



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.246

Annex E1
(11/2000)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication
procedures

Interworking of H-Series multimedia terminals with
H-Series multimedia terminals and voice/voiceband
terminals on GSTN and ISDN

**Annex E1: Mobile Application Part and H.225.0
interworking**

ITU-T Recommendation H.246 – Annex E1

ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
SYSTEMS AND TERMINAL EQUIPMENT FOR AUDIOVISUAL SERVICES	H.300–H.399
SUPPLEMENTARY SERVICES FOR MULTIMEDIA	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation H.246

Interworking of H-Series multimedia terminals with H-Series multimedia terminals and voice/voiceband terminals on GSTN and ISDN

Annex E1

Mobile Application Part and H.225.0 interworking

Summary

The purpose of this annex is to introduce the mechanisms to enable current Mobile Subscribers to access mobile networks using an H.323 terminal and obtain the same Mobile Services they get from a Public Land Mobile Network (PLMN) Mobile Terminal.

- PLMN mobile subscribers without an H323_UIM Terminal cannot use regular H.323 terminals to access and use the services provided by PLMN mobile networks with the same mobile phone number. Such services include Call Delivery with Caller Identification, Call Origination, Call Termination, Message Waiting Notification, Short Message Services, etc.
- The solution is to define an Interworking function (IWF) between the H.323 network and PLMN networks (such as ANSI-41, GSM and PDC networks), defining the extension of H.323 terminal protocols and procedures to allow the support of **User Identification Module (UIM) or User Identification Information** for various PLMN mobile networks.
- This annex does not require any changes in the Public Land Mobile Networks.

H.246 Annex E2 describes the interworking between ANSI-41 Mobile Application Part (MAP of North American Signalling System No.7) and H.225.0 Multimedia Call Control protocol. It specifies the necessary mapping an interworking function would utilise to achieve connectivity and functionality between an H.323 network and Public Land Mobile Network.

H.246 Annexes E3 and E4 cover the interworking functions between GSM Mobile Application Part (MAP of ITU-T Signalling System), PDC Mobile Application Part (MAP of Japan Signalling System No. 7) and H.225.0 Multimedia Call Control protocol. The interworking function specifications between GSM, PDC and H.323 networks are for further study.

This annex requires H.323 and H.225.0 versions 4 or later. Version 4 products can be identified by H.225.0 messages containing a **protocolIdentifier** = {itu-t (0) recommendation (0) h (8) 2250 version (0) 4}.

Source

Annex E1 to ITU-T Recommendation H.246 was prepared by ITU-T Study Group 16 (2001-2004) and approved under the WTS Resolution 1 procedure on 17 November 2000.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

© ITU 2002

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

CONTENTS

Page

Annex E1 – Mobile Application Part and H.225.0 interworking	1
E1.1 Scope	1
E1.2 Definitions	3
E1.3 Normative references.....	3
E1.4 Abbreviations	4
E1.5 H.323 and PLMN Interworking Network Architecture.....	5
E1.5.1 New functions of H.323 & PLMN interworking Network Architecture.....	6
E1.5.2 H323_UIM Terminal contains a User Identification Module	6
E1.5.3 AnnexE_GK with PLMN Interworking Function (IWF).....	6
E1.6 Mapping of ANSI-41 PLMN MAP messages to H.323 messages.....	7
E1.6.1 Mapping of GSM/PDC PLMN MAP messages to H.323 messages.....	8
E1.7 AnnexE_GK and H323_UIM Terminal messages	8
E1.7.1 Additions of Mobility parameters and procedure to H.225 RAS messages...	8
E1.7.2 Security aspects of Mobile User Identity Module (UIM).....	8
E1.8 Message syntax of Mobile parameters in H.225.0 messages to support H.323 mobility.....	8
Appendix E1.I.....	9
E1.I.1 USIM Overview (Informational).....	9
E1.I.2 USIM description (Informational).....	9
E1.I.3 USIM contents (Informational)	9

ITU-T Recommendation H.246

Interworking of H-Series multimedia terminals with H-Series multimedia terminals and voice/voiceband terminals on GSTN and ISDN

