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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Next Generation Networks – Service aspects: Interoperability of services and networks in NGN

Call server-based PSTN/ISDN emulation

ITU-T Recommendation Y.2271

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ITU-T Recommendation Y.2271

Call server-based PSTN/ISDN emulation

Summary

The NGN shall support PSTN/ISDN emulation. One mechanism for providing this functionality is the use of a Call Server-based architecture. This Recommendation identifies service and network capabilities for this call server-based solution.

Source

ITU-T Recommendation Y.2271 was approved on 13 September 2006 by ITU-T Study Group 13 (2005-2008) under the ITU-T Recommendation A.8 procedure.

Keywords

Call server, emulation, ISDN, PES, PSTN

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Call server-based PSTN/ISDN emulation

1 Scope

This Recommendation describes the service and network capability requirements for a call server-based (CS-based) PSTN/ISDN emulation component. It also provides a list of network elements used in conjunction with the CS-based PSTN/ISDN emulation component. Appendix II also provides a number of call control scenarios for CS-based PSTN/ISDN emulation component.

Administrations may require operators and service providers to take into account national regulatory and national policy requirements in implementing this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[E.360.1] ITU-T Recommendation E.360.1 (2002), *Framework for QoS routing and related traffic engineering methods for IP-, ATM-, and TDM-based multiservice networks.*

[E.360.2] ITU-T Recommendation E.360.2 (2002), *QoS routing and related traffic engineering methods – Call routing and connection routing methods.*

[E.600] ITU-T Recommendation E.600 (1993), *Terms and definitions of traffic engineering.*

[G.711] ITU-T Recommendation G.711 (1988), *Pulse code modulation (PCM) of voice frequencies.*

[G.723.1] ITU-T Recommendation G.723.1 (2006), *Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s.*

[G.729] ITU-T Recommendation G.729 (2007), *Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP).*

[H.248.1] ITU-T Recommendation H.248.1 v3 (2005), *Gateway control protocol: Version 3 (and its specific capabilities defined in H.248.x-series of Recommendations).*

[Q.826] ITU-T Recommendation Q.826 (2000), *Routing management model*.

[X.110] ITU-T Recommendation X.110 (2002), *International routing principles and routing plan for Public Data Networks.*

[X.805] ITU-T Recommendation X.805 (2003), *Security architecture for systems providing end-to-end communications.*

[Y.2031] ITU-T Recommendation Y.2031 (2006), *PSTN/ISDN emulation architecture.*

[Y.2261] ITU-T Recommendation Y.2261 (2006), *PSTN/ISDN evolution to NGN.*

[RFC 3261] IETF RFC 3261 (2002), *SIP: Session Initiation Protocol.*

[EN 301 703] ETSI European Standard, EN 301 703 V7.0.2 (1999), *Digital cellular telecommunications system (Phase 2+) (GSM); Adaptive Multi-Rate (AMR); Speech processing functions; General description.*

3 Definitions

This Recommendation defines the following terms:

NOTE – In this clause the [aaa] notation after the title of a term indicates source of the definition for that term.

3.1 access border gateway (ABG): A packet gateway between an access network and a core network.

3.2 access gateway (AG) [Y.2261]: A unit that allows end users with various accesses (e.g., PSTN, ISDN, V5.x) connection to the packet node of NGN.

NOTE – The AG may be embedded in an access node, which serves also other access interfaces (e.g., xDSL, LAN). Such access nodes are also known as multi-service access nodes (MSAN).

3.3 application server (AS): A unit that interacts with the call server and the user profile server to support service execution.

3.4 application server gateway (ASG): A unit that interworks between application server and call server.

NOTE – In IMS, ASG interworks between the application server and the core IMS.

3.5 call server (CS): The core element of a CS-based PSTN/ISDN emulation component, which is responsible for call control, media resource control, call routing, user profile and subscriber authentication, authorization and accounting. Depending on its role, the behaviour of the call server may be different. In these cases, the role of the call server is identified, for example, as "Access call server", "Breakout call server", "IMS call server", "Routing call server" or "Gateway call server".

3.6 media server (MS): A network element providing the media resource processing function for telecommunication services in NGN.

3.7 PSTN/ISDN emulation: Provides PSTN/ISDN service capabilities and interfaces using adaptation to an IP infrastructure.

NOTE – Not all service capabilities and interfaces have to be present to provide an emulation.

3.8 interconnection border gateway (IBG): A unit responsible for packet interworking between two service provider's core networks.

3.9 residential gateway (RG): A unit that interworks PSTN/ISDN user equipments to a packet network. A residential gateway is located at the customer premises.

3.10 signalling gateway (SG) [Y.2261]: A unit that provides out-of-band call control signalling conversion between the NGN and other networks (e.g., between a Call server in NGN and a STP or SSP in SS7).

3.11 trunking media gateway (TMG) [Y.2261]: A unit that provides interfaces between the packet nodes of the NGN and the circuit-switched nodes (e.g., transit exchange, local exchange, international exchange) of PSTN/ISDN for bearer traffic. The TMG provides any needed conversion to the bearer traffic.

