services for ISDN terminals and PBXs. These may be connected directly to residential gateways or access gateways, or via V5 access networks.

The present document provides a framework for an IMS-based functional architecture and is considered to be a preliminary version. In addition, in order to fulfil the requirements of different operators and national regulatory requirements, this architecture will need to be enhanced.

See annex A for a list of potential open areas.

2 References

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture Release 1".

[2] ETSI ES 282 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS) Functional architecture".

[3] ETSI TS 182 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Stage 2 description".

[4] ETSI ES 283 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 [Release 7], modified]".

[5] ETSI TS 183 043: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation; Stage 3 specification".

[6] ETSI TS 183 021: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Release 1; Endorsement of 3GPP TS 29.162 Interworking between IM CN Sub-system and IP networks".

[7] ETSI ES 282 010: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Charging management Endorsement of 3GPP TS 32.240 Release 7, 3GPP TS 32.260 Release 7, 3GPP TS 32.297 Release 7, 3GPP TS 32.298 Release 7 and 3GPP TS 32.299 Release 7, modified".

[8] ETSI ES 201 915-1: "Open Service Access (OSA); Application Programming Interface (API); Part 1: Overview (Parlay 3)".

[9] IETF RFC 3136: "The SPIRITS architecture".

[10] ETSI ETS 300 738: "Human Factors (HF); Minimum Man-Machine Interface (MMI) to public network based supplementary services".

[11] ITU-T Recommendation H.248: "Gateway control protocol".

[12] ETSI EN 300 659 (all parts): "Access and Terminals (AT); Analogue access to the Public Switched Telephone Network (PSTN); Subscriber line protocol over the local loop for display (and related) services".

[13] ETSI ETR 150: "V5 interface; Public Switched Telephone Network (PSTN) mappings".

2.2 Informative references

Not Applicable.

3 Definitions and abbreviations

3.1 Definitions

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

Access Gateway (AG): gateway device that interworks a significant number of analogue lines/ISDN accesses (directly or via an V5 Access Network) to a packet network and is located at the operator's premises

NOTE: An AG can take the form of a Media Gateway (A-MGW) or a Voice over IP Gateway (A-VGW).

Media Gateway (MGW): gateway device acting at the media/transport plane, providing the functions of an MGF as defined in ES 282 001 [1]

NOTE 1: A MGW may additionally relay signalling traffic, in which case it also provides the functions of an SGF as defined in ES 282 001 [1].

NOTE 2: In the present document, Media Gateway refers both to Access Gateways and to Residential Gateways, to form a A-MGW, or a R-MGW, respectively.

Media Gateway Controller (MGC): See ITU-T Recommendation H.248 [11].

Residential Gateway (RG): gateway device that interworks a small number of analogue lines/ISDN accesses

NOTE: A residential gateway typically contains one or two analogue lines/ISDN accesses and is located at the customer premises. A RG can take the form of a Media Gateway (R-MGW) or a Voice over IP Gateway (R-VGW).

Voice over IP Gateway (VGW): SIP-based gateway device that connects legacy equipment to the NGN

NOTE 1: A Voice over IP Gateways (VGW) plays the role of an IMS UE with regards to the P-CSCF.

NOTE 2: A Voice over IP Gateway can be classified as a AG or RG, to form a A-VGW, or a R-VGW, respectively.

3.2 Abbreviations

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

AF	Application Function
AG	Access Gateway
AGCF	Access Gateway Control Function
A-MGF	Access Media Gateway Function
A-MGW	Access Media GateWay
AN	Access Node
AS	Application Server
ASF	Application Server Function
ATA	Analogue Terminal Adaptor
A-VGW	Access Voice over IP GateWay
BCSM	Basic Call State Model
BGCF	Breakout Gateway Control Function
BGF	Border Gateway Function
CCBS	Call Completion on Busy Subscriber
CSCF	Call Session Control Function
DDI	Direct Dialling In
DNS	Domain Name Server
DSS1	Digital Subscriber Signalling System No.1
GW	GateWay
HSS	Home Subscriber Server
IBCF	Interconnection Border Control Function
I-CSCF	Interrogating-Call Session Control Function
IM	IP Multimedia
IMS	IP Multimedia Subsystem
IM-SSF	IP Multimedia-Service Switching Function
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IWF	InterWorking Function
MG	Media Gateway
MGC	Media Gateway Controller
MGCF	Media Gateway Control Function
MGF	Media Gateway Function
MGW	Media Gateway
MRFC	Multimedia Resource Function Controller
MRFP	Multimedia Resource Function Processor
NAPT	Network Address Port Translation
NASS	Network Attachment SubSystem
NGN	Next Generation Network
OSA	Open Service Access
PBX	Private Branch Exchange
P-CSCF	Proxy-Call Session Control Function
PES	PSTN/ISDN Emulation Subsystem
PSTN	Public Switched Telephone Network
RACS	Resource and Admission Control Subsystem
RG	Residential Gateway
R-MGF	Residential-MGF
R-MGW	Residential Media GateWay
R-VGW	Residential Voice over IP GateWay
SCIM	Service Capability Interaction Manager
SCS	Service Capability Server
S-CSCF	Serving-Call Session Control Function

SIGTRAN	SIGnalling TRANsport
SIP	Session Initiation Protocol
SLF	Subscription Locator Function
SS7	Signalling System n°7
SSF	Service Switching Function
TDM	Time Division Multiplexing
TGW	Trunking Gateway
T-MGF	Trunking Media Gateway Function
UE	User Equipment
UPSF	User Profile Server Function
VGW	Voice over IP GateWay
VoIP	Voice over IP

4 Overview

4.1 PSTN/ISDN Emulation subsystem environment

Figure 1 shows the PSTN/ISDN Emulation Subsystem and its relationships with other TISPAN NGN subsystem.

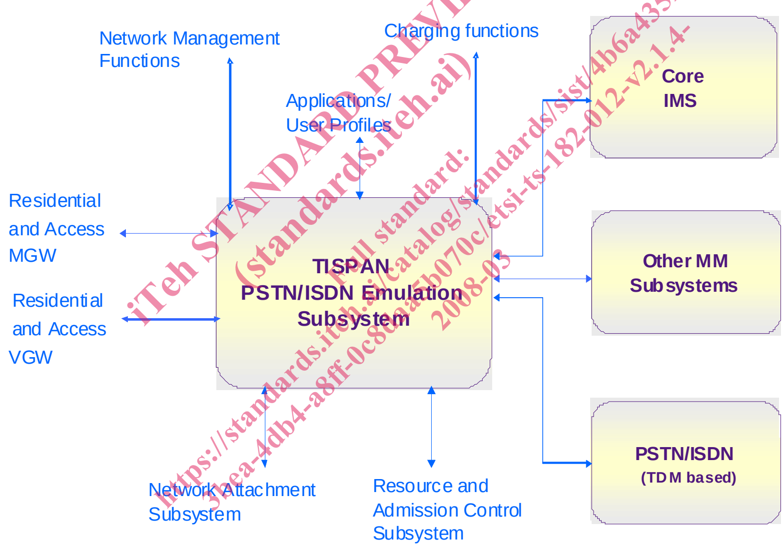

Figure 1: PSTN/ISDN Emulation Subsystem and its environment

4.2 Signalling configurations

Figure 2 illustrates the signalling configurations supported by the PSTN/ISDN Emulation Subsystem (PES) described in the present document.

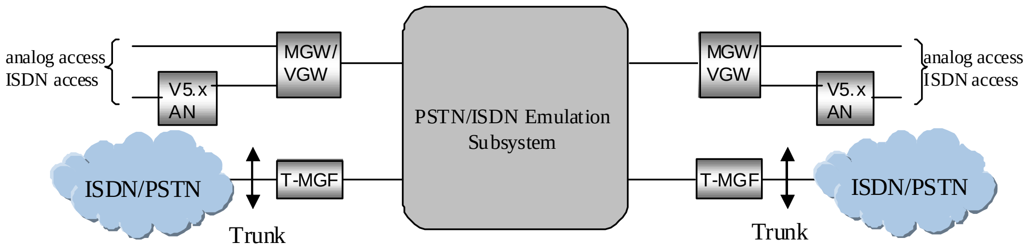

Figure 2: Signalling Configurations

Legacy terminals, i.e. analog phones and ISDN phones may be connected to R-VGW, R-MGW, A-VGW and A-MGW, using the interfaces based on the Z, S/T and U reference point, respectively.

ISDN PBXs may be connected to an A-VGW or A-MGW using the interfaces based on the T reference point.

When connected to an AG (A-VGW or A-MGW) a legacy terminal or ISDN PBX may be connected directly to the AG or indirectly via a V5.xAccess Node.

The R-VGW and A-VGW are connected to the IMS PES via the Gm reference point.

The R-MGW and A-MGW are connected to the IMS PES via the P1 reference point.

PSTN/ISDN islands may also be connected via trunking media gateway function (T-MGF), controlled via the Mn reference point. Transit network functionality is supported as provided by the IMS ES 282 007 [2].

4.3 Constraints on services

The range of services that can be emulated in TISPAN NGN Release 1 is constrained by the functional architecture and the IMS SIP profile defined in ES 283 003 [4] on the Mw/Mx and ISC reference points, and of the Gm reference points in case of VGW.

4.4 Overlap signalling

Overlap sending is a mechanism that is used for dialling over analogue and ISDN accesses, and is inbuilt in the inter-exchange signalling systems of the PSTN/ISDN networks. As such, it is a mechanism that the IMS-based PSTN/ISDN emulation subsystem architecture shall support, in a similar manner as for the PSTN.

To support overlap signalling the PES shall support the following functionality:

- at the originating side, the VGW and the AGCF shall support the ability to collect digits sent by the user to the extent of its knowledge of the dialling plan in use. As a result, the completeness of the number may be unknown, and the VGW and AGCF may, dependent on operator policy, use overlap sending;
- Networks supporting overlap sending should provide a B2BUA function that has the ability to collect digits, before routeing to another network that does not support overlap sending, such that the address information is provided in a single message;
- at the terminating side, e.g. when connected to a legacy PBX, the VGW and the AGCF should support based on operator policy the ability to transfer digits to the user using overlap sending;
- at the terminating side, e.g. when connected to a legacy PBX, an AS may support the ability to transfer digits to the user dependent on operator policy, using overlap sending;
- In case of an incoming call (from another network), the I-CSCF or TrRF or O-MGCF, possibly in combination with HSS/DNS/ENUM, will forward the call only when a sufficient number of digits have been received:
    - for terminating cases to access the service profile assigned to a user. Only for cases additional digits not relevant for the IMS service profile lookup are received as overlap signalling, e.g. for DDI towards a PBX, based on network options this additional overlap signalling should be sent towards the terminating user;
    - for transit cases when the number received points towards another network to select and forward the call to an appropriate network egress point (e.g. IBCF or I-MGCF). the solution shall interoperate with IMS networks not supporting overlap signalling without requiring any changes in those networks.

NOTE 1: A terminating IMS network not supporting overlap signalling will perform a database lookup to assign a S-CSCF for an incoming call and will return a 404 error response to an INVITE with an incomplete number.

- in interconnection scenarios, as a network option, it shall be possible to support overlap signalling.

NOTE 2: In the PES network the service level provided to the user should not be dependent on using overlap or en-bloc sending.