Annex E1

Mobile Application Part and H.225.0 interworking

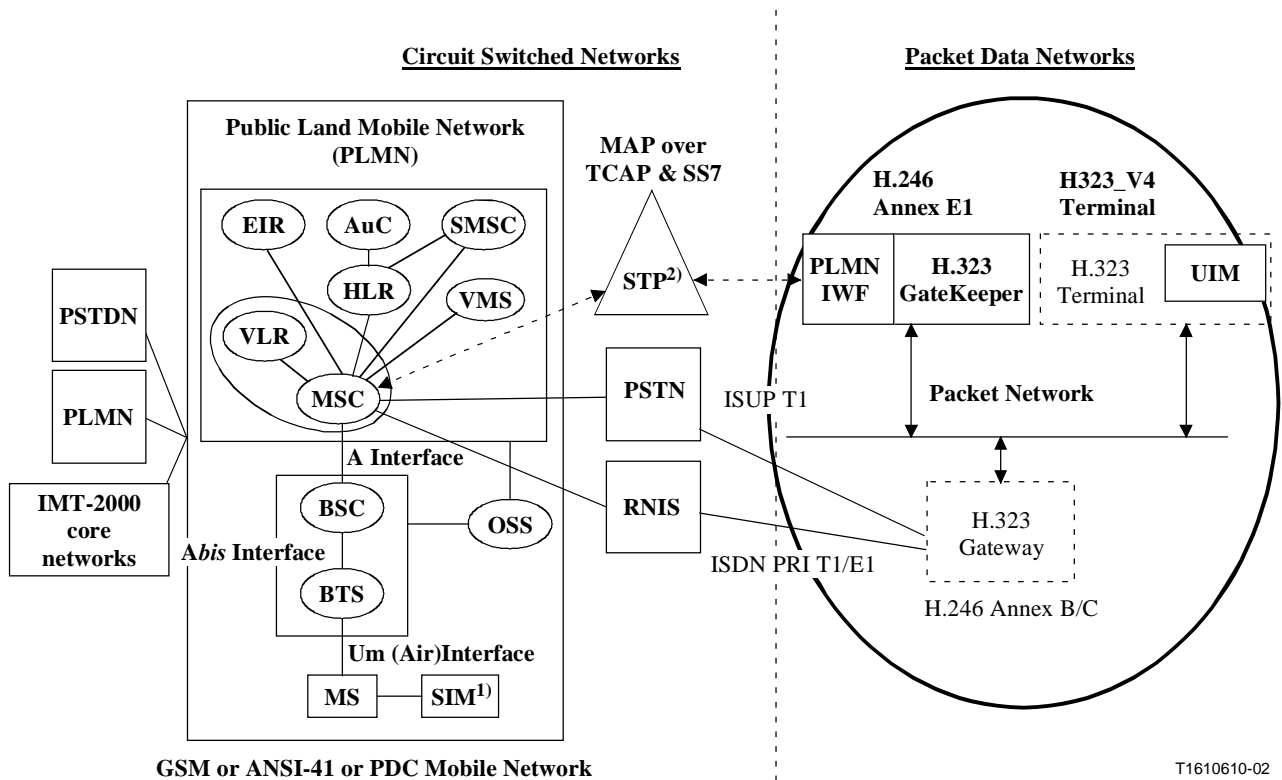
E1.1 Scope

This annex specifies the Interworking Function (IWF) between 2nd Generation PLMNs and H.323 networks. The IWF includes the mapping of PLMN Mobile Application Part (MAP) with H.323 messages, some new messages, parameters and procedures within the H.323 network. This proposal does not require any changes in the Mobile Networks.

This annex also specifies how the mobile User Identification Module (UIM) or User Identification Information may be used in an H.323 terminal. UIM support enables H.323 terminals to appear as PLMN terminals on the H.323 network. The PLMN Interworking Function (IWF) between H.323 and PLMN networks allows the user to pursue functions such as sending and receiving voice calls, voice mail notification, sending short messages and receiving short messages. The scope is limited to:

- G.711 IMT/ISDN_PRI/CAS trunks between PLMN and H.323 networks. End-to-End mobile phone Codecs use (i.e., GSM, EIA/TIA-136-Rev.A, etc) is for further study.
- operation where the H.323 terminal has either UIM or User Identification Information. If the H.323 terminal does not have UIM or User Identification Information, the following principles will apply:
 - The H.323 terminal without UIM is a regular H.323 terminal. Calls from a regular H.323 terminal to phone numbers on PLMN or PSTN through an associated H.323 Gateway will be regarded as regular H.323 calls in the packet data network.
 - Calls from PLMN cannot be delivered to a regular H.323 terminal unless an association of mobile phone number with the regular H.323 terminal exists.