4 Abbreviations

This Recommendation uses the following abbreviations:

ABG Access Border Gateway

ACS Access Call Server

AG Access Gateway

AGCF Access Gateway Control Function

AMG	Access Media Gateway
AS	Application Server
ASG	Application Server Gateway
ASR	Automatic Speech Recognition
BCS	Breakout Call Server
BICC	Bearer Independent Call Control
BRI	Basic Rate Interface
CAMEL	Customized Applications for Mobile Network Enhanced Logic
CCF	Call Control Function
CDR	Call Detail Record
CS	Call Server
CS-based	Call Server based
CSCS	Call Session Control Server
CS-PES	Call Server-based PSTN/ISDN Emulation Service component
DTMF	Dual Tone Multi Frequency
FE	Function Entity
GCS	Gateway Call Server
IBG	Interconnection Border Gateway
ICS	IMS Call Server
IMS	IP Multimedia Subsystem
IN	Intelligent Network
INAP	Intelligent Network Application Part
IPSec	IP Security
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IVR	Interactive Voice Response
MGCF	Media Gateway Control Function
MRCF	Media Resource Control Function
MRP	Media Resource Process
MS	Media Server
NACF	Network Attachment Control Function
NGN	Next Generation Network
PES	PSTN/ISDN Emulation Service component
PIEA	PSTN/ISDN Emulation Architecture
PLMN	Public Land Mobile Network
POTS	Plain Old Telephone Service
PRI	Primary Rate Interface

PSAP Public Safety Answering Point

PSTN Public Switched Telephone Network

QoS Quality of Service

RACF Resource and Admission Control Function

RCS Routing Call Server

RF Routing Function

RG Residential Gateway

SCP Service Control Point

SG Signalling Gateway

SIGTRAN Signalling Transport

SIP Session Initiation Protocol

SIP-I SIP with encapsulated ISUP

SPF Service Provider Function

SSF Service Switching Function

TDR Telecommunications for Disaster Relief

TMG Trunking Media Gateway

UMTS Universal Mobile Telecommunications System

UPS User Profile Server

WIN Wireless Intelligent Network

5 Conventions

None.

6 PSTN/ISDN emulation in NGN

PSTN/ISDN emulation, as one of the service components of NGN, provides PSTN/ISDN basic and supplementary services, and co-exists with the IP Multimedia component, the streaming component, and other components. It interworks with the existing networks and other components of NGN.

PSTN/ISDN emulation satisfies the following basic requirements:

- In terms of service provisioning, it inherits PSTN/ISDN basic and supplementary services, and provides IN services.
- In terms of user-network connection, it supports existing PSTN/ISDN UNI interfaces.

Therefore, PSTN/ISDN end users may use existing services and existing terminals under the PSTN/ISDN emulation environment, without the knowledge of network being replaced by NGN.

The term "call server-based" indicates that service control logic and service execution environment is primarily located in a call/session control server (CSCS; briefly call server (CS)). The CS is therefore the responsible network entity for service delivery (often also called as "anchor point of services"). This function relates to the service switching function (SSF) in PSTN/ISDN.

Completely opposite to the CS-based service control concept is the IMS-based approach, because the application server (AS) houses the service control logic and service execution environment behind CSCS entities.

7 Service and network capabilities

7.1 Service capabilities

The CS-based PSTN/ISDN emulation component should support:

- PSTN/ISDN teleservices and supplementary services as per I.240 and I.250 series of ITU-T Recommendations.
- Capabilities provided by the application server (AS).
- Capabilities provided by traditional IN.
- Public interest services.

7.2 Network capabilities

7.2.1 Numbering, naming and addressing

The users of the PSTN/ISDN emulation component will be allocated numbers in the appropriate E.164 spaces. The nature of this E.164 number varies from service provider to service provider and from country to country. The use of both geographical and non-geographical E.164 numbers shall be permitted.

There is no requirement to support the use of non-E.164 numbers within the PSTN/ISDN emulation, but the use of non-E.164 numbers is not precluded.

7.2.2 Call routing

A CS-based PSTN/ISDN emulation system is required to provide the ability to use different routing mechanisms. The CS can choose a route based on dialled number, calling party features and traffic routing policy (see e.g., call routing as defined by [Q.826], [E.360.1], [E.360.2], [E.600] or [X.110]).

7.2.3 Accounting, charging and billing

Billing and charging functions are supported in the CS-based PSTN/ISDN emulation in order to provide accounting data to the service provider regarding the utilization of resources in the network. These functions support the collection of data for later processing as well as near real-time interactions with applications such as prepaid card services. A CS should have the capability of terminating a session/call in real-time.

7.2.4 User profile management

A user profile is a set of attributes related to the user. These attributes include, but are not limited to:

- Authentication, authorization.
- Service subscription.
- Charging, accounting.
- User registration status (registered, not registered).