Figure E1.1 shows H.246 Annex E1 Network Architecture with Interworking Function & H323_UIM Terminal needed to provide seamless services between H.323 and PLMN networks.



T1610610-02

¹⁾ SIM for GSM networks only

²⁾ Routing via STP is optional

Figure E1.1/H.246 – H.246 Annex E1 Network Architecture Diagram

To provide seamless operations between H.323 and PLMN networks, this annex proposes the Interworking function (IWF) gateway and H.323 extensions to access Mobile Network services using H.323 terminal via wired or wireless connection to IP Networks with H.235 Security.

An important aspect of current and future Mobile Networks is *Mobility Management and Communications Management*.

Mobility Management enables the mobile network to maintain the location and mobile subscriber status in order to provide mobile telecommunication to the end user.

Communication Management enables the mobile network to provide call control, supplementary services, short message services and data services. GSM, ANSI-41, and PDC provide seamless network capabilities between network equipment manufactured by different manufacturers. Without the GSM, ANSI-41, PDC, PHS, GPRS and IMT-2000 standardization, it will be difficult for a cellular/PCS/3rd Generation Wireless service provider to provide mobility between systems. GSM, ANSI-41 and PDC cover standard interface and procedures to achieve:

- 1) Call origination, Call termination, Supplementary Services, Short Message Services and data services anywhere in the wireless network;
- 2) Subscription transparency across networks;
- 3) Ease of use;
- 4) Secure service access:
 - Fraud prevention;
 - Authentication and privacy;
- 5) Billing capability, operation administration and management capability.

The H.246 annexes which deal with the interworking functions between different Public Land Mobile Networks (PLMNs) and H.323 networks are the following:

- 1) H.246 Annex E1: In force
 - General section on the interworking function between PLMN and H.323 networks. Also covers User Mobility Service using User Identification common to PLMN and H.323 networks using PLMN Subscriber Identification Module.
- 2) H.246 Annex E2: In force
 - AnnexE2_GK: Specifications for interworking function between ANSI-41 Mobile Application Part (MAP) and H.225.0
 - H323_UIM: Specifications for ANSI-41 PLMN User Identification Module capability in an H.323 terminal
- 3) H.246 Annex E3: For further study
 - AnnexE3_GK: Specifications for interworking function between GSM Mobile Application Part (MAP) and H.225.0
 - H323_UIM: Specifications for GSM PLMN Subscriber Identification Module capability in an H.323 terminal
- 4) H.246 Annex E4: For further study
 - AnnexE4_GK: Specifications for interworking function between PDC Mobile Application Part (MAP) and H.225.0
 - H323_UIM: Specifications for PDC PLMN User Identification Module capability in an H.323 terminal

E1.2 Definitions

This annex defines the following terms:

E1.2.1 H323_UIM: An H.323 terminal with User Identification Module or User Identification Information of a current Public Land Mobile Network.

E1.2.2 AnnexE_GK: An H.323 gatekeeper with PLMN interworking function.

E1.3 Normative 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; all 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.

All the normative references of ITU-T Rec. H.323 version 3 (1999), ITU-T Rec. H.225.0 version 2 (1998) and ITU-T Rec. H.245 apply:

- ITU-T Recommendation H.225.0, version 2 (1998), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems.*
- ITU-T Recommendation H.235 (1998), *Security and encryption for H-Series (H.323 and other H.245-based) multimedia terminals.*
- ITU-T Recommendation H.323, version 2 (1998), *Packet-based multimedia communications systems.*
- ITU-T Recommendation H.323, Annex K (2000), *HTTP-based service control transport channel.*