7.2.5 Access network types

A CS-based PSTN/ISDN emulation component supports access networks of diverse technologies and capabilities. PSTN/ISDN emulation services should be available to all authorized users requesting those services regardless of the type of access network technology.

The following non-exhaustive list of telephony access types should be supported for the CS-based PSTN/ISDN emulation component:

- POTS (analogue lines, e.g., Z interface) access.
- ISDN BRI or PRI access.
- V5.x or ANSI equivalent access.

7.2.6 Capability of supporting various user equipments

User equipments are connected via the customer network to the access network and provide services to the end users. A variety of user equipments should be supported. These include AG with connected legacy user equipment that provides the capability of supporting PSTN/ISDN emulation services.

7.2.7 Identification, authentication and authorization

A CS-based PSTN/ISDN emulation component shall provide authentication and authorization of the devices connected to an NGN. Authentication requires devices connected to an NGN to be identified by the service provider and network provider in order to obtain access to the network or service.

7.2.8 Media resource management

7.2.8.1 Overview

Media resources support mechanisms are traditionally used in conjunction with the traditional voice processing services and user interactions via voice and dual-tone multi-frequency (DTMF). A CS-based PSTN/ISDN emulation component provides the capability of handling various media resource types in order to enable applications that include but are not limited to:

- Recorded and composed announcements.
- Interactive voice response (IVR).
- Audio recording.
- Voice mail.
- Automatic speech recognition (ASR).
- Text-to-speech, speech-to-text.
- Audio conference bridge.

7.2.8.2 Audio codecs

As the NGN should be able to interwork with different networks (e.g., PSTN/ISDN, UMTS, IP network), the following should be considered:

- Support for different types of voice codecs (e.g., [G.711], AMR [EN 301 703], [G.729] and [G.723.1]).
- Support for negotiation among NGN entities (e.g., terminal and network elements).
- If necessary, audio transcoding shall be performed to ensure end-to-end service interoperability. It is preferable to avoid transcoding wherever possible.

7.2.9 Quality of service (QoS)

A CS-based PSTN/ISDN emulation component should provide guaranteed QoS for a session through resource and admission control, including general coordination between access and core networks as well as inter-core-network aspects. End-to-end QoS required by applications running on the network should be clearly described. To that purpose, required conditions for each network performance parameter, such as throughput, delay, jitter, loss, and so on, have to be described.

7.2.10 Security

The security requirements are based on the application of [X.805] for NGN and thus address the following dimensions of NGN security:

- Authentication.
- Non-repudiation.
- Data confidentiality.
- Communication security.
- Data integrity.
- Availability.
- Privacy.

7.2.11 Open service environment

In the call server-based emulation environment, as new services can be provided in the application layer, demands for new services will greatly increase. This may require:

- Development of more intelligent networks capable of supporting basic and supplementary services.
- Ease of provisioning, portability and reuse of services by network service provider.
- Application programming interfaces (APIs) may be applicable to services and applications as a part of a service creation environment.
- A call server-based emulation component should be able to provide the user status, such as availability, to other users.

7.2.12 Emergency telecommunications

It is desirable that CS-PES provides:

- The capability of supporting priority mechanisms for emergency telecommunications in multimedia services (e.g., voice, data, and video). Emergency telecommunications include:
  - individual-to-individual telecommunications;
  - individual-to-authority telecommunications, i.e., calls to emergency service providers;
  - authority-to-authority telecommunications. Telecommunications for disaster relief (TDR); and
  - authority-to-individual telecommunications;
- support for calls to emergency service providers which may be free of charge for the calling user. Such calls should include information on how to enable emergency services to call back the calling user and, at least, the accurate location information about the calling user at the time of call initiation, e.g., to be provided to the emergency response centres, routing of the call to the public safety answering point (PSAP), regardless of whether the user is fixed, mobile or nomadic. Accurate location may be such information as postal address, geographic coordinates or other information like cell indicators. Both network and user location information shall be provided, if available;
- the capability of ensuring that calling line identification presentation (or the equivalent information in IMS) is not ruled out on a per call, per line or per identity basis for calls to the emergency call number;
- network integrity, as far as possible, in order to support critical telecommunications such as TDR support in a crisis situation.

7.2.13 Interworking

7.2.13.1 Interworking with PSTN/ISDN

The PSTN/ISDN emulation component shall provide interfaces to PSTN/ISDN.

The PSTN/ISDN emulation components shall support service transparency between PSTNs/ISDNs. The CS-based PSTN/ISDN emulation service component should support user plane and the control plane interworking.

7.2.13.2 Interworking with other PSTN/ISDN emulation

The PSTN/ISDN emulation component shall provide a high level of interoperability with the services in other emulated PSTN/ISDN networks.

7.2.13.3 Interworking with PLMN

The PSTN/ISDN emulation component shall provide interfaces to interwork with PLMNs.

7.2.13.4 Interworking with IMS

The PSTN/ISDN emulation component shall support the interworking with 3GPP IMS-based PSTN/ISDN-like services. The scope of this interworking may result in a limited service capability.

8 Relevant network elements

The functional architecture of CS-based PSTN/ISDN emulation is described in [Y.2031]. This clause provides a number of network elements used in conjunction with the CS-based PSTN/ISDN emulation component.

8.1 Application server

The application server (AS) is a unit that interacts with the call server and the user profile server to support service execution. Examples of application servers are conference servers and messaging servers (e.g., server for fixed SMS, server for fixed MMS).

8.2 Application server gateway

The application server gateway is a unit that interworks between application server and call server. This relates to entity APL-GW-FE in [Y.2031]. It may provide an open interface (e.g., for third-party application service providers).

8.3 User profile server

The user profile server (UPS) is responsible for storing of user profile and user subscription data.

8.4 Call server

Depending on the network configuration, a call server may support different capabilities and may be deployed as one of:

- Access call server.
- Breakout call server.
- IMS call server.
- Gateway call server.
- Routing call server.

8.4.1 Access call server (ACS)

The ACS serves for PSTN/ISDN emulation access subscribers.

The capabilities supported by the ACS are:

- Access gateway control, which includes registration, authentication, event detection, resource allocation of access gateway (AG).
- Call control: the ACS maintains call states as needed for support of the related service, and forwards the requested messages or responses to the access gateway, other call server or application server (AS).
- Routing schemes within domain that ACS belongs to.
- Service capabilities including basic voice services, supplementary services and other services controlled by itself or by interacting with application platforms.
- Media resource control, which control media servers (MS), to provide related resources that are needed for services (e.g., announcements).
- Protocol adaptation (e.g., mapping [H.248.1] protocol elements to or from SIP [RFC 3261] messages).
- Service switching function (SSF) in order to access to intelligent network (IN) service logic programs hosted in service control point (SCP).
- User profile management capabilities if hosted in ACS.
- Interaction with access border gateway (ABG). The access border gateway acts as a signalling proxy between access gateway and ACS, in such an instance, ACS sends and receives messages to or from access gateway by access border gateway.
- Interaction with user profile server if user profile is hosted outside the ACS.
- Interaction with application server directly or through application service gateway for the support of services.
- Interaction with the resource and admission control system.
- Generation of CDRs.

8.4.2 Breakout call server (BCS)

The BCS controls the trunking media gateway to interwork with PSTN/ISDN.

The capabilities supported by the BCS are:

- Media gateway control, which controls trunking media gateway to interwork with PSTN/ISDN, and to exchange SS7 signalling information with the signalling gateway (SG).
- Call control: the BCS maintains call states as needed for support of the related service.
- Routing schemes within the domain that BCS belongs to.
- Interworking capability between SIP/BICC and non-call related SS7 signalling (e.g., TCAP-based signalling).
- Generation of CDRs.

8.4.3 IMS call server (ICS)

ICS controls the interconnection border gateway to interwork with packet-based networks (e.g., other NGN, other IP multimedia network and Internet).

The capabilities supported by the ICS are:

- Call control.

  NOTE – Whether the ICS needs to maintain call states is for further study.
- Protocol adaptation.

- Routing schemes within the domain that the ICS belongs to.
- Capabilities, which control interconnection border gateway to interwork with packet-based network (e.g., media codec conversion (e.g., transcoding), topology hiding, resource reservation, etc.).
- Interaction with the resource and admission control function (RACF). When the ICS provides interconnection border gateway control capabilities, it can control interconnection border gateway directly or through RACF.
- Network information hiding capabilities to restrict the flow of selected information from one service provider to another.
- Security mechanisms, especially interworking with Internet.
- Generation of call detail records (CDRs).

8.4.4 Gateway call server (GCS)

The Gateway Call Server provides interoperability function among CS-PESs in order to provide end-to-end services.

The capabilities supported by the GCS are:

- Call control.

  NOTE – Whether the GCS needs to maintain call states is for further study.
- Protocol adaptation (e.g., mapping SIP messages to BICC messages and vice versa).
- Routing schemes within the domain that GCS belongs to.
- Capabilities which control interconnection border gateway to interwork with other service providers' CS-PES networks (e.g., media codec conversion, topology hiding, resource reservation, etc.).
- Interaction with the resource and admission control functions (RACF). When the GCS provides packet gateway control capabilities, it can control packet gateway directly or through RACF.
- Network information hiding capabilities to restrict the flow of selected information from one service provider to another.
- Security mechanisms (e.g., IPSec tunnel).
- Generation of call detail records (CDRs).

8.4.5 Routing call server (RCS)

The Routing Call Server provides a routing function between call servers.

The capabilities supported by the RCS are:

- Call control.

  NOTE – Whether the RCS needs to maintain call states is for further study.
- Routing schemes in order to determine the next hop of the call server.
- Service switching function (SSF) in order to access intelligent network service logic programs hosted in legacy service control points.
- Interaction with the application server directly or through the application service gateway for supporting services.
- Media resource control (see MRCF in [Y.2031]), which controls the media server (MS, see MRP-FE in [Y.2031]) to provide related resources needed for services (e.g., announcements).
- Generation of call detail records (CDRs).

8.5 Gateways

A gateway is a unit that interconnects different networks and performs the necessary translation between the protocols used in these networks.

8.5.1 Access gateway (AG)

The AG may be located at the service provider's premises, or the customer premises.

The capabilities supported by the AG are:

- Support of codec algorithms (e.g., [G.711]).
- Detection of the events from the user, and reporting these events to the ACS.
- Downloading of the digital map information from the ACS.
- Possible facsimile support (some gateways may not support this capability).
- When the AG is located in the customer premises, it may communicate with the ACS through the ABG, mainly for security.
- Silence detection.
- Echo cancellation.

8.5.2 Trunking media gateway (TMG)

The capabilities supported by the TMG are:

- Voice, voiceband data and optionally facsimile.
- Silence detection.
- Echo cancellation.

8.5.3 Signalling gateway (SG)

SG should be able to map signalling messages received from the call server to the PSTN/ISDN and vice versa.

8.5.4 Access border gateway (ABG)

The access border gateway (see ABG-FE in [Y.2031]) performs both border policy enforcement functions and NA(P)T functionality under the control of the call server, amongst others.

8.5.5 Interconnection border gateway (IBG)

IBG (see IBG-FE in [Y.2031]) enables masking of one domain from another. It should support inter-domain media conversion (e.g., IPv4/IPv6 conversion) amongst others.

8.6 Media server (MS)

The capabilities supported by the MS include but are not limited to:

- Media stream resources storage and management function.
- Media stream processing (e.g., audio transcoding, media analysis).
- Mixing of the incoming media streams (e.g., for multiple parties).
- Interaction with the call server to allow call server control of media stream resources provided by the MS.

Appendix I

Mapping functional entities to network elements

Table I.1 shows an example of mapping functional entities to a network element.

Table I.1/Y.2271 – Mapping CS-based PIEA functional entity into network elements

Network element	Required functional entities	Optional functional entities
Application server	AS-FE	APL-GW-FE
Application service gateway	APL-GW-FE	
User profile server	SUP-FE	
ACS	AGCF, CCF, SPF, MRCF, SIF	SSF, SUP-FE, RF
BCS	MGCF, CCF	RF
ICS	CCF, SIF	RF, IBC-FE
GCS	CCF, SIF	RF, IBC-FE
RCS	RF, CCF	SSF, MRCF
Access media gateway	AMG-FE	MRP-FE
Trunking media gateway	TMG-FE	MRP-FE
Signalling gateway	SG-FE	
Access border gateway	ABG-FE	
Interconnection border gateway	IBG-FE	
Media server	MRP-FE	
NOTE 1 – There is no intention that the table should disallow any other combination of functional entities that would result in a NE not shown in the table. Figure I.1 provides a high level presentation of how call servers and other network elements are deployed in an NGN, and the relationship between different call servers and networks. NOTE 2 – All functional entities identified in this appendix are described either in [Y.2012], [Y.2031] or in related Recommendations.		

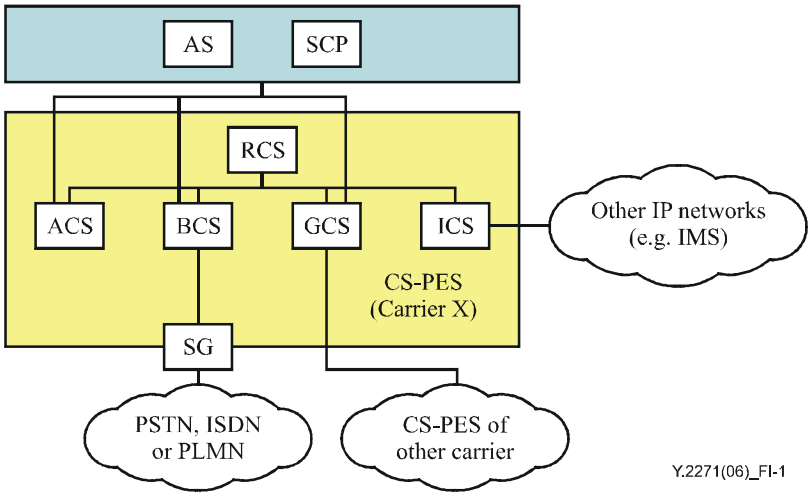


Figure I.1/Y.2271 – Call server deployment example

Appendix II

Basic call control scenario in call server-based PES

This appendix provides a number of scenarios for basic call control for CS-PES. The term intra CS-PES indicates when there is one or more ACSs belonging to one domain (e.g., belonging to one operator). Inter CS-PES indicates presence of gateway call server between two different domains (e.g., belonging to different operators).

II.1 Intra CS-PES call

II.1.1 Scenario 1, single ACS and no ABG

Call between two CS-PES users belonging to the same ACS. AG_A and AG_B are connected to ACS. AG_A and AG_B may be the same.

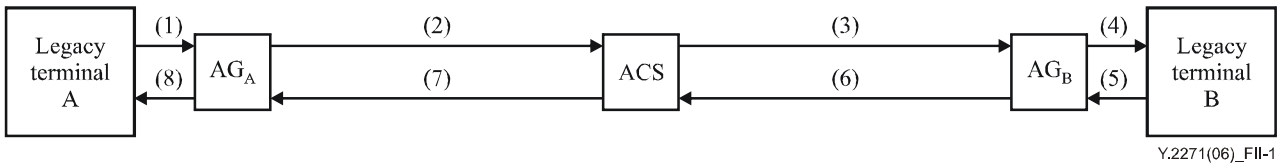


Figure II.1/Y.2271 – Intra CS-PES call scenario 1

(1) A call attempt is originated from the legacy terminal A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ACS.

(3) The ACS performs the call-related functions (e.g., service provisioning, charging, etc.) and requests the appropriate AG (i.e., AG_B) to allocate resources and setup the connection.

(4) AG_B sends an alerting indication to the legacy terminal B.

(5) - (8) The call is answered and the response from legacy terminal B to legacy terminal A traces the path across all the network elements involved in the call to establish the connection.

II.1.2 Scenario 2, single ACS and two ABGs

Call between two CS-PES users belonging to the same ACS. AG_A and AG_B are connected to ACS through ABG_A and ABG_B respectively. AG_A and AG_B may be the same, so are ABG_A and ABG_B.

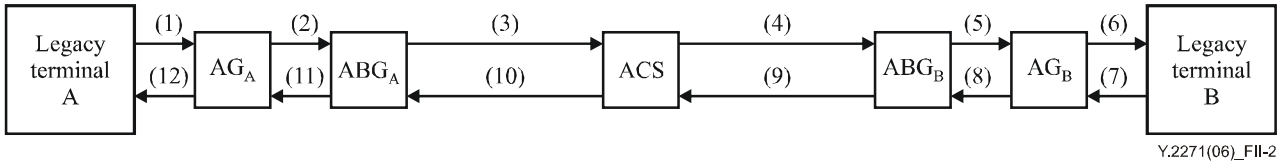


Figure II.2/Y.2271 – Intra CS-PES call scenario 2

(1) A call attempt is originated from the legacy terminal A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ABG_A.

(3) ABG_A transfers the notification to the ACS.

(4) ACS performs the call-related functions (e.g., service provisioning, charging, etc.) and requests the appropriate AG (i.e., AG_B) through ABG_B to allocate resources and setup the connection.

(5) ABG_B transfers the notification to AG_B.

(6) AG_B sends an alerting indication to the legacy terminal B.

(7) - (12) The call is answered and the response from legacy terminal B to legacy terminal A traces the path across all the network elements involved in the call to establish the connection.

II.1.3 Scenario 3, single ACS and a single ABG

Call between two CS-PES users belonging to the same ACS. AG_A is connected to ACS and AG_B is connected to ACS through ABG.

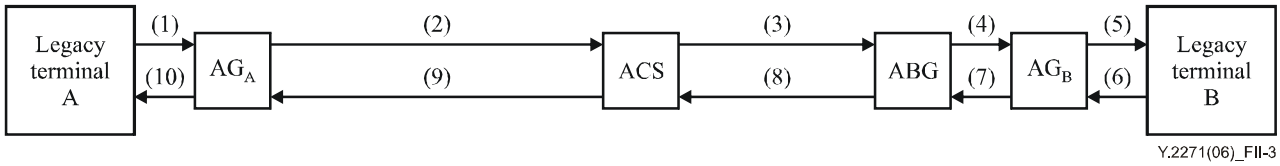


Figure II.3/Y.2271 – Intra CS-PES call scenario 3

(1) A call attempt is originated from the legacy terminal A.

(2) AG_A detects the relevant events and sends notifications to ACS.

(3) ACS performs the call-related functions (e.g., service provisioning, charging) and requests the AG_B through ABG to allocate resources and setup the connection.

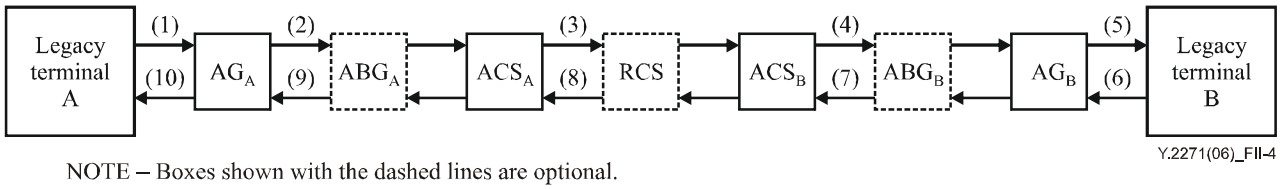
(4) ABG transfers the notification to AG_B.

(5) AG_B sends an alerting indication to the legacy terminal B.

(6) - (10) The call is answered and the response from the legacy terminal B to legacy terminal A traces the path across all the network elements involved in the call. Then connection for the call between the legacy terminals A and B is established.

II.1.4 Scenario 4, multiple ACSs

Call between two CS-PES users belonging to different ACSs.



NOTE – Boxes shown with the dashed lines are optional.

Figure II.4/Y.2271 – Intra CS-PES call scenario 4

(1) A call attempt is originated from the legacy terminal A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ABG_A if present. Otherwise, AG_A sends notifications to ACS_A.

(3) ACS_A performs the call-related functions (e.g., service provisioning and charging) and routes the call to ACS_B. If ACS_A cannot locate ACS_B, a relevant RCS(s) is used to route and forward the call.

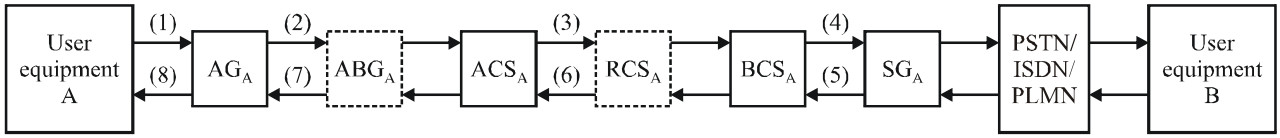
(4) ACS_B performs the call-related functions and requests AG_B, through ABG_B, if present, to allocate resources and setup the connection.

(5) AG_B sends an alerting indication to the legacy terminal B.

(6) - (10) The call is answered and the response from the legacy terminal B to legacy terminal A traces the path across all the network elements involved in the call. Then connection for the call between the legacy terminals A and B is established.

II.2 Scenario 5: Call between CS-PES user and PSTN, ISDN or PLMN

Call between CS-PES user and PSTN, ISDN or PLMN user. User equipment A is a legacy terminal and User equipment B may be a legacy terminal or a wireless terminal.



NOTE – Boxes shown with the dashed lines are optional.

Figure II.5/Y.2271 – Call scenario involving interworking with PSTN/ISDN/PLMN

(1) A call attempt is originated from the user equipment A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ABG_A, if present. Otherwise, AG_A sends notifications to ACS_A.

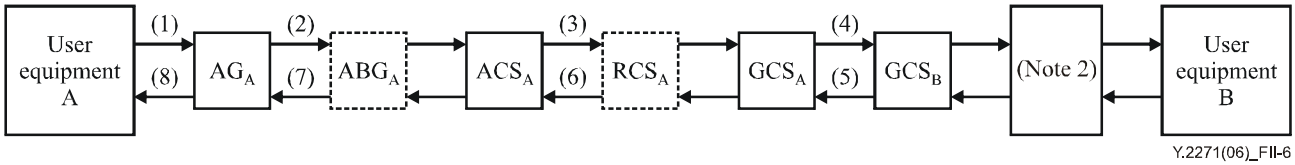
(3) The ACS_A performs the call-related functions (e.g., service provisioning, charging, etc.), and routes the call to BCS_A. If ACS_A cannot locate BCS_A, relevant RCS_A is used to route and forward the call.

(4) The BCS_A routes the call to PSTN/ISDN/PLMN domain via SG_A, which adapts the IP-based signals to the circuit-based ones. PSTN/ISDN/PLMN entities take over the call, find out the called terminal and send an alerting indication to user equipment B.

(5) - (8) The call is answered and the response from user equipment B to user equipment A traces the path across all the network elements involved in the call. Then connection for the call between the user equipments A and B is established.

II.3 Scenario 6: Inter CS-PES call

Call between CS-PES user and other service provider's CS-PES user. User equipments A and B are legacy terminals and connect to CS-PES networks that belong to different service providers.



NOTE 1 – GCS_B (other service provider) signifies the combination of GCS_A. Boxes shown with the dashed lines are optional.
NOTE 2 – This box is indicative of the sequence of AG_B, ABG_B (optional), ACS_B and RCS_B (optional) and is shown this way due to lack of space.

Figure II.6/Y.2271 – Call scenario involving interconnection with PES of other service providers

(1) A call attempt is originated from the user equipment A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ABG_A, if present. Otherwise, AG_A sends notifications to ACS_A.

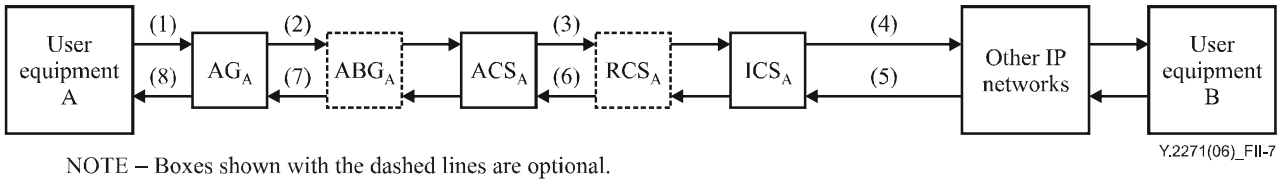
(3) The ACS_A performs the call-related functions (e.g., service provisioning, charging, etc.), and routes the call to GCS_A. If ACS_A cannot locate GCS_A, relevant RCS_A is used to route and forward the call.

(4) GCS_A performs the call-related functions and routes the call to GCS_B. The call is processed in the CS-PES domain B.

(5) - (8) The call is answered and the response from user equipment B to user equipment A traces the path across all the network elements involved in the call. Then connection for the call between the user equipments A and B is established.

II.4 Scenario 7: Call between CS-PES user and user of other IP networks

Call between CS-PES user and other IP network user. User equipment A is a legacy terminal and B may be an NGN end system.



NOTE – Boxes shown with the dashed lines are optional.

Figure II.7/Y.2271 – Call scenario involving interworking with other IP networks

(1) A call attempt is originated from the user equipment A.

(2) AG_A detects the relevant events, allocates resources and sends notifications to ABG_A, if present. Otherwise, AG_A sends notifications to ACS_A.

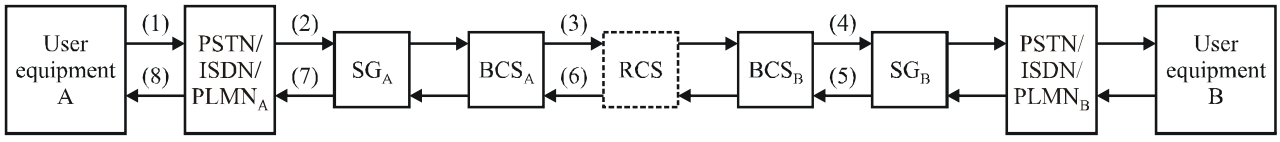
(3) The ACS_A performs the call-related functions (e.g., service provisioning, charging, etc.), and routes the call to ICS_A. If ACS_A cannot locate ICS_A, relevant RCS_A is used to route and forward the call.

(4) ICS_A performs the call-related and interworking functions between the CS-PES domain and another IP network, and routes the call to the other IP network.

(5) - (8) The call is answered and the response from the user equipment B to A traces the path across all the network elements involved in the call. Then connection for the call between the user equipments A and B is established.

II.5 Scenario 8: Call between two PSTN/ISDN/PLMN users via CS-PES

Call between two PSTN/ISDN/PLMN users via CS-PES. The CS-PES provides a call transit function between two PSTN/ISDN/PLMN domains in the scenario. The user equipments A and B may be legacy terminals or wireless terminals. Two PSTN/ISDN/PLMN domains may belong to the same service provider.



NOTE – Boxes shown with the dashed lines are optional.

Figure II.8/Y.2271 – Call scenario between two PSTN/ISDN/PLMN users via CS-PES

(1) A call attempt is originated from the user equipment A.

(2) The $PSTN/ISDN/PLMN_A$ routes the call to BCS_A via SG_A, which adapts the IP-based signals to the circuit-based ones.

(3) The BCS_A controls the appropriate transit gateway to allocate media resources and routes the call to the BCS_B. If BCS_A cannot locate BCS_B, relevant RCS(s) is used to route and forward the call.

(4) The BCS_B controls the appropriate transit gateway to allocate media resources and routes the call to PSTN/ISDN/$PLMN_B$ via SG_B. PSTN/ISDN/$PLMN_B$ entities take over the call, find out the called terminal and send an alerting indication to User equipment B.

(5) - (8) The call is answered and the response from the user equipment B to A traces the path across all the network elements involved in the call. Then connection for the call between the user equipments A and B is established.

Appendix III

Reference points and protocols

Table III.1 provides examples of protocols at the identified reference points of CS-based emulation architecture as described in [Y.2031].

Table III.1/Y.2271 – Candidate protocols for reference points

Reference point	Reference point located between	Candidate protocols
I1	AMG-FE and AGCF	H.248 SIGTRAN user adaptations like IUA or V5UA
I2	AMG-FE and ABG-FE	H.248, RTCP and RTP with UDP/IP transport
I3	AGCF and ABG-FE	H.248
I4	MRCF and MRP-FE	H.248, SIP
I5	CCF and RACF	TBD
I6	MGCF and TMG-FE	H.248
I7	MGCF and SG-FE	SIGTRAN
I8	IBC-FE and IBG-FE	H.248
I9	SIF and APL-GW-FE/AS-FE	SIP, SIP-I
I10	SSF and APL-GW-FE/AS-FE	INAP, CAMEL, WIN
I11	CCF and SUP-FE	DIAMETER, MAP
I12	AS-FE and SUP-FE	DIAMETER, MAP
I13	SG-FE and PSTN/ISDN	ISUP, TUP
I14	IBC-FE and other PES	SIP, SIP-I, BICC
I15	IBC-FE and other Multimedia Systems (e.g., IMS)	SIP H.323
I16	AGCF and NACF	

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