- ITU-T Recommendation X.680 (1997), *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*
- ITU-T Recommendation X.691 (1997), *Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER).*
- ANSI/TIA/EIA-41-D-97, *Cellular Radiotelecommunications Intersystem Operations.*
- ANSI/TIA/EIA-664-A-2000, *Cellular Features Description.*
- ETSI GSM 09.02 (1990-1991), *Mobile Application Part (MAP) specifications.*
- TTCJJ.70.10 *Mobile Application Part (MAP) Signalling System of Digital Mobile, Communications Network Inter-node Interface (DMNI) for PDC.*

E1.4 Abbreviations

This annex uses the following abbreviations:

ADN	Abbreviated Dialling Number
ANSI-41	American National Standards Institute Mobile Networks specifications – 41
AuC	Authentication Centre
BSC	Base Station Controller
BTS	Base Trans-receiver Station
CDMA-2000	Code-Division Multiple Access – 2000
EDGE	Enhanced Data Rates for GSM Evolution
EIR	Equipment Identification Register
ESN	Electronic Serial Number
GK	Gatekeeper
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HLR	Home Location Register
IK	Integrity Key
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IMT-2000	International Mobile Telecommunications-2000 (known as 3rd Generation Wireless standards group under ITU)
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MAP	Mobile Application Part
MDN	Mobile Directory Number
MGC	Media Gateway Controller
MGW	Media Gateway
MIN	Mobile Identification Number
MS	Mobile Station

MSC	Mobile Switching Centre
MSID	Mobile Station Identity
MSISDN	Mobile Subscriber ISDN Number
NNI	Network-to-Network Interface
OAM	Operations, Administration, Maintenance
OSS	Operation Services System
PCS	Personal Communication Service
PDC	Personal Digital Cellular – the digital network used primarily in Japan
PHS	Personal Handy phone systems – the digital network used primarily in Japan
PIN	Personal Identification Number
PLMN	Public Land Mobile Network
PRI	Primary Rate Interface
PSDN	Packet Switched Data Network
PSTN	Public Switched Telephone Network
SESN	SIM Electronic Serial Number
SGW	Signalling Gateway
SIM	Subscriber Identity Module
SMSC	Short Message Service Centre
SOC	System Operator Code
SS7	Signalling System No. 7
STP	Signalling Transfer Point
TCAP	Transaction Capabilities Application Part
UIM	User Identity Module
USIM	Universal Subscriber Identity Module
VLR	Visited Location Register
VMS	Voice Mail System
W-CDMA	Wideband Code-Division Multiple Access

E1.5 H.323 and PLMN Interworking Network Architecture

This annex specifies only those services, procedures, protocol messages, etc. that are mandatory for the implementation of an H.323 Mobile Gateway and H.323 Mobile Endpoints — which is a subset of the optional functionality of an ITU-T Rec. H.323 version 4 (2000) system.

All other (optional) mobile features defined in ITU-T Rec. H.323 version 4 are – by definition – optional, and their implementation in an H.323 mobile device is entirely at the discretion of the manufacturer.

E1.5.1 New functions of H.323 & PLMN interworking Network Architecture

The following clauses describe the functions of the H323_UIM Network components.

- The H323_UIM Terminal contains a User Identification Module (UIM) or User Identification Information.
- AnnexE_GK is a new interworking function between H.323 networks and PLMNs.

E1.5.2 H323_UIM Terminal contains a User Identification Module

The H.323 terminal shall share and present the subscriber identity used in the particular PLMN (ANSI-41, GSM, PDC, etc) with which interworking is desired. This allows the H.323 terminal to provide the required subscriber identity to register with the PLMN and gain access to services.

Note that in the future these identities should be harmonized with the proposed Universal subscriber Identity Module (USIM) in 3rd generation wireless standards groups.

E1.5.3 AnnexE_GK with PLMN Interworking Function (IWF)

The current worldwide digital wireless networks mainly comprises of:

- GSM networks with TDMA air interface throughout most of the world.
- ANSI-41 networks with TDMA and CDMA air interfaces throughout North and South America, most parts of Asia, Russia, Australia and some parts of Europe
- PDC network with TDMA air interface throughout Japan and some parts of Asia.

The Public Land Mobile Network's main role is to manage the communications between the mobile users and other users, such as mobile users, H323_UIM users, ISDN users, fixed telephony users, etc. It also includes databases needed in order to store information about the subscribers and to manage their mobility. The PLMN IWF provides interworking between the PLMN and an H.323 network.

The basic model of an AnnexE_GK solution is a logical interworking function that performs the appropriate protocol conversion, database mapping and transaction management to support the Mobility Management, Call Origination, and Call Delivery functions.

An H.246 Annex E Gatekeeper between an H.323 network and a PLMN network maps the operations and messages between Gateway, Gatekeeper and serving Mobile Switching Centre (MSC), Visited Location Register (VLR). The Inter-working functions are as follows:

Mobility Management areas

- Registration of H323_UIM Terminal and/or user;
- Authentication of the H323_UIM Terminal and user.

Communication Management area


- Call Origination from H323_UIM Terminal to PLMN;
- Call Termination to H323_UIM Terminal from PLMN;
- Message Waiting Notification delivery to H323_UIM Terminal;
- Short Message Origination from Short Message Entity in H323_UIM Terminal;
- Short Message Termination to Short Message Entity in H323_UIM Terminal.

This AnnexE_GK looks like a Gatekeeper from the H.323 Endpoint and like a Visited Location Register (VLR) and a serving Mobile Switching Centre (MSC) from the PLMN.

E1.6 Mapping of ANSI-41 PLMN MAP messages to H.323 messages

Functions	ANSI-41 MAP messages	H.323 messages
Registration	RegistrationNotification (REGNOT)	GRQ, GCF, GRJ, RRQ, RCF, RRJ operations are used for Registration and Authentication of the H323_UIM Terminal
Authentication	AuthenticationRequest (AUTHREQ) AuthenticationDirective (AUTHDIR) AuthenticationStatusReport (ASREPORT) CountRequest (COUNTREQ) AuthenticationFailureReport (AFREPORT) RandomVariableRequest (RANDREQ)	
Subscriber Profile Update	QualificationRequest (QUALREQ) FeatureRequest (FEATREQ) QualificationDirective (QUALDIR)	ARQ, ACF, ARJ
Call Delivery	LocationRequest (LOCREQ) RoutingRequest (ROUTREQ) RemoteUserInteractionDirective (RUIDIR)	↑ ↓
Mapping of ISUP ↔ Q.931	Call Setup and Call Release messages	Setup, Connect, Info Refer to H.248 contributions
Message Waiting Notification	QUALDIR, InformationDirective (INFODIR), MWN Indication	H.450.7 MWI SS
Short Message Service	SMSRequest (SMSREQ), SMS Delivery Point to Point (SMD PP), SMS Notification (SMSNOT), SMS Backward (SMS BACK), SMS Forward (SMS FWD)	H.323 Facility (user-to-user information) messages
Wireless Application Protocol (WAP) services	WML Scripts & Web Browser	H.323 Annex K (HTTP-based service control transport channel in H.323)
Deregistration	RegistrationCancellation (REGCANC) MSInactive (MSINACT) BulkDeregistration (BULKDEREG)	URQ, UCF, URJ, URQ, UCF, URJ URQ, UCF, URJ

E1.6.1 Mapping of GSM/PDC PLMN MAP messages to H.323 messages

Functions	GSM MAP messages	H.323 messages
Registration	INSERT SUBSCRIBER DATA	GRQ, GCF, GRJ, RRQ, RCF, RRJ operations are used for Registration and Authentication of the H323_UIM Terminal
Authentication	UPDATE LOCATION, ATTACH ACTIVATE SS DEACTIVATE SS GET PASSWORD INTERROGATE SS REGISTER PASSWORD	
Subscriber Profile Update	PROCESS UNSTRUCTURED SS DATA SEND PARAMETERS NOTE MS PRESENT	
Call Delivery	PROVIDE ROAMING NUMBER SEND ROUTING INFORMATION ALERT SERVICE CENTRE	Setup, Connect, Info
Message Waiting Notification	SET MESSAGE WAITING DATA	H.450.7 MWI SS
Short Message Service	SMSRequest (SMSREQ), SMS Delivery Point to Point (SMD PP), SMS Notification (SMSNOT), SMS Backward (SMS BACK), SMS Forward (SMS FWD)	H.323 Facility (user-to-user information) messages
Wireless Application Protocol (WAP) services	WML Scripts & Web Browser	H.323 Annex K (HTTP-based service control transport channel in H.323)
Deregistration	DEREGISTER MOBILE SUBSCRIBER CANCEL LOCATION, DETACH DELETE SUBSCRIBER DATA	URQ, UCF, URJ,

E1.7 AnnexE_GK and H323_UIM Terminal messages

E1.7.1 Additions of Mobility parameters and procedure to H.225 RAS messages

Extending the AliasAddress type with a new type mobile UIM that supports all the various mobile identification formats provides the H.323 mobile user identity.

E1.7.2 Security aspects of Mobile User Identity Module (UIM)

Follow procedures of ITU-T Rec. H.235 to ensure privacy of the mobile UIM.

E1.8 Message syntax of Mobile parameters in H.225.0 messages to support H.323 mobility

MobileUIM AliasAddress type has been added to ITU-T Rec. H.225.0 Version 4 in order to permit interworking with Public Land Mobile Networks.

The AliasAddress structure is meant to capture the various external address formats that reference a particular transport location on the LAN and PLMN.

Appendix E1.I

E1.I.1 USIM Overview (Informational)

The current USIM specifications are defined in 3GPP Technical Specification group Terminal WG3; please refer to the 3GPP URL = <http://www.3gpp.org/TB/TT3/T3.htm>. The current USIM proposal does not include ANSI-41 network parameters at this time. The ANSI-41 parameters should be included in the H323_UIM USIM.

E1.I.2 USIM description (Informational)

- The USIM is a secured smart agent that identifies the terminal. By inserting the USIM agent into the terminal, the user can have access to all the subscribed services. Without the USIM agent, the terminal is not operational.
- The USIM agent is protected by a four-digit Personal Identification Number (PIN). In order to identify the subscriber to the system, the USIM agent contains some parameters of the user such as its International Mobile Subscriber Identification (IMSI) or Mobile Identification Number (MIN), Electronic Serial Number (ESN) or International Mobile Equipment Identity (IMEI), Mobile Subscriber ISDN Number (MSISDN) or Mobile Directory Number (MDN).
- Another advantage of the USIM agent is the mobility of the users. In fact, the only element that personalizes a terminal is the USIM agent. Therefore, the user can have access to its subscribed services in any terminal using its USIM agent.
- The Subscriber identity in USIM is used to uniquely identify the subscriber service profile and subscribed feature information in the Home Location Register. ANSI-41 uses two parameters to uniquely identify the subscriber. The Mobile Identification Number (MIN) and Electronic Serial Number (ESN) are used for subscriber identity. In most of the ANSI-41 operations, Mobile Identification Number (MIN) is used for subscriber identity. Where as GSM/PDC uses International Mobile Subscriber Identification (IMSI) and Mobile Subscriber ISDN Number (MSISDN) for subscriber identity.

E1.I.3 USIM contents (Informational)

User-related information

- 1) Terminal identification: A number uniquely identifying the End-Terminal and the Terminal issuer;
- 2) Preferred language(s);
- 3) Directory of applications.

USIM-related information

- Administrative information: Indicates mode of operation of the USIM, e.g. normal, type approval;
- USIM service table: Indicates which optional services are provided by the USIM;
- Market Identity Number (MID) or System Identity Number (SID);
- Private System Identity Number (PSID), Residential System Identity Number (RSID);
- MSID (IMSI or MIN); MDN or MSISDN; ESN or IMEI;
- Language indication;
- Location information;
- Cipher key (Kc) and cipher key sequence number;
- Access control class(es);
- Forbidden PLMNs;

- Preferred PLMNs;
- Phase identification;
- Ciphering Key for GPRS;
- GPRS location information;
- Cell Broadcast related information;
- Emergency call codes;
- Phone numbers (ADN, MDN, MSISDN, IP Address);
- Short messages and related parameters;
- Capability and Configuration parameters;
- Home PLMN search period.

Information accessible to the USIM and other applications

- ADN, MDN, MSISDN, IP Address

In addition, the USIM shall manage and provide storage for the following information with the software security:

- PIN;
- PIN enabled/disabled indicator;
- PIN error counter;
- Unblocked PIN;
- Unlock PIN error counter;
- Data integrity keys;
- Subscriber authentication keys.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems