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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, ISDN and
PLMN**

ITU-T Recommendation H.246



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ITU-T Recommendation H.246

Interworking of H-series multimedia terminals with H-series multimedia terminals and voice/voiceband terminals on GSTN, ISDN and PLMN

Summary

This Recommendation describes Gateways which provide protocol interworking between H-Series multimedia terminals and other H-Series multimedia terminals, voice/voiceband terminals on GSTN, ISDN or PLMN, V.70 terminals on the GSTN, and multi-call applications on the GSTN. H.246 Gateways provide the required translation of control and media streams to allow interworking between terminals running different protocols. Annex A specifies H.323-H.320 interworking. Annex C specifies the interworking between ISUP (ISDN User Parts of Signalling System No. 7) and H.225.0. Annex E1 specifies the interworking between 2nd Generation Public Land Mobile Networks (PLMN) and H.323. Annex E2 specifies the interworking between 2nd Generation ANSI-41 PLMNs and H.323. Annex F specifies H.323-H.324 interworking.

Note that Annex B and Annex D do not exist; they were planned, but were never approved.

Source

ITU-T Recommendation H.246 was approved on 29 May 2006 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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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.

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

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ITU-T Recommendation H.246

Interworking of H-series multimedia terminals with H-series multimedia terminals and voice/voiceband terminals on GSTN, ISDN and PLMN

1 Scope

This Recommendation describes Gateways which provide protocol interworking between H-Series multimedia terminals and other H-Series multimedia terminals, voice/voiceband terminals on GSTN or ISDN, V.70 terminals on the GSTN, and multi-call applications on the GSTN. H.246 Gateways provide the required translation of control and media streams to allow interworking between terminals running different protocols.

The interworking of the H-Series protocols H.323, H.320, H.324, H.324 Mobile, and H.310 with the network acting transparently are covered in this Recommendation as shown in Figures 1 to 3. The interworking of H-Series protocols with voice/voiceband GSTN or ISDN terminals is covered in this Recommendation and involves the interconnection of regular telephone equipment with H-Series protocols in both the call originate and call answer applications. This includes interaction with IP-based telephony which is H.323-based. The interworking of H-Series protocols and multi-call applications on the GSTN is covered in this Recommendation and involves an H-Series protocol interacting with several calls simultaneously on a single GSTN line.

This Recommendation specifies interworking requirements with respect to call control, system control, and media flow between multimedia and voice/voiceband terminals.

The body of this Recommendation provides a general overview of the Recommendation and specifies any mappings which are applicable to more than one interworking scenario. Specifications of specific interworking scenarios such as H.323 to H.320 are covered in individual Annexes.

The H-Series interworking scenarios which are planned to be part of this Recommendation are summarized in Table 1. Additional interworking scenarios are described in Table 2.

Table 1/H.246 – Annex name of H-Series interworking

	H.320^{a)}	H.324	H.310^{b)}	H.324 Mobile
H.323	A	TBA	TBA	TBA
H.320^{a)}	NA	TBA	TBA	TBA
H.324	NA	NA	TBA	TBA
H.310^{b)}	NA	NA	NA	TBA

NA Not Applicable
TBA Annex designator To Be Assigned

a) H.321 and H.322 will be covered in the H.320 Annexes.
b) H.310 RAST-1 and RAST-5 terminals will be covered in the H.310 Annexes.

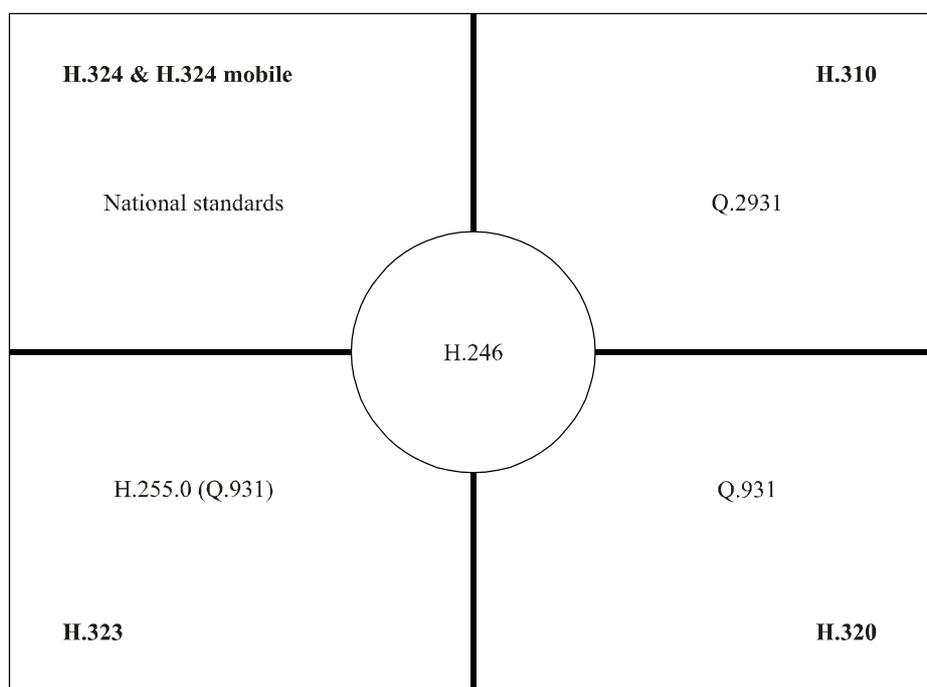
Table 2/H.246 – Annex name of H-Series interworking with Voice/Voiceband terminals on GSTN and ISDN

	Voice/Voiceband terminal on GSTN	Voice/Voiceband only terminal on ISDN
H.323	B	TBA
H.320^{a)}	TBA	TBA
H.324	TBA	TBA
H.310^{b)}	TBA	TBA
H.324 Mobile	TBA	TBA
TBA Annex designator To Be Assigned		
a) H.321 and H.322 will be covered in the H.320 Annexes.		
b) H.310 RAST-1 and RAST-5 terminals will be covered in the H.310 Annexes.		

Figures 1 through 3 show the H-Series call control, system control, and media flow interworking which is specified in this Recommendation.

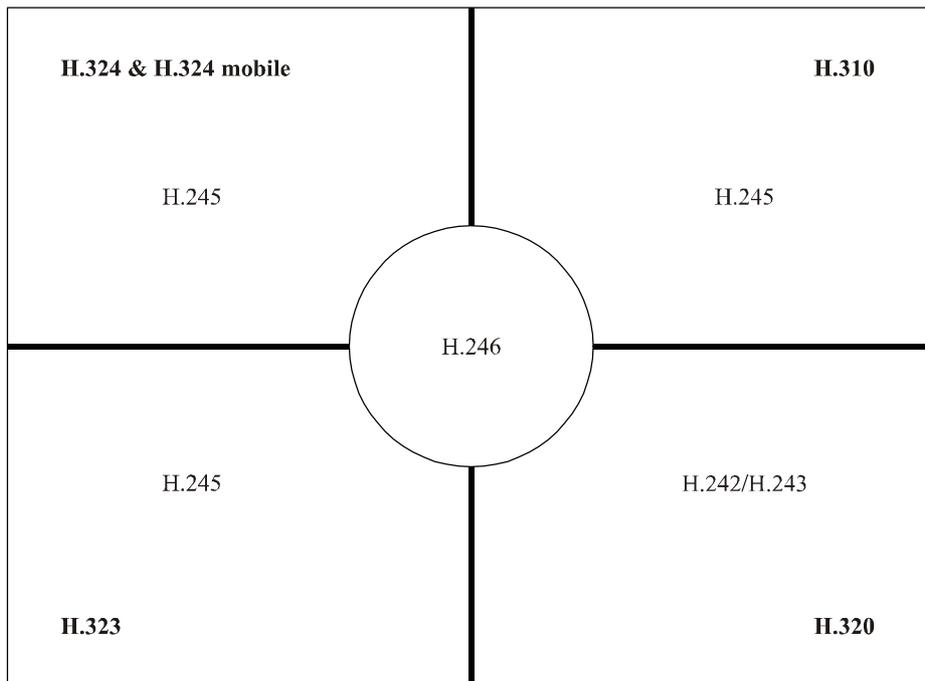
Voice/Voiceband terminals on GSTN use the appropriate national standards for call control and G.711 or analogue signals for voice. Voice/Voiceband terminals on ISDN use the appropriate national variant of Q.931 for call control and G.711 for voice.

Interworking of H.323 over ATM with H.323 over non-ATM IP networks is possible through the use of an H.323-H.323 gateway. Transport of H.323 media streams over ATM is described in AF SAA-0124.000.



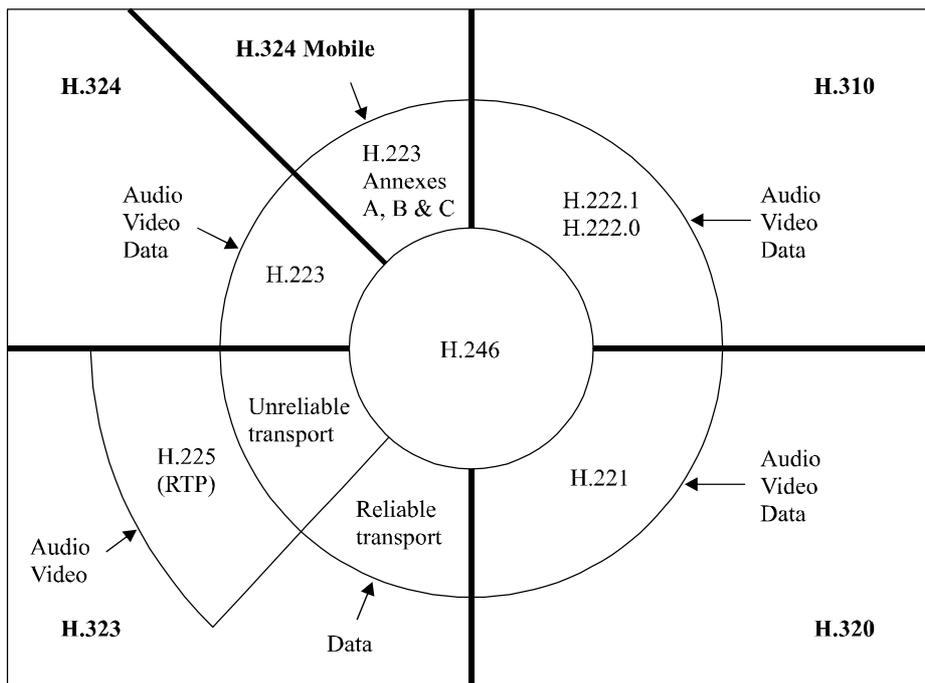
H.246(05-06)_F01

Figure 1/H.246 – H-Series call control interoperability



H.246(05-06)_F02

Figure 2/H.246 – H-Series system control interoperability



H.246(05-06)_F03

Figure 3/H.246 – H-Series media interoperability

2 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- ITU-T Recommendation E.164 (2005), *The international public telecommunication numbering plan*.
- CCITT Recommendation G.711 (1988), *Pulse Code Modulation (PCM) of voice frequencies*.
- CCITT Recommendation G.722 (1988), *7 kHz audio-coding within 64 kbit/s*.
- ITU-T Recommendation G.723.1 (2006), *Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s*.
- CCITT Recommendation G.728 (1992), *Coding of speech at 16 kbit/s using low-delay code excited linear prediction*.
- ITU-T Recommendation G.729 (1996), *Coding of speech at 8 kbit/s using Conjugate Structure Algebraic-Code Excited Linear-Prediction (CS-ACELP)*.
- ITU-T Recommendation H.221 (2004), *Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.
- ITU-T Recommendation H.225.0 (2006), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems*.
- ITU-T Recommendation H.230 (2004), *Frame-synchronous control and indication signals for audiovisual systems*.
- ITU-T Recommendation H.242 (2004), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s*.
- ITU-T Recommendation H.243 (2005), *Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 1920 kbit/s*.
- ITU-T Recommendation H.245 (2006), *Control protocol for multimedia communication*.
- ITU-T Recommendation H.261 (1993), *Video codec for audiovisual services at $p \times 64$ kbit/s*.
- ITU-T Recommendation H.262 (2000) | ISO/IEC 13818-2:2000, *Information technology – Generic coding of moving pictures and associated audio information: video*.
- ITU-T Recommendation H.263 (2005), *Video coding for low bit rate communication*.
- ITU-T Recommendation H.310 (1998), *Broadband audiovisual communication systems and terminals*.
- ITU-T Recommendation H.320 (2004), *Narrow-band visual telephone systems and terminal equipment*.
- ITU-T Recommendation H.321 (1998), *Adaptation of H.320 visual telephone terminals to B-ISDN environments*.
- ITU-T Recommendation H.322 (1996), *Visual telephone systems and terminal equipment for local area networks which provide a guaranteed quality of service*.

- ITU-T Recommendation H.323 (2006), *Packet-based multimedia communications systems*.
- ITU-T Recommendation H.324 (2005), *Terminal for low bit-rate multimedia communication*.
- ITU-T Recommendation Q.931 (1998), *ISDN user-network interface layer 3 specification for basic call control*.
- ITU-T Recommendation Q.932 (1998), *Digital Subscriber Signalling System No. 1 – Generic procedures for the control of ISDN supplementary services*.
- ITU-T Recommendation Q.950 (2000), *Supplementary services protocols, structure and general principles*.
- ITU-T Recommendation T.120 (1996), *Data protocols for multimedia conferencing*.
- ISO/IEC 10646:2003, *Information technology – Universal Multiple-Octet Coded Character Set (UCS)*.
- ATM Forum Technical Committee, AF-SAA-0124.000, *Gateway for H.323 Media Transport Over ATM, 1999*.

3 Definitions

This Recommendation defines the following terms:

3.1 terminal: A terminal is any endpoint and may be a user's terminal or some other communication system such as an MCU or an information server.

3.2 multipoint control unit: The Multipoint Control Unit (MCU) is an endpoint which provides the capability for three or more terminals and Gateways to participate in a multipoint conference.

3.3 multipoint controller: The Multipoint Controller (MC) is an H.323 entity on the local area network which provides for the control of three or more terminals participating in a multipoint conference. It may also connect two terminals in a point-to-point conference which may later develop into a multipoint conference. The MC provides for capability negotiation with all terminals to achieve common levels of communications. It also may control conference resources such as who is multicasting video. The MC does not perform mixing or switching of audio, video and data.

4 Abbreviations

This Recommendation uses the following abbreviations:

CAPS	H.245 or H.242 Capabilities
DTMF	Dual Tone Multi-Frequency
FFS	For Further Study
GSTN	General Switched Telephone Network
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MC	Multipoint Controller
MCU	Multipoint Control Unit
MSN	Multiple Subscriber Number
PLMN	Public Land Mobile Network
SCN	Switched Circuit Network

SPID	Service Provider ID
TE	Terminal Equipment

5 Conventions

In this Recommendation the following conventions are used:

"Shall" indicates a mandatory requirement.

"Should" indicates a suggested but optional course of action.

"May" indicates an optional course of action rather than a recommendation that something take place.

6 General H-Series interworking definitions

The following definitions define mappings which are applicable to more than one interworking scenario.

This clause is for further study.

Annex A

H.323-H.320 interworking

A.1 Summary

This annex specifies the interworking requirements of a H.323 to H.320 protocol conversion device called a H.323 to H.320 Gateway.

A H.323 to H.320 Gateway provides interworking by providing conversion of the audio, video, data, and control protocols as specified in the H.323 and H.320 system specifications.

H.321 and H.322 specifics are for further study in this annex.

A.2 Definitions

In addition to the definitions listed in clause 3, this annex uses the following definitions:

A.2.1 capability: A terminal has a particular capability if it is able to encode and transmit or receive and decode that particular signal.

A.2.2 logical channel: A logical channel is a unidirectional path or bidirectional path for the transmission of information.

A.2.3 mode: A mode is a set of elementary streams that a terminal is transmitting, intends to transmit, or would like to receive.

A.2.4 multimedia communication: Multimedia communication refers to the transmission and/or reception of signals of two or more Medium Types simultaneously.

A.2.5 non-standard: Not conforming to a national or international standard referenced in this Recommendation.

A.2.6 session: A session is a period of communication between two terminals which may be conversational or non-conversational (for example, retrieval from a database).

A.3 Abbreviations

In addition to the abbreviations listed in clause 4, this annex uses the following abbreviations:

MC	H.323 Multipoint Control Entity
QCIF	Quarter CIF
RTCP	Real-time Transport Control Protocol
RTP	Real-time Transport Protocol

A.4 Overview

A H.323 to H.320 Gateway shall support the mandatory functionality as specified for a H.320 terminal in the H.320 system specification on the SCN and the mandatory functionality as specified for a H.323 endpoint in the H.323 system specification on the LAN.

The following table summarizes the minimum protocol requirements for a H.323 to H.320 Gateway.

Component	H.323	H.320
Call Control	H.225.0	Q.931
System Control	H.245	H.242
Multiplex	H.225.0	H.221
Audio	G.711	G.711
Video (If video supported)	H.261 QCIF	H.261 QCIF
Data (If data supported)	T.120	T.120

The following subclauses define the mapping between a H.323 terminal on the LAN side of a Gateway to a H.320 terminal or H.231 MCU on the SCN side of a Gateway.

A.5 Mapping H.323 System Control (H.245) to H.320 System Control (H.242)

The following tables focus on the action required in H.245 based on the receipt of a H.242 (H.221 or H.230) command. The action in the reverse case may be produced by consideration of the following tables.

For mandatory terminal or endpoint capabilities or commands, the Gateway shall respond according to the following table mappings. For option terminal or endpoint capabilities or commands, the Gateway shall respond according to the following table mappings if the option is supported. In cases where the Gateway is transcoding audio or video, flow control or channel opening or closing as specified in the tables may not be necessary (e.g., the Gateway may match bit rates via transcoding, mode switches, or flow control).

A.5.1 H.221 commands/CAPS

Generally H.221/H.230 commands are continuously repeated in the unreliable H.221 BAS channel. As the control channel on the LAN is reliable, only new or changed commands should be passed on by the H.323 Gateway to the LAN side.

When a version two H.323 endpoint receives a H.245 empty capability set (i.e., a terminalCapability set that indicates that the endpoint sending the message has no receive capabilities), the endpoint shall close all open logical channels using the standard H.245 procedures and enter a paused state.

Gateway vendors should note that experience has shown when translating a H.245 empty capability set to a H.320 empty cap set, called Mode 0 in H.320, call termination may occur. Many H.320

endpoints forced into Mode 0 after exchanging a non-empty cap set and/or exchanging media will view a subsequent transition to Mode 0 as a signal that the remote terminal is ending the call and initiate a disconnect themselves. Therefore, vendors are recommended to implement this translation by other means such as using mutes in the H.323 to H.320 direction and not sending media packets in the H.320 to H.323 direction.

A.5.1.1 Clause A.1/H.221 – Commands

In this table it has been assumed that if the audio operates at a well known rate, e.g., 16 kbit/s for G.728, the rate can be inferred from the logical channel open.

In cases where there are matching audio and video capabilities, it is strongly recommended that Gateways avoid transcoding. However, it is up to an individual manufacturer to determine how to resolve conference capabilities in which there are no algorithms in common.

H.221 command	H.245 equivalent
Neutral	<ul style="list-style-type: none"> Close the logical channel or use flow control for any logical channel being used for audio. Close any logical data channels that exist only in the I-channel on the SCN side. Send FlowControlCommand to limit the video rate to be equivalent to the additional channels on the SCN side. Send FlowControlCommand to limit the HSD data rate to be equivalent to the additional channels on the SCN side if needed. <p>NOTE – The neutral command does not necessarily indicate a long-term bandwidth change.</p>
Capex	The Gateway should send SendTerminalCapabilitySet using genericRequest to the H.323 terminal and then pass the resulting capability to the SCN augmented with its own capabilities to account for its transcoding and translation properties.
Au-off, U	Close the logical channel being used for audio.
Au-off, F	Close the logical channel being used for audio.
A-law, 0U	Open a logical channel with AudioCapability of g711Alaw64k or other algorithm if the Gateway is transcoding .
A-law, 0F	Open a logical channel with AudioCapability of g711Alaw64k or other algorithm if the Gateway is transcoding . Note that the Gateway pads the 56 kbit/s SCN G.711 to put it on the LAN and truncates the 64 kbit/s LAN audio to put it on the SCN as described in ITU-T Rec. H.225.0.
μ-law, 0U	Open a logical channel with AudioCapability of g711Ulaw64k or other algorithm if the Gateway is transcoding .
μ-law, 0F	Open a logical channel with AudioCapability of g711Ulaw64k or other algorithm if the Gateway is transcoding . Note that the Gateway pads the 56 kbit/s SCN G.711 to put it on the LAN and truncates the 64 kbit/s LAN audio to put it on the SCN as described in ITU-T Rec. H.225.0.
A-law, F6	Open a logical channel with AudioCapability of g711Alaw64k or other algorithm if the Gateway is transcoding . Note that the Gateway pads the 48 kbit/s SCN G.711 to put it on the LAN and truncates the 64 kbit/s LAN audio to put it on the SCN as described in ITU-T Rec. H.225.0.
μ-law, F6	Open a logical channel with AudioCapability of g711Ulaw64k or other algorithm if the Gateway is transcoding . Note that the Gateway pads the 48 kbit/s SCN G.711 to put it on the LAN and truncates the 64 kbit/s LAN audio to put it on the SCN as described in ITU-T Rec. H.225.0.

H.221 command	H.245 equivalent
G.722-64	Open a logical channel with AudioCapability of g722-64k or other algorithm if the Gateway is transcoding – use payload type 15 (G.722) in RTP.
G.722-56	Open a logical channel with AudioCapability of g722-56k or other algorithm if the Gateway is transcoding . Signal the dynamicRTPPayloadType option of the H2250LogicalChannelParameters in the OpenLogicalChannel command.
G.722-48	Open a logical channel with AudioCapability of g722-48k or other algorithm if the Gateway is transcoding . Signal the dynamicRTPPayloadType option of the H2250LogicalChannelParameters in the OpenLogicalChannel command.
Au-40k	FFS
Au-32k	FFS
Au-24k	FFS
G.723.1	Open a logical channel with AudioCapability of g7231 or other algorithm if the Gateway is transcoding .
G.728	Open a logical channel with AudioCapability of g728 or other algorithm if the Gateway is transcoding .
G.729	Open a logical channel with AudioCapability of g729 or other algorithm if the Gateway is transcoding .
Au4k	FFS

A.5.1.2 Clause A.2/H.221 – Commands

In general, SCN transfer rates are translated into H.245 maximum bit rate capabilities that apply to the audio and video logical channels on the LAN. The following table illustrates the Gateway requirements.

NOTE – When the Gateway is transcoding media, the LAN and SCN media rates may not be equal.

Media	LAN Side	SCN Side
Audio	max bit rate is implied by the algorithm chosen; the LAN transmitter shall not exceed the negotiated rate. The Gateway should use FlowControlMessages to correct for clock synchronization issues	max bit rate is implied by algorithm.
Video	max bit rate is taken from H261VideoCapability's maxBitRate field. Endpoint procedures are the same as for audio. The Gateway should use FlowControlMessages to correct for clock synchronization issues or fluctuations in bandwidth due to dynamic data channels	If the Gateway is not transcoding, the max bit rate should be at least the transfer rate minus the audio minus the FAS/BAS minus the data bandwidth. The Gateway must compute this value dynamically and close/open the video logical channel or use flow control when it changes. The Gateway may set the max bit rate higher and then use flow control to adapt the rate based on data or audio channel bandwidth changes. If the Gateway contains a rate reducer, the LAN max bit rate does not need to match the SCN max bit rate.
Data	max bit rate is taken from DataApplicationCapability's maxBitRate field. Flow control is provided by the underlying data protocol.	max bit rate is implied by the data rate in use. Changes in max bit rate on the SCN side result in a close/re-open sequence or flow control for the associated LAN logical channel for data.

The LAN side is unaware of the differences between SCN multilink or single channels. The total bandwidth on the LAN and SCN link may be unequal since control on the LAN side is essentially unconstrained, and the audio or video may be transcoded in the Gateway.

If an "Initial Channel Lost" (loss-ic) is received by the Gateway, it should translate into a lower LAN bit rate for the appropriate media channels via closing and reopening the logical channels or via the use of flow control commands.

A.5.1.3 Clause A.3/H.221 – Commands

H.221 command	H.245 equivalent
Video-off	Close the video logical channel.
H.261_on	Open a logical channel with VideoCapability of H261VideoCapability and a maxBitRate to force a match to the SCN side video rate unless transcoding to another algorithm or bit rate.
H.262S_on (Simple Profile)	Open a logical channel with VideoCapability of H262VideoCapability and a maxBitRate to force a match to the SCN side video rate unless transcoding to another algorithm or bit rate. Use the Simple Profile at the Main Level.
H.262M_on (Main Profile)	Open a logical channel with VideoCapability of H262VideoCapability and a maxBitRate to force a match to the SCN side video rate unless transcoding to another algorithm or bit rate. Use the Main Profile at the Main Level.
H.263_on	Open a logical channel with VideoCapability of H263VideoCapability and a maxBitRate to force a match to the SCN side video rate unless transcoding to another algorithm or bit rate.
Video-MPEG-1_on	FFS
Freeze-pic (H.230 VCF)	Send videoFreezePicture
Fast-update (H.230 VCU)	Send videoFastUpdatePicture
Encryp-on (ECS channel active)	FFS NOTE – Although the ECS channel is in effect always open on the LAN link, receiving this command from the SCN may require a close/re-open logical channel command to correct for changes in the data rates of the media.
Encryp-off (ECS channel inactive)	See Encryp-on.
Au-loop	Send mediaLoop on the logical channel carrying audio.
Vid-loop	Send mediaLoop on the logical channel carrying video.
Dig-loop	A Gateway shall implement this on the SCN side, looping the H.320 stream back to the SCN side. The Gateway should continue to pass the stream onto the LAN side. Any input from the LAN side may be lost while this loop is in effect.
Loop-off	Send the MaintenanceLoopOffCommand .
SM-comp	Close/re-open logical channels affected by video, audio, or data max bit rate changes.
Cancel-SM-comp	Close/re-open logical channels affected by video, audio, or data max bit rate changes.
6B-H ₀ -comp	Close/re-open logical channels affected by video, audio, or data max bit rate changes.

H.221 command	H.245 equivalent
Not-6B-H ₀ -comp	Close/re-open logical channels affected by video, audio, or data max bit rate changes.
Restrict	Close/re-open logical channels affected by video, audio, or data max bit rate changes.
Derestrict	Close/re-open logical channels affected by video, audio, or data max bit rate changes.

A.5.1.4 Clause A.4/H.221 – Commands

The Gateway, upon receipt of a LSD/HSD/MLP command, should not seek to open a logical channel until an application command is received. At that time, the Gateway should open a logical channel with the appropriate application and a maxBitRate derived from the LSD/HSD/MLP rate in effect.

In the reverse direction, once the Gateway receives an open logical channel, it should seek to open the appropriate LSD/HSD/MLP channel and turn on the requested application. When the far end SCN terminal responds with both the rate and the application command, the Gateway should send **OpenLogicalChannelAck** to the LAN side.

In either direction, the Gateway will require buffering to ensure that data is not lost.

A.5.1.5 Clauses A.5/A.6/A.7/A.8/A.10/H.221 – Capabilities

Audio, video, and encryption capabilities map one to one with H.245 capabilities. MBE, HSD, LSD, MLP, and transfer rate capabilities are not applicable on the LAN.

LSD and HSD channels on the LAN are differentiated by logical channel number.

NOTE – **temporalSpatialTradeOffCapability** should be terminated at a H.245 device and not passed to H.242 as there is no equivalent command.

A.5.1.6 Clause A.9/H.221 – Escape Table Values

H.221 command	H.245 equivalent
Table A.6	The transfer rates (commands & caps) should be translated into maxBitRates for logical channels.
Table A.2	The Au-ISO related caps/cmds shall be ignored; their translation is FFS. The HSD/MLP transfer rate commands result in the opening of a logical channel. See A.4 for a discussion of the issues.
H.230	See A.5.2.
SBE numbers	The values 0-9, #, and * shall be sent using UserInputIndication . Other values may be optionally forwarded by a Gateway in either direction.
SBE characters	The characters are always embedded in other messages so there is no direct translation (e.g., they are associated with MLP or H.230 commands).
Start-MBE	No translation is needed as all existing MBEs are translated into LAN messages.
NS-cap	If the Gateway does not understand the non-standard capability, it should send the Capability with nonStandard set to the appropriate NonStandardParameter . The Gateway should map the H.221 country code and manufacturer code into the h221NonStandard field of NonStandardIdentifier and place the actual non-standard H.221 cap in NonStandardParameter.data .
NS-comm	Send NonStandardMessage with nonStandardIdentifier set to h221NonStandard . The Gateway should map the H.221 country code and manufacturer code into the h221NonStandard field of NonStandardIdentifier , and place the actual non-standard H.221 cap in NonStandardParameter.data .
Cap-mark	When H.320 cap set ends, the H.245 cap set should be sent.
Table A.4	See A.5.1.7.

A.5.1.7 Table A.4/H.221 – Data applications

Reserved code points are ignored in this table. Note that on the SCN (H.221) side, the data channel is opened, and then various applications are turned on and off. On the H.245 side, the application is specified when the logical channel is opened. Thus, opening logical data channels on the LAN side are deferred until it is clear what application is to be used.

H.221 command	H.245 equivalent
V.120 LSD	Open a logical channel with DataApplicationCapability of userData and DataModeProtocol of v120 . Set maxBitRate using LSD rate in effect.
V.120 HSD	Open a logical channel with DataApplicationCapability of userData and DataModeProtocol of v120 . Set maxBitRate using HSD rate in effect.
V.14 LSD	FFS
V.14 HSD	FFS
H.224_MLP_on/off	FFS
H.224_LSD_on/off	FFS
H.224_HSD_on/off	FFS
T.120_on/off	Open a logical channel with DataApplicationCapability of t120 and DataModeProtocol of separateStack . Set maxBitRate using MLP rate in effect.

The following table shows application capability mappings within LSD and HSD channels. Note that there is no differentiation of HSD from LSD except for logical channel number on the LAN side.

H.221 capability	H.245 equivalent
Still Image (Annex D/H.261)	Use H261VideoCapability stillImageTransmission field.
V.120 LSD	Use DataApplicationCapability of userData and DataProtocolCapability of v120 .
V.120 HSD	Use DataApplicationCapability of userData and DataProtocolCapability of v120 .
V.14 LSD	FFS
V.14 HSD	FFS
H.224_MLP	FFS
H.224_LSD	FFS
H.224_HSD	FFS
T.120	DataApplicationCapability of t120 on DataProtocolCapability of SeparateStack .
H.224_sim	Not applicable
Nil_data	Not applicable

A.5.1.8 Clause A.11/H.221 – HSD/H-MLP commands

HSD/H-MLP commands are translated into open logical channel requests. Flow control commands and the maxBitRate are in general used to match the SCN side rate. The channel should not be opened until the data application code is sent by the SCN side.

A.5.1.9 Clauses A.12/A.13/H.221 – Au-ISO commands and capabilities

These commands are not applicable to H.245 conversion.

A.5.1.10 Clauses A.14/A.15/H.221 – Data application commands and capabilities

See Table A.4/H.221.

A.5.1.11 Clause A.16/H.221 – Transfer rate commands and capabilities used in channel aggregation

Transfer rate changes on the SCN may require the close and re-open of LAN logical channels to account for bit rate changes.

A.5.2 H.230 commands

H.245 equivalents for H.230 commands and indications are for the most part defined in the H.245 commands **ConferenceCommand** and **ConferenceIndication**.

A.5.2.1 Video Commands and Indications (C&I)

H.230 command/indication	H.245 equivalent
VIS	Send logicalChannelInactive for the video channel.
VIA	Send logicalChannelActive for the video channel.
VIA2	Same as VIA for video source number 2.
VIA3	Same as VIA for video source number 3.
VIR	Send videoIndicateReadyToActivate .
VCF	Send videoFreezePicture .
VCU	Send VideoFastUpdatePicture .

A.5.2.2 Audio C&I

H.230 command/indication	H.245 equivalent
AIM	Send logicalChannelInactive for the audio channel.
AIA	Send logicalChannelActive for the audio channel.
ACE	Not applicable on LAN as audio and video are time-stamped independently by the transmitter.
ACZ	Not applicable on LAN as audio and video are time-stamped independently by the transmitter.

A.5.2.3 Maintenance C&I

H.230 command/indication	H.245 equivalent
LCV	Send mediaLoop on the logical channel carrying video.
LCD	Not applicable on LAN.
LCA	Send mediaLoop on the logical channel carrying audio. A Gateway should implement this on the SCN side, looping the H.320 stream back to the SCN side, while continuing to pass the stream onto the LAN side. Any input from the LAN side may be lost while this loop is in effect.
LCO	Send the MaintenanceLoopOffCommand .

A.5.2.4 Multipoint C&I

A.5.2.4.1 Multipoint Control C&I

H.230 command/indication	H.245 equivalent
MCC	Send multipointConference indication to indicate the presence of an H.231 MCU. The Gateway may have to adapt the maxBitRate on the LAN media channels to match the SCN transfer and audio rate as required by MCC.
MMS	Send multipointModeCommand . Once in receipt of this command, the LAN endpoint is required to follow all mode requests from the sender of MMS.
Cancel-MCC	Send cancelMultipointConference .
Cancel-MMS	Send cancelMultipointModeCommand .
MIZ	Send multipointZeroComm .
Cancel-MIZ	Send cancelMultipointZeroComm .
MIS	Send multipointSecondaryStatus .
Cancel-MIS	Send cancelMultipointSecondaryStatus .
MIM	FFS
MCV	Send either conferenceRequest.broadcastMyLogicalChannel or conferenceCommand.broadcastMyLogicalChannel with the LCN of the video channel in the direction from the gateway to the H.323 endpoint. If the gateway has previously both sent and received the MVC capability to/from the H.230 side (indicating that both ends of the terminal-MCU or inter-MCU link have declared the MVC capability or the H.245 equivalent), then the H.245 side shall use the conferenceRequest form of the message. Otherwise, it shall use the conferenceCommand form of the message.
Cancel-MCV	Send conferenceCommand.cancelBroadcastMyLogicalChannel .
MIV	Send seenByAtLeastOneOther .
Cancel-MIV	Send cancelSeenByAtLeastOneOther .
MCS/MCN	Send multipointConference indication to indicate the presence of an H.231 MCU. The Gateway may have to adapt the maxBitRate on the LAN media channels to match the SCN transfer and audio rate as required by MCC.
MIL	FFS
MIH	FFS
MIJ	FFS
MVA	Send conferenceResponse.broadcastMyLogicalChannel.grantedBroadcastMyLogicalChannel .
MVC	Send conferenceCapability.multipointVisualizationCapability .
MVR	Send conferenceResponse.broadcastMyLogicalChannel.deniedBroadcastMyLogicalChannel .
RAN	FFS

A.5.2.4.2 Terminal Numbering C&I

H.230 command/indication	H.245 equivalent
TCI	Send enterH243TerminalID .
TII	Send terminalIDResponse .
TIS	Not applicable
TIC(cap)	Not applicable
TIX	Not applicable
TIA	Send terminalNumberAssign .
TIN	Send terminalJoinedConference .
TID	Send terminalLeftConference .
TCU	Send terminalListRequest .
TCA	Send requestChairTokenOwner .
TIL	Send terminalListResponse .
TIR	Send chairTokenOwnerResponse .
TIE	Not applicable
TIP	Send mCterminalIDResponse .
TIP-5	Send mCUnicodeTerminalIDResponse .
TCP	Send requestTerminalID .
TCP-5	Send requestUnicodeTerminalID .

A.5.2.4.3 Conference Query C&I

H.230 command/indication	H.245 equivalent
TCS-1	Send enterH.243Password .
TCS-2	Send enterH243TerminalID .
TCS-3	Send enterH.243ConferenceID .
TCS-4	Gateway should return desired H.323 extension if known via IIS; otherwise, send enterExtensionAddress to the LAN and upon receiving extensionAddressResponse , send the extension via IIS.
TCS-5	Send enterH243UnicodeTerminalID .
IIS	Send terminalIDResponse or passwordResponse depending on the IIS value as defined in ITU-T Rec. H.230.
IIS-5 (value of n=5)	Send unicodeTerminalIDResponse .

A.5.2.4.4 Video Selection and Notification C&I

H.230 command/indication	H.245 equivalent
VIN	Send terminalYouAreSeeing .
VCB/Cancel-VCB	Send makeTerminalBroadcaster/cancelMakeTerminalBroadcaster .
VCS/Cancel-VCS	Send sendThisSource/cancelSendThisSource .
VCR	Send videoCommandReject .
VIN2	Send terminalYouAreSeeingInSubPictureNumber .
VIC	Send videoIndicateCompose .
VIM	Send videoIndicateMixingCapability .

A.5.2.4.5 Chair Control C&I

H.230 command/indication	H.245 equivalent
CCA	Send makeMeChair .
CIS	Send cancelMakeMeChair .
CIT	Send grantedChairToken from makeMeChairResponse .
CCR	Send deniedChairToken from makeMeChairResponse if in response to makeMeChairRequest , otherwise send withdrawChairToken .
CCD	Send dropTerminal .
CCK	Send dropConference .
CIR	Send terminalDropReject .
CIC (cap)	Send chairControlCapability from MiscellaneousCapability .
TIF	Send requestForFloor . In reverse direction floorRequested or requestForFloor should cause a TIF to be sent to the SCN.

A.5.2.4.6 Data Channel Related C&I

H.230 command/indication	H.245 equivalent
DCA-L,DIT-L,DCR-L,DIS-L,DCC-L	FFS
DCA-H,DIT-H,DCR-H,DIS-H,DCC-H	FFS
DCM (sent by Gateway to SCN)	The H.323 terminal sends a RequestMode with a dataMode of t120 and a DataModeProtocol of SeparateStack to the Gateway. The H.323 Gateway sends a DCM to the attached MCU or terminal. When the MLP rate command and T120_on have been received by the Gateway, it sends OpenLogicalChannel to the H.323 terminal to open a t120 channel and uses the channel maxBitRate to constrain the LAN to SCN data flow to match the signalled MLP channel rate.
DCM (received by Gateway from SCN)	This implies that the H.323 Gateway is acting as an MCU; the Gateway sends RequestMode with dataMode of t120 and a DataModeProtocol of SeparateStack . Since it is in receipt of multipointModeCommand the H.323 endpoint responds with an OpenLogicalChannel to the Gateway . At the same time, the Gateway sends an MLP rate command and T120_on to the H.320 SCN side endpoint to open the MLP channel and turn on T.120. Alternatively, the GW/MCU could send OpenLogicalChannel to the H.323 endpoint.

A.5.2.5 Channel Aggregation C&I

Table A.1/H.230 command/indication	H.245 equivalent
AggIN	FFS
NII	FFS
RIR	Received if H.323 Gateway is acting as a master MCU on the SCN; an H.245 equivalent is FFS.
RID	Not applicable
RIU	Received if H.323 Gateway is acting as a master MCU on the SCN; an H.245 equivalent is FFS.

A.5.2.6 Transfer of Network Address C&I

Table A.1/H.230 command/indication	H.245 equivalent
MIL	Not applicable
NCA-i, NCA-a, NIS, NIC, NID, NIR	Not applicable
NIA-s, NIQ-s, NIQ-m	Not applicable
NIA-m	Not applicable
NIAP	Not applicable
AU_MAP	Not applicable
AU_COM	Not applicable

A.6 Mapping H.323 Call Control (H.225.0) to H.320 Call Control on N-ISDN (Q.931)

The Gateway shall terminate the Q.931 Call Signalling Channel between an H.323 endpoint and the Gateway on one hand and the call signalling channel (if any) between the Gateway and the SCN endpoint on the other. The following applies only if the SCN side supports a call signalling protocol such as Q.931 or Q.2931.

The Gateway shall conform to the call signalling procedures recommended for the SCN side independent from the LAN side. The Gateway shall conform to the call signalling procedures of this Recommendation for the LAN side independent from the SCN side.

In addition, call signalling messages received from one side (LAN/SCN) may require forwarding to the other side (SCN/LAN). Some forwarded messages may contain information elements or parts of information elements which are unmodified or uninterpreted by the Gateway. Other forwarded messages may contain modified information elements or parts of information elements which may be added or removed by the Gateway, as required.

In the following, an overview of the actions to be taken by the Gateway in response to Q.931 messages and the information elements, is provided. Messages and information elements that are forbidden in H.225.0 are not considered.

Q.931 messages originating on the H.323 side:

- A SETUP message side shall lead to initiation of call setup procedure for the SCN side contingent upon proper endpoint authorization to use the Gateway and the approval of a Gatekeeper via the ARQ/ACF sequence if the Gateway is registered to one.
- A RELEASE COMPLETE shall lead to initiation of the call disconnect as defined for the SCN side.
- A CALL PROCEEDING message shall be forwarded to the SCN side. This shall not be done if a CALL PROCEEDING has been sent before to the SCN in compliance to the respective SCN specification (Q.931 in the ISDN case).
- A CONNECT message shall be forwarded to the SCN side upon receipt from an H.323 endpoint if it has not already been sent.
- The Gateway is required to respond to a calling H.323 endpoint in either CONNECT, RELEASE COMPLETE, CALL PROCEEDING or ALERTING. Hence, if the connection on the SCN takes longer than the H.225.0 specified time-out, CALL PROCEEDING shall be sent to the calling H.323 endpoint.
- A CONNECT ACKNOWLEDGE message shall be sent to the SCN in compliance with the respective SCN specification. CONNECT ACKNOWLEDGE is forbidden on the LAN.
- Messages for supplementary services (FACILITY, NOTIFY, and the INFORMATION messages) that are not processed by the Gateway, should be forwarded to the SCN side.
- All messages forbidden to be originated from an H.323 endpoint shall be generated by the Gateway autonomously as required by the SCN protocol.

The information elements of the respective messages are to be converted as follows:

- The contents of connection specific information elements (such as Call Reference Value) shall be adapted as required by the SCN protocol.
- Information elements that are not in use on the H.323 side shall be generated by the Gateway as required by the SCN protocol.
- Translation of other information elements shall be done as required by the SCN protocols and procedures. Where interoperability is not an issue, conversion is left to the discretion of the manufacturer.

- Only the user-data part of the user-user information element shall be forwarded to the SCN side. It shall be re-encoded following Figure 4-36/Q.931 and Table 4-26/Q.931.

All call signalling messages originating on the SCN side should be forwarded to the H.323 endpoint without modification except for the following:

- Messages forbidden by Table 4/H.225.0 shall not be passed to the H.323 side.
- The call reference value shall be mapped to the appropriate value for the H.323 side.
- The user data field is copied into the corresponding ASN.1 user-user information element structure.
- The user-user information element structure shall be generated according to the specification in ITU-T Rec. H.225.0.

A.7 Inward and outward calling

A.7.1 Inward calling

There are many strategies for accepting a H.320 call from the SCN, determining the H.323 endpoint which is being dialled, and routing a call to the desired destination. Some example methods include H.320 BAS code processing, Direct Inward Dialling (DID), Multiple Subscriber Number (MSN), and ISDN sub-addressing.

A.7.1.1 H.320 BAS Code processing

When accepting a call from the SCN and using the H.320 BAS Code method for extracting the destination location, the Gateway should have multiple strategies for querying the calling endpoint for an extension. Although H.230 includes TCS-4 (Request Remote Extension) and its associated response, many existing H.320 systems do not support this optional H.320 request. To account for this, a Gateway should have the capability to prompt for an extension via an audio prompt and then collect the extension via DTMF signalling.

To accomplish this, a Gateway may request a remote extension from a caller via the TCS-4 command at the same time it plays an audio prompt requesting the extension information. The Gateway should then be prepared to retrieve the intended destination by either DTMF tone detection or by the reception of an IIS message indicating the desired H.323 endpoint. If the endpoint does not provide the intended location by either method, the Gateway should route the call to an operator or have some other means to deal with the inbound call.

NOTE – TCS-4/IIS support is mandatory for a H.323 to H.320 Gateway. DTMF support is optional for a H.323 to H.320 Gateway.

A.7.1.2 Calling an H.323 MC

If a H.323 Gateway connects an inbound H.320 call to a H.323 endpoint that has an active MC, the Gateway should act as an MCU to its attached H.320 endpoint.

H.323 Gateways should pass the H.245 multipointConference command from the H.323 link to the H.320 link as a H.230 MCC command when it is received. Failure to do so could lead to interoperability problems for H.320 endpoints participating in a H.323 multipoint call.

A.7.2 Outward calling

A.7.2.1 Calling an H.320 MCU

A H.323 Gateway should determine the type of H-Series device it is connecting with before it responds to a H.323 setup message. If the H-Series device is a MCU, then the Gateway should indicate that it is a H.323 MCU in its H.245 Master/Slave terminal type. In this situation, the T.120 top provider will either be in the H-Series MCU, or be in an MCU which is cascaded to it. If the H-series device is not an MCU, then the Gateway should signal that it has no MC. If the H.323

endpoint has an active MC, then the Gateway should act as an MCU to its attached H-Series endpoint.

Failing to alter the device type in the H.245 Master/Slave negotiation, can lead to a situation where a H.323 terminal becomes the MC of a conference in which it is attached to a H.320 MCU through a Gateway. While this call can operate if the Gateway shields the two sides of the call from each other, it cannot handle requested mode changes by the MCU like switching from CIF to QCIF unless the Gateway can transcode or the terminal, which could think it is a MC, has advertised transmit capabilities and is willing to accept a request mode command.

H.323 Gateways should pass the H.230 MCC command from the H.320 link to the H.323 link as a H.245 multipointConference command when it is received. Failure to do so could lead to interoperability problems for H.323 endpoints participating in a H.320 multipoint call.

A.7.2.2 Calling another Gateway

To allow for the case of a H.323 endpoint dialling through two Gateways and then back to another H.323 terminal, a H.320 to H.323 Gateway shall support the TCS4/IIS H.230 BAS commands so that the remote extension can be passed between the Gateways.

A.8 Securing encrypted connections between H.320 and H.323 terminals

For further study.

Annex C

ISDN User Part function – H.225.0 interworking

C.1 Methodology

C.1.1 General

The procedures and elements of information that are not carried over the international interface (i.e., are defined for national use) are not described in this Recommendation, except for the interworking cases of the calling party number, connected number, generic digits and redirection number when the national number can be used.

The elements of information (parameters, information elements, and messages) that are of local significance only (i.e., are not mapped onto elements of information in the other signalling system) are not mentioned.

Moreover, only the parameters and indicators being a matter of interworking are described. Hence, no information is given concerning, for example, the satellite indicator, continuity check indicator, echo control device indicator, or propagation delay counter parameter.

In the same way, information to be sent in case of local fallback or local rejection of Supplementary Services is not relevant to interworking and therefore is not mentioned.

C.1.2 ISUP segmentation

Some ISUP messages may indicate that they are followed by a Segmentation Message (SGM). The actions described in this Recommendation on receipt of such messages take place only after the completion of the segmentation procedure specified in 2.1.12/Q.764 [1].

Regarding statements in this text that a parameter is received in an ISUP message, in case of segmentation, that parameter could be received in the segmentation message (SGM) as well.

The ISUP messages, which can be segmented, and the ISUP parameters, which can be conveyed in a segmentation message (SGM), are described in 2.1.12/Q.764 [1].

C.1.3 H.225.0 segmentation

Segmentation is not supported in ITU-T Rec. H.225.0.

C.1.4 Handling of the cause and location fields

NOTE – ITU-T Rec. Q.850 [2] does not mention ITU-T Rec. H.225.0. However as it is based on Q.931/DSS1, the coding in ITU-T Rec. Q.850 is relevant.

When a cause parameter or information element is to be sent by the exchange, only the cause value is given in the text; the location indication is coded according to [2].

When a progress indicator information element is to be sent by the exchange, only the progress description is given in the text; the location indication is coded according to [2].

The handling of the diagnostic received in a cause parameter or in a cause information element is described in [2].

C.1.5 Services interactions

Impacts of services interactions on interworking are not described.

C.1.6 Reference model

Reference points S and T are described in ITU-T Rec. I.411. The T reference point best represents the interworking function. A coincident S and T reference best describe the functionality where an MCU and interworking function are involved in a call.

C.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.

- [1] ITU-T Recommendation Q.764 (1999), *Signalling System No. 7 – ISDN User Part signalling procedures, plus Amendment 2 (2002), Support for the International Emergency Preference Scheme.*
- [2] ITU-T Recommendation Q.850 (1998), *Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN user part.*
- [3] ITU-T Recommendation Q.931 (1998), *ISDN user-network interface layer 3 specification for basic call control.*
- [4] ITU-T Recommendation Q.732.2-5 (1999), *Stage 3 description for call offering supplementary services using Signalling System No. 7 – Call diversion services:*
 - Q.732.2, *Call forwarding busy (CFB).*
 - Q.732.3, *Call forwarding no reply (CFNR).*
 - Q.732.4, *Call forwarding unconditional (CFU).*
 - Q.732.5, *Call deflection (CD).*
- [5] ITU-T Recommendation Q.733, *Stage 3 description for call completion supplementary services using Signalling System No. 7:*
 - Q.733.2 (1993), *Call Hold (HOLD).*
 - Q.733.4 (1993), *Terminal Portability (TP).*
- [6] ITU-T Recommendation H.323 (2006), *Packet-based multimedia communications systems.*
- [7] ITU-T Recommendation H.225.0 (2006), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems.*
- [8] ITU-T Recommendation H.450.1 (1998), *Generic functional protocol for the support of supplementary services in H.323.*
- [9] ITU-T Recommendation H.450.2 (1998), *Call transfer supplementary service for H.323.*
- [10] ITU-T Recommendation H.450.3 (1998), *Call diversion supplementary service for H.323.*
- [11] ITU-T Recommendation H.450.4 (1999), *Call hold supplementary service for H.323.*
- [12] ITU-T Recommendation H.450.5 (1999), *Call park and call pickup supplementary services for H.323.*
- [13] ITU-T Recommendation H.450.6 (1999), *Call waiting supplementary service for H.323.*
- [14] ITU-T Recommendation H.450.7 (1999), *Message waiting indication supplementary service for H.323.*
- [15] ITU-T Recommendation H.450.8 (2000), *Name identification supplementary service for H.323.*
- [16] ITU-T Recommendation I.411 (1993), *ISDN user-network interfaces – Reference configurations.*

- [17] ITU-T Recommendation Q.953.4 (1995), *Stage 3 description for call completion supplementary services using DSSI: Terminal Portability (TP)*.
- [18] ITU-T Recommendation Q.731.1 (1996), *Stage 3 description for number identification supplementary services using Signalling System No. 7: Direct-Dialling-In (DDI)*.
- [19] ITU-T Recommendations Q.951.x, *Stage 3 description for number identification supplementary services using DSSI*.
- [20] ITU-T Recommendation H.460.5 (2002), *H.225.0 transport of multiple Q.931 information elements of the same type*.
- [21] ITU-T Recommendation H.460.4 (2002), *Call priority designation for H.323 calls*.
- [22] ITU-T Recommendation E.106 (2003), *International Emergency Preference Scheme (IEPS) for disaster relief operations*.

C.3 Abbreviations

This Recommendation uses the following abbreviations:

3PTY	Three-Party Service
ACM	Address Complete Message
ANM	Answer Message
ATP	Access Transport Parameter
BC	Bearer Capability information element
CGB	Circuit Group Blocking message
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
CON	Connect message
CPAP	Connected Party Address Presentation
CPG	Call Progress message
CUG	Closed User Group
CW	Call Waiting
DDI	Direct-Dialling-In
FAA	Facility Accept message
FAR	Facility Request message
FRJ	Facility Reject message
GRS	Circuit Group ReSet message
HLC	High Layer Compatibility information element
HOLD	Call HOLD
IAM	Initial Address Message
IE	Information Element
IEPS	International Emergency Preference Scheme

ind.	indicator
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
MLPP	Multi-Level Precedence and Pre-emption
MSN	Multiple Subscriber Number
p.i.	progress indicator information element
REL	Release message
RES	Resume message
RSC	ReSet Circuit message
SAM	Subsequent Address Message
SGM	Segmentation Message
SUB	Subaddressing
SUS	Suspend message
TMR	Transmission Medium Requirement parameter
TMU	Transmission Medium Used parameter
TP	Terminal Portability
USI	User Service Information parameter
USR	User-to-user information message
UUS	User-to-User signalling

C.4 Conventions

ISUP messages appear in lower case. H.225.0 messages appear in upper case.

C.5 ISUP to H.225.0 mapping

C.5.1 Messages

See Table C.1.

Table C.1/H.246 – Mapping of external ISUP messages to internal H.225.0 messages

ISUP message	H.225.0 message
Initial address message (IAM)	SETUP
Address complete (ACM)	CALL PROCEEDING
	PROGRESS
	ALERTING
	FACILITY
Call Progress (CPG)	PROGRESS
	ALERTING
	NOTIFY
	FACILITY
Subsequent Address (SAM)	INFORMATION
Answer (ANM)	CONNECT
Connect (CON)	
Facility (FAC)	NA
Facility request (FAR)	
Facility accept (FAA)	
Facility reject (FRJ)	
Information (INF)	
Confusion	
Information request (INR)	
Identification request (IDR)	NA (see C.6.1.15)
Release (REL)	RELEASE COMPLETE
Release Complete (RLC)	NA
Suspend (SUS)	NA
Resume (RES)	NA

C.5.2 Parameters

NOTE – NA (not available) in Table C.2 indicates that ITU-T Rec. H.225.0 does not support the parameter or the functionality the parameter provides.

Table C.2/H.246 – Mapping of ISUP parameters to H.225.0 information elements

ISUP parameter	H.225.0 information element
Access delivery information	NA
Access transport	May contain H.225.0 parameters: Progress Indicator Called party subaddress Calling party subaddress Connected subaddress
Automatic congestion level	NA
Backward call indicators	NA
Call diversion information	Notification indicator (non-H.450.3 endpoint) divertingLegInformation1 (H.450.3 endpoint) – see Tables C.29, C.30, C.31
Call history information	NA
Call reference	NA
Called party number	Called party number
Calling party's category	Call Priority Designation Parameter (ITU-T Rec. H.460.4)
Calling party number	Calling party number or sourceAddress
Circuit state indicator	NA
Circuit group supervision message type indicator	NA
Closed user group interlock code	NA
Connected number	Connected number
Connection request	NA
Continuity indicators	NA
Echo control information	NA
End of optional parameters	NA
Event information	NA
Facility indicator	NA
Forward call indicators	FFS
Generic digits	NA
Generic notification indicator	Notification indicator (non-H.450.3 endpoint) divertingLegInformation1 (H.450.3 endpoint) – see Tables C.29, C.30
Generic number – Additional Calling Party Number	Calling Party Number
Hop counter	NA
Information indicators	NA
Information request indicators	NA
Location number	NA

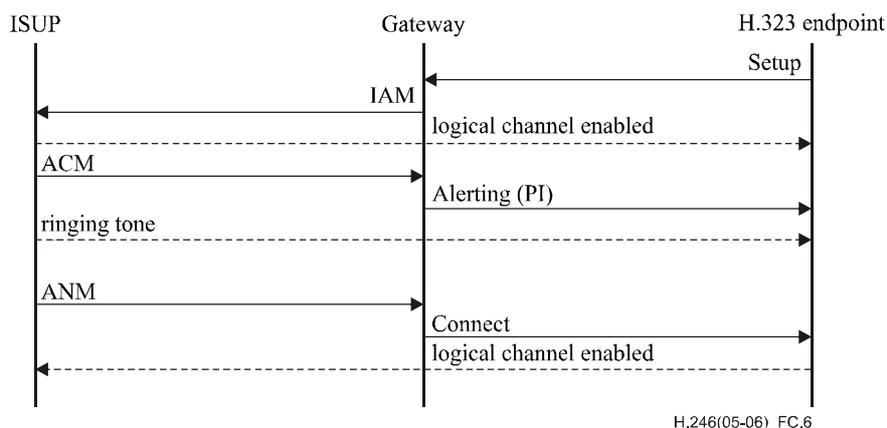
Table C.2/H.246 – Mapping of ISUP parameters to H.225.0 information elements

ISUP parameter	H.225.0 information element
MCID request indicator	NA
MCID response indicator	NA
Message compatibility information	NA
MLPP precedence	NA
Nature of connection indicators	NA
Network-specific facilities	NA
Optional backward indicators	NA
Optional forward indicators	NA
Original called number	divertingLegInformation2 (H.450.3 endpoint)
Origination ISC point code	NA
Parameter compatibility information	NA
Propagation delay counter	NA
Range and status	NA
Redirecting number	divertingLegInformation2 (H.450.3)
Redirection information	divertingLegInformation2 (H.450.3 endpoint)
Redirection number	divertingLegInformation2 (H.450.3 endpoint) – see Table C.31
Redirection number restriction	divertingLegInformation1 (H.450.3 endpoint) – see Table C.31
Remote operation	FFS
Service Activation	NA
Signalling point code	NA
Subsequent number	Called party number
Suspend/Resume indicators	FFS
Transit network selection	NA
Transmission medium requirement	NA
Transmission medium requirement prime	NA
Transmission medium used	NA
User Service Information	Bearer capability
User Service Information prime	NA
User Teleservice Information	FFS
User-to-user Indicators	NA
User-to-user Information	User Data

C.6 Outgoing call – Interworking from H.225.0 to ISUP

In traditional telephone networks, through-connect occurs very early in the call (before the called party answers) to provide tones or announcements, and to eliminate clipping on answer while the voice channel is being connected end-to-end. Clause 8.1.7.4/H.323 describes the behaviour for early through-connect (that is, through-connect before the H.225.0 CONNECT message).

For calls from the packet network to the circuit network, the best behaviour would be to through-connect in the backward direction on IAM, and on the forward direction on answer (to avoid fraud):



The notation "Alerting (PI)" indicates the presence of the progress indicator as described in 8.1.7.4/H.323.

C.6.1 Basic call

C.6.1.1 Sending of the Initial Address Message (IAM)

When the interworking function has received from the calling user in a SETUP message (possibly followed by other H.225.0 messages) enough information to determine that the call is to be routed over the SS7 network, the gateway shall select a suitable, free, inter-exchange circuit and send an Initial Address Message (IAM).

The coding of the Initial Address Message (IAM) according to the SETUP message is described hereafter.

NOTE – The coding of the Initial Address Message (IAM) sent by a forwarding exchange is described in 2.5.2.5/Q.732.2-5 [4]. The parameters used in such a case are not mentioned hereafter.

C.6.1.1.1 Mandatory parameters

Forward call indicators

bit A National/international call indicator
0 *call to be treated as a national call.*

This bit may be set to "1" for international calls in the case where the H.323 network component routes a call across a national boundary.

bit D Interworking indicator
0 *no interworking encountered (No. 7 signalling all the way). Set for H.323 terminated or originated calls. Set when originating endpoint type is NOT a gateway*
1 *interworking encountered. Set for H.323 trunked calls set; when originating endpoint type indicates a gateway*

If bit D set to "0", then bits FHGI should be set as below:

bit F ISDN User Part indicator
1 *ISDN User Part used all the way*

bits	HG	ISDN User Part preference indicator
	1 0	<i>ISDN User Part required all the way</i> if required by the invoked telematic teleservices or Supplementary Services or by ITU-T Rec. E.172
	0 0	<i>ISDN User Part preferred all the way otherwise</i>
bit	I	ISDN access indicator
	1	<i>originating access ISDN</i>

ITU-T Rec. H.225.0 does not support the transmission of the Forward Call Indicators and as such the interworking function shall decide what to send in the IAM message.

Calling party's category

Coded according to internal data of the interworking unit, except when the H.460.4 [21] Call Priority designation parameter is included in the SETUP message and it indicates a priority value of emergencyAuthorized. In this case, one of the following scenarios applies:

- a) For an internal national gateway: If an internal national gateway receives a Call Priority designation parameter set to emergencyAuthorized, call establishment proceeds with priority. The CPC parameter in the outgoing IAM message should be set to the IEPS call marking value (0000 1110 [14]) or to a nationally assigned emergency call value. The actions taken on the ISUP side are described in 2.1.1.4 e/Q.764 [1] except that the ACM would be replaced by a Call Proceeding on the H.323 side.
- b) For an outbound international gateway: If an outgoing international gateway receives a Call Priority designation parameter set to emergencyAuthorized, call establishment proceeds with priority. The CPC parameter in the outgoing IAM message should be set to the IEPS call marking value (0000 1110 [14]) or to a nationally assigned emergency call value. The actions taken on the ISUP side are described in 2.1.1.3 e/Q.764 [1] except that the ACM would be replaced by a Call Proceeding on the H.323 side.
- c) For an inbound international gateway: If an inbound international gateway receives a Call Priority designation parameter set to emergencyAuthorized, and if there is a bilateral agreement between governmental authorities to support IEPS, then call establishment proceeds with priority. The CPC parameter in the outgoing IAM message should be set to the IEPS call marking value (0000 1110 [14]) or to a nationally assigned emergency call value. The actions taken on the ISUP side are described in 2.1.1.5 e/Q.764 [1] except that the ACM would be replaced by a Call Proceeding on the H.323 side.
- d) For an intermediate international gateway: If an intermediate international exchange receives a Call Priority designation parameter set to emergencyAuthorized, call establishment proceeds with priority. The CPC parameter in the outgoing IAM message should be set to the IEPS call marking value (0000 1110 [14]) or to a nationally assigned emergency call value. The actions taken on the ISUP side are described in 2.1.1.4 e/Q.764 [1] except that the ACM would be replaced by a Call Proceeding on the H.323 side.

Transmission medium requirement

The transmission medium requirement parameter is coded as described in Table C.3.

Table C.3/H.246 – Coding of the transmission medium requirement parameter (TMR) One BC received

SETUP→		IAM→
Bearer capability information element		Transmission medium requirement parameter
Information transfer capability	Information transfer rate	
<i>Speech</i>	Value non-significant	<i>Speech</i>
<i>3.1 kHz audio</i>	Value non-significant	<i>3.1 kHz audio</i>
<i>Restricted digital information</i>	For further studies	For further studies
<i>Unrestricted digital information</i>	<i>64 kbit/s unrestricted</i>	<i>FFS</i>
	<i>2 × 64 kbit/s unrestricted</i>	<i>2 × 64 kbit/s</i>
	<i>384 kbit/s unrestricted</i>	<i>384 kbit/s</i>
	<i>1536 kbit/s unrestricted</i>	<i>1536 kbit/s</i>
	<i>1920 kbit/s unrestricted</i>	<i>1920 kbit/s</i>
	<i>Multirate: 6 × 64 kbit/s</i>	<i>384 kbit/s</i>
	<i>Multirate: 24 × 64 kbit/s</i>	<i>1536 kbit/s</i>
	<i>Multirate: 30 × 64 kbit/s</i>	<i>1920 kbit/s</i>
NOTE – For a call originated from an H.323 endpoint, the Rate Multiplier shall be used to indicate the bandwidth to be used for this call. If a gateway is involved, then this value shall reflect the number of external connections to be set up. The bandwidth needed for the call is the bandwidth needed on the SCN side, and may or may not match the bandwidth allowed on the packet-based network by the ACF H.225.0 RAS messages.		

Called party number

- Nature of address indicator:
According to the type of number field in the called party number information element and internal data of the originating exchange.
- Internal network number indicator:
1 *routing to internal network number not allowed*
- Numbering plan indicator:
001 *ISDN (telephony) numbering plan (ITU-T Rec. E.164)*
- Address signal:
According to the called number information received in the SETUP, INFORMATION or H.225.0 ACF messages.

NOTE – When the *Numbering plan identification* information element is received and it indicates "1001" (Private Numbering Plan) in a packet-based network originated call, this indicates that:

- 1) the E.164 address is not present in SETUP; and
- 2) the call will be routed via an alias address in the user-to-user information which must be a public number, otherwise the call must be cleared.

User-to-user information

The user-to-user information element contains the Setup-UUIE defined in the H.225.0 Message Syntax. The Setup-UUIE may include the following (see Table C.4):

Table C.4/H.246 – User-to-user information received from H.225.0

SETUP→	IAM→
Content	
User Data	User-to-user

Location number

This parameter is sent only if the parameter LocationSourceAddress is present inside the SETUP message.

- Nature of address indicator:
According to the field PublicTypeOfNumber in the alias address of the LocationSourceAddress parameter.
- Internal network number indicator:
1 *routing to internal network number not allowed*
- Numbering plan indicator:
001 *ISDN (telephony) numbering plan (ITU-T Rec. E.164)*
- Address presentation restricted indicator:
According to the field presentationIndicator of the LocationSourceAddress parameter.
- Address screening indicator:
According to the field screeningIndicator of the LocationSourceAddress parameter.
- Address signal:
According to the LocationSourceAddress parameter received in the SETUP.

C.6.1.1.2 Optional parameters

Calling party number

See Table C.5.

Table C.5/H.246 – Calling party number

SETUP →	IAM →
Source Address	If aliasaddress is E.164 or party number, copy to Calling Party Number

See C.6.2.1.1 and C.6.2.1.2.

Optional forward call indicators

- bits BA Closed user group call indicator:
 0 (Not applicable)
- bit H Connected line identity request indicator:
 Shall be set to "0" unless it can be determined that the User has Connected Party Address Presentation. See C.6.2.3.

Closed user group interlock code

Not applicable.

Connection request

Not applicable.

Access transport

If progress indicator is present in a SETUP message, the Access transport contains this progress indicator.

The High layer compatibility and Low layer compatibility is FFS.

Called Party subaddress and Calling Party subaddress may be mapped to the IAM Access Transport parameter.

User service information

See Table C.6.

Table C.6/H.246 – Coding of the user service information parameter (USI)

SETUP→	IAM→
Content	User service information parameter
BC	BC (Note)
NOTE – The BC should be the same as that received in the SETUP with the exception of when the BC is 1 × 64 k. 1 × 64 k BC is for further study.	

User-to-user indicators

NA.

Generic number

See C.6.2.1.

User service information prime

This parameter is present only if two bearer capability information elements are received and if no fallback occurs in the originating exchange. H.225.0 cannot generate 2 bearer capabilities therefore USI prime will not be generated.

User teleservice information

FFS.

Generic notification

See C.6.2.6.

Transmission medium requirement prime

This parameter is present only if two bearer capability information elements are received and if no fallback occurs in the originating exchange. H.225.0 cannot generate 2 BCs, therefore TMR prime is not supported.

MLPP precedence

NA.

C.6.1.2 Sending of the Subsequent Address Message (SAM)

If the initial address message has already been sent, and if the originating endpoint or Gatekeeper has not determined that the called number information received was complete, the receipt of an

INFORMATION message containing additional digits causes the sending of a Subsequent Address Message (SAM).

C.6.1.3 Receipt of the Address Complete Message (ACM)

C.6.1.3.1 ACM with a cause parameter

See Table C.7.

Table C.7/H.246 – Receipt of ACM with a cause parameter

←PROGRESS	←ACM
Cause information element (Note 1) Progress indicator No. 8 (Note 2)	Cause parameter Optional backward call indicators parameter In-band information ind. <i>In-band info...</i>
NOTE 1 – If the cause value received in the Address Complete Message (ACM) is unknown in H.225.0, the unspecified cause value of the class is sent.	
NOTE 2 – The progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) is only sent if the BC received in the SETUP message is coded <i>speech or 3.1 kHz audio</i> .	
NOTE 3 – If a bearer is available, then end interwork should apply the far-end tone/announcement.	

C.6.1.3.2 ACM without the cause parameter

Upon receiving an address complete message, the interworking function shall send a message across the H.323 network to the calling user, as described in Table C.8.

Table C.8/H.246 – Message sent to the H.225.0 upon receipt of ACM

←Message sent to the H.225.0	←ACM
	Backward call indicators parameter Called party's status indicator
CALL PROCEEDING when not sent before (Note 1), otherwise: – PROGRESS if a progress indicator information element is to be sent (Note 2) – No message if no progress indicator information element is to be sent (Note 2)	00 <i>No indication</i>
ALERTING	01 <i>Subscriber free</i> (Note 3)
NOTE 1 – The receipt from the network of an Address Complete Message (ACM) without the <i>subscriber free</i> indication is interpreted by the network as a sending complete indication, in the case where the network could not determine it before.	
NOTE 2 – The sending of a progress indicator information element is described below.	
NOTE 3 – The FACILITY message may be used anyway by the interworking function to transfer H.225.0 internal information, e.g., the fastStart parameter. For the coding of the FACILITY message, see Table 16/H.225.0 [7].	

The backward message sent to the calling user (ALERTING, CALL PROCEEDING or PROGRESS message) is coded as follows.

Bearer capability

When an ACM will not contain a bearer capability, the interworking function may generate an appropriate bearer capability in case there is a terminal involved in the call.

Progress indicator

Progress indicator information elements possibly present in the access transport parameter of the Address Complete Message (ACM) are transferred into the message sent to the calling user. If the calling user is an H.323 end system, it need not interpret this information element.

In addition, progress indicator information elements are created by the Interworking function according to the coding of the Address Complete Message (ACM). Table C.9 shows the sending criteria of each value.

By performing the conversion specified in ITU-T Rec. H.460.5 [20], every message sent to the access (ALERTING, CALL PROCEEDING or PROGRESS) can contain two or more progress indicator information elements.

See Table C.9.

Table C.9/H.246 – Sending criteria of the progress indicator information elements created by the interworking function

←H.225.0 Message sent (See Table C.8)	←ACM
Progress indicator information element	Content
No. 1 <i>(Call is not end-to-end ISDN: further call progress information may be available in-band)</i>	Backward call indicators parameter ISDN User Part indicator 0 <i>ISDN User Part not used all the way</i>
No. 2 <i>(Destination address is non-ISDN)</i>	Backward call indicators parameter ISDN User Part indicator 1 <i>ISDN User Part used all the way</i> ISDN access indicator 0 <i>Terminating access non-ISDN</i>
No. 8 (Note) <i>(In-band information or an appropriate pattern is now available)</i>	Optional backward call indicators parameter In-band information indicator 1 <i>In-band info...</i>
NOTE – The progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) is only sent if the BC received in the SETUP message is coded <i>speech</i> or <i>3.1 kHz audio</i> .	

High layer compatibility

FFS.

Notification indicator

NA.

Call diversion information

See C.6.2.6.

Redirection number restriction

See C.6.2.6

Redirection number

See C.6.2.6.

Facility

See C.6.2.

User-to-user

The user-to-user information element contains the CallProceeding-UUIE defined in the H.225.0 Message Syntax.

This information element is mandatory in the CALL PROCEEDING message.

The user-to-user information element contains the Alerting-UUIE defined in the H.225.0 Message Syntax.

Handling of fallback information

Fallback procedures are not defined in ITU-T Rec. H.225.0. An ACM should not be received with TMU as H.323 network will not send it in the forward direction.

C.6.1.4 Receipt of the Call Progress message (CPG)

C.6.1.4.1 CPG with a cause parameter

See Table C.10.

Table C.10/H.246 – Receipt of CPG with a cause parameter

←PROGRESS	←CPG
Cause information element (Note 1)	Cause parameter
Progress indicator No. 8 (Note 2)	Event information parameter Event indicator <i>In-band info...</i> or Optional backward call indicators parameter In-band information ind. <i>In-band info...</i>
NOTE 1 – If the cause value received in the Call Progress Message (CPG) is unknown in ITU-T Rec. H.225.0, the unspecified cause value of the class is sent. NOTE 2 – The progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) is only sent if the BC received in the SETUP message is coded <i>speech</i> or <i>3.1 kHz audio</i> . NOTE 3 – If the bearer is established, the interwork function should initiate far-end tone/announcement.	

User-to-user

The user-to-user information element contains the ReleaseComplete-UUIE defined in the H.225.0 Message Syntax.

C.6.1.4.2 CPG without the cause parameter

Upon receiving a Call Progress message (CPG), the exchange shall send a message across the user-network interface to the calling user, as described in Table C.11.

Table C.11/H.246 – Message sent to the H.225.0 upon receipt of CPG

←H.225.0 Message sent	←CPG	
	Event information parameter Event indicator	
ALERTING when not sent before, otherwise: – PROGRESS if a progress indicator information element is to be sent (Note) – No message if no progress indicator information element is to be sent (Note)	000 0001	<i>(alerting)</i>
– PROGRESS if a progress indicator information element is to be sent (Note) – No message if no progress indicator information element is to be sent (Note)	000 0010 or 000 0011	<i>(progress)</i> <i>(in-band information or an appropriate pattern is now available)</i>
NOTE – The sending of a progress indicator information element is described below.		

The backward message sent to the calling user (ALERTING or PROGRESS message) is coded as follows.

Bearer capability

When a CPG will not contain a bearer capability, the interworking function may generate an appropriate bearer capability in case there is a terminal involved in the call.

Progress indicator

Progress indicator information elements possibly present in the access transport parameter of the Call Progress Message (CPG) are transferred into the message sent to the calling user. If the calling user is an H.323 end system, it need not interpret this information element.

In addition, progress indicator information elements are created by the interworking function according to the coding of the Call Progress Message (CPG). Table C.12 shows the sending criteria of each value.

By performing the conversion specified in ITU-T Rec. H.460.5 [20], every message sent to the access (ALERTING or PROGRESS) can contain two or more progress indicator information elements.

Table C.12/H.246 – Sending criteria of the progress indicator information elements created by the interworking function

←H.225.0 Message sent (See Table C.11)	←CPG
Progress indicator information element	Content (Note 2)
No. 1 <i>(Call is not end-to-end ISDN: further call progress information may be available in-band)</i>	Backward call indicators parameter ISDN User Part indicator 0 <i>ISDN User Part not used all the way</i>
No. 2 <i>(Destination address is non-ISDN)</i>	Backward call indicators parameter ISDN User Part indicator 1 <i>ISDN User Part used all the way</i> ISDN access indicator 0 <i>Terminating access non-ISDN</i>
No. 4 <i>(Call has returned to the ISDN)</i>	Backward call indicators parameter ISDN User Part indicator 1 <i>ISDN User Part used all the way</i> ISDN access indicator 1 <i>Terminating access ISDN whereas the last indication received was "0", Terminating access non-ISDN</i>
No. 8 (Note 1) <i>(In-band information or an appropriate pattern is now available)</i>	Event information parameter Event indicator 000 0011 <i>In-band info ...</i>
No. 8 (Note 1) <i>(In-band information or an appropriate pattern is now available)</i>	Optional backward call indicators parameter In-band information indicator 1 <i>In-band info ...</i>
NOTE 1 – The progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) is only sent if the BC received in the SETUP message is coded <i>speech</i> or <i>3.1 kHz audio</i> .	
NOTE 2 – The mapping of the contents in the CPG message is only relevant if the information received in the message is different compared to earlier received information, e.g., in the ACM message or a CPG message received prior to this message.	

High layer compatibility

FFS.

Notification indicator

NA.

Call diversion information

See C.6.2.6.

Redirection number restriction

See C.6.2.6.

Redirection number

See C.6.2.6.

Facility

See C.6.2.

User-to-user

The user-to-user information element contains the Alerting-UUIE defined in the H.225.0 Message Syntax.

The user-to-user information element contains the Progress-UUIE defined in the H.225.0 Message Syntax.

Handling of fallback information

Fallback procedures are not defined in ITU-T Rec. H.225.0. A CPG should not be received with TMU, as H.323 network will not send it in the forward direction.

C.6.1.5 Receipt of the Answer Message (ANM)

Upon receipt of an Answer Message (ANM), the interworking function shall send a CONNECT message across the H.225.0 interface to the calling user.

The CONNECT message is coded as follows.

Bearer capability

When an ANM will not contain a bearer capability, the interworking function may generate an appropriate bearer capability in case there is a terminal involved in the call.

Progress indicator

Progress indicator information elements possibly present in the access transport parameter of the Answer Message (ANM) are transferred into the CONNECT message sent to the calling user. If the calling user is an H.323 end system, it need not interpret this information element.

In addition, progress indicator information elements are created by the interworking function according to the coding of the backward call indicators parameter possibly received in the Answer Message (ANM). Table C.13 shows the sending criteria of each value.

By performing the conversion specified in ITU-T Rec. H.460.5 [20], the CONNECT message sent to the access can contain two or more progress indicator information elements.

Table C.13/H.246 – Sending criteria of the progress indicator information elements created by the interworking function

←CONNECT	←ANM
Progress indicator information element	Content
No. 1 <i>(Call is not end-to-end ISDN: further call progress information may be available in-band)</i>	Backward call indicators parameter ISDN User Part indicator 0 <i>ISDN User Part not used all the way</i>
No. 2 <i>(Destination address is non-ISDN)</i>	Backward call indicators parameter ISDN User Part indicator 1 <i>ISDN User Part used all the way</i> ISDN access indicator 0 <i>terminating access non-ISDN</i>
No. 4 <i>(Call has returned to the ISDN)</i>	Backward call indicators parameter ISDN User Part indicator 1 <i>ISDN User Part used all the way</i> ISDN access indicator 1 <i>terminating access ISDN</i> whereas the last indication received was "0" <i>terminating access non-ISDN</i>

High layer compatibility

FFS.

Low layer compatibility

FFS.

Notification indicator

NA.

Call diversion information

See C.6.2.6.

Redirection number restriction

See C.6.2.6.

Redirection number

See C.6.2.6.

Facility

See C.6.2.

User-to-user

The user-to-user information element contains the Connect-UUIE defined in the H.225.0 Message Syntax.

Connected number

See C.6.2.3.

Connected subaddress

See C.6.2.3.

Handling of fallback information

Fallback procedures are not defined in ITU-T Rec. H.225.0. An ANM should not be received with TMU as H.323 network will not send it in the forward direction.

C.6.1.6 Receipt of the Connect message (CON)

Upon receiving a Connect message (CON), the interworking function shall send a CONNECT message across H.225.0 interface to the calling user.

The CONNECT message is coded as follows.

Bearer capability

When a CON will not contain a bearer capability, the interworking function may generate an appropriate bearer capability in case there is a terminal involved in the call.

Progress indicator

Progress indicator information elements possibly present in the access transport parameter of the Connect message (CON) are transferred into the CONNECT message sent to the calling user. If the calling user is an H.323 end system, it need not interpret this information element.

By performing the conversion specified in ITU-T Rec. H.460.5 [20], the CONNECT message sent to the access can contain two or more progress indicator information elements.

High layer compatibility

FFS.

Low layer compatibility

FFS.

Notification indicator

NA.

Call diversion information

See C.6.2.6.

Redirection number restriction

See C.6.2.6.

Redirection number

See C.6.2.6.

Facility

See C.6.2.

User-to-user

The user-to-user information element contains the Connect-UUIE defined in the H.225.0 Message Syntax.

Connected number

See C.6.2.3.

Connected subaddress

See C.6.2.3.

Handling of fallback information

Fallback procedures are not defined in ITU-T Rec. H.225.0. A CON should not be received with TMU as H.323 network will not send it in the forward direction.

C.6.1.7 Receipt of the Release message (REL)

Cause

See Table C.14.

Table C.14/H.246 – Receipt of the Release message (REL)

←RELEASE COMPLETE (Note 1)	←REL
Cause information element	Cause parameter
Cause value No. x (Note 2)	Cause value No. x

NOTE 1 – If the cause value received in the Release message (REL) is unknown in ITU-T Rec. H.225.0, the unspecified cause value of the class is sent.

NOTE 2 – Mapping the Cause Value to ReleaseCompleteReason is not required as packet-based network entities are required to decode the Cause IE.

User-to-user

The user-to-user information element contains the ReleaseComplete-UUIE defined in the H.225.0 Message Syntax. The handling of the other parameters is described in C.6.2.

C.6.1.8 Sending of the Release message (REL)

See Table C.15.

Table C.15/H.246 – Call clearing from the user

RELEASE COMPLETE→	REL→
Cause information element	Cause parameter
Cause value No. x	Cause value No. x
ReleaseCompleteReason	Cause parameter
noBandwidth	34 – No circuit/channel available
gatekeeperResources	47 – Resource unavailable, unspecified
unreachableDestination	3 – No route to destination
destinationRejection	16 – Normal call clearing
invalidRevision	88 – Incompatible destination
noPermission	127 – Interworking, unspecified
unreachableGatekeeper	38 – Network out of order
gatewayResources	42 – Switching equipment congestion
badFormatAddress	28 – Invalid number format
adaptiveBusy	41 – Temporary failure
inConf	17 – User busy
undefinedReason	31 – Normal, unspecified
facilityCallDeflection	16 – Normal call clearing
securityDenied	31 – Normal, unspecified
calledPartyNotRegistered	20 – Subscriber absent
callerNotRegistered	31 – Normal, unspecified
newConnectionNeeded	47 – Resource Unavailable
nonStandardReason	127 – Interworking, unspecified
replaceWithConferenceInvite	31 – Normal, unspecified
genericDataReason	31 – Normal, unspecified
neededFeatureNotSupported	31 – Normal, unspecified
tunnelledSignallingRejected	127 – Interworking, unspecified
invalidCID	3 – No route to destination
NOTE – If the cause value received in the H.225.0 message is unknown in ISUP, the unspecified cause value of the class is sent.	

User-to-user

The user-to-user information element contains the ReleaseComplete-UUIE defined in the H.225.0 Message Syntax.

C.6.1.9 Receipt of Reset Circuit message (RSC), Circuit Group Reset message (GRS) or Circuit Group Blocking message (CGB) with the indication *hardware failure oriented*

Table C.16 shows the message sent to the calling user upon receipt of either a RSC message, GRS message or CGB message with the indication *hardware failure oriented*, when at least one backward message relating to the call has already been received.

Table C.16/H.246 – Receipt of RSC, GRS or CGB messages

←RELEASE COMPLETE	←Message received from ISUP
Cause information element	
Cause value No. 31 <i>Normal, unspecified</i>	Reset Circuit message (RSC)
Cause value No. 31 <i>Normal, unspecified</i>	Circuit Group Reset message (GRS)
Cause value No. 31 <i>Normal, unspecified</i>	Circuit Group Blocking message (CGB) with the type indicator of the circuit group supervision message type indicator parameter coded "01" (<i>hardware failure oriented</i>)

User-to-user Information

See C.6.1.8.

C.6.1.10 H.225.0 Transport level reset and Transport level failure procedures

The data link reset and data link failure procedures are respectively described in 5.8.8/Q.931 and 5.8.9/Q.931 [3]. See Table C.17.

Table C.17/H.246 – H.225.0 Transport level reset and Transport level failure procedures

←RELEASE COMPLETE	Trigger event	REL→
Cause information element		Cause parameter
AdaptiveBusy <i>call is dropping due to LAN crowding</i>	Transport level reset in overlap sending state	Cause value No. 41 <i>(temporary failure)</i>
(Note 1)	Transport level failure in a state other than active state. (Note 2).	Cause value No. 27 <i>(destination out of order)</i>
(Note 1)	Failure of the transport level re-establishment procedure after a transport level failure in active state. (Note 2).	Cause value No. 27 <i>(destination out of order)</i>
NOTE 1 – The call is cleared internally. No DISCONNECT message is sent on the access.		
NOTE 2 – These errors correspond to the H.225.0 Release reason <i>unreachableDestination</i> .		

C.6.1.11 Receipt of the Suspend message (SUS) network initiated

The actions taken on the ISUP side upon receipt of the Suspend message (SUS) are described in 2.4.1/Q.764 [1].

There is no support for Suspend message (SUS) network initiated on the H.225.0 side, so the actions taken should be the actions as described in ITU-T Rec. Q.764 for the controlling exchange.

C.6.1.12 Receipt of the Resume message (RES) network initiated

The actions taken on the ISUP side upon receipt of the Resume message (RES) are described in 2.4.1/Q.764 [1].

There is no support for Resume message (RES) network initiated on the H.225.0 side, so the actions taken should be the actions as described in ITU-T Rec. Q.764 for the controlling exchange.

C.6.1.13 Release by the interworking function

See Table C.18.

Table C.18/H.246 – Release from the interworking function

←RELEASE COMPLETE	Trigger event	REL→
Cause information element		Cause parameter
Cause value No. 28 <i>Invalid number format (address incomplete)</i>	Determination that the called number information received is incomplete, after an IAM message has already been sent	Cause value No. 28 <i>Invalid number format (address incomplete)</i>
Cause value No. 31 <i>normal, unspecified</i>	Failure of the automatic repeat attempt procedure	No action
Cause value No. 16 <i>normal call clearing</i>	T6 expiry (Note 1)	Cause value No. 102 <i>recovery on timer expiry</i>
Cause value No. 97 or No. 99	Call release due to the ISUP compatibility procedure	Cause value No. 97 or No. 99
Same cause value as in the REL message (Note 2)	Other cases of failure on the ISUP side	Cause value coded according to [1]
Cause value coded according to 7.2.2.8/H.225.0	Other cases of failure on the H.225.0 side	Same cause value as in the Release Complete message (Note 3)

NOTE 1 – T6: awaiting resume message (RES) timer. T6 start, stop, and expiry are described in 2.4/Q.764 and Annex A/Q.764 [1].

NOTE 2 – If the cause value sent in the REL message is unknown in H.225.0, the unspecified cause value of the class is sent.

NOTE 3 – If the cause value sent in the Release Complete message is unknown in ISUP, the unspecified cause value of the class is sent.

User-to-user Information

See C.6.1.8.

C.6.1.14 Receipt of INR

On reception of INR, the interworking function should respond with INF with the appropriate information.

C.6.1.15 Receipt of IDR

On reception of IDR, the interworking function should respond with IDS with the appropriate information.

C.6.2 ISUP supplementary services and H.323 services

C.6.2.1 Calling Party Name Presentation (H.450.8)/Calling Line Identification Presentation (CLIP)

The mapping shown in C.6.2.1.1 forms part of basic call.

C.6.2.1.1 Special arrangement applies

Setup Received from a Terminal or Gateway

The interworking function does not validate the Calling Line Identity when special arrangement applies. Table C.19 applies:

Table C.19/H.246 – CLIP – Special arrangement applies

SETUP→		IAM→			
Calling party number IE		Coding of the calling party number and generic number parameters			
Type of number	Numbering plan identification	Address signals	Numbering plan indicator	Nature of address indicator	Screening indicator (Note 3)
No or invalid (Note 1) calling party number information element		Calling party number parameter			
		Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>
		No generic number parameter indicating <i>additional calling party number</i> is sent			
<i>National number</i>	<i>ISDN/telephony numbering plan</i>	Calling party number parameter			
		Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>
	or <i>Unknown</i>	Number provided by the user	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	00 <i>User provided, not verified</i>
<i>International number</i>	<i>ISDN/telephony numbering plan</i>	Calling party number parameter			
		Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>
	or <i>Unknown</i>	Number provided by the user	001 <i>ISDN numbering plan</i>	000 0100 <i>International number</i>	00 <i>User provided, not verified</i>
NOTE 1 – Validity conditions of the calling party number information element are defined in 3.5.2.1/Q.951.x [19].					
NOTE 2 – The generic number parameter contains the number qualifier indicator coded "00000110" (<i>additional calling party number</i>).					
NOTE 3 – In the case of an IAM message sent by a interworking function to the ISDN, the interworking function shall copy the Calling Party Number IE from the Setup message from the packet network, or if this IE is not present, the gateway shall form the Calling Party Number IE using the sourceAddress (assuming it is one of the telephone number alias types). If the presentation indicator in the Calling party number IE is in conflict with the presentationIndicator, the presentation indicator of the Calling party number IE shall be used. The screening indicator of the Calling Party Number IE shall be set according to the table. Network provided relates to the Gatekeeper and User Provided relates to the endpoint.					

Setup Received from Gatekeeper

- a) If only the `additionalSourceAddresses` is present; or
if only the Calling Party Number is present; or
if only the `sourceAddress` is present, then Table C.20.1 applies:

Table C.20.1/H.246 – Calling Party Number

SETUP→	IAM→
<code>additionalSourceAddresses</code> or Calling Party Number or <code>sourceAddress</code>	Calling Party Number

- b) If the Calling Party Number (or the `sourceAddress` in case the Calling Party Number IE is absent) and the `additionalSourceAddresses` are present, then Table C.20.2 applies:

Table C.20.2/H.246 – Calling Party Number

SETUP→	IAM→
Calling Party Number or <code>sourceAddress</code>	Generic Number (– additional Calling Party Number)
<code>additionalSourceAddresses</code>	Calling Party Number

The address presentation restricted indicator of the calling party number and generic number parameters shall be set according to the CLIR supplementary service.

The calling party number incomplete indicator of the calling party number and the generic number parameters shall be set to "0" (*complete*).

Calling party subaddress

If provided, the calling party subaddress is transported transparently in the access transport parameter.

User-to-user information

See C.6.1.1.

C.6.2.1.2 Special arrangement does not apply

SETUP received from Terminal or Gateway

The Calling Line Identity information should be discarded unless the interworking function can validate it. If the information is valid, then Table C.21 applies:

Table C.21/H.246 – CLIP – Special arrangement does not apply

SETUP→			IAM→			
Calling party number information element			Coding of the calling party number and generic number parameters			
Type of number	Numbering plan identification	Number digits	Address signals	Numbering plan indicator	Nature of address indicator	Screening indicator (Note 2)
No or invalid (Note 1) calling party number information element			Calling party number parameter			
			Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>
			No generic number parameter indicating <i>additional calling party number</i> is sent			
Failure of the screening function			Calling party number parameter			
			Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>
			No generic number parameter indicating <i>additional calling party number</i> is sent			
<i>Subscriber number</i> or <i>National number</i> or <i>International number</i>	<i>ISDN/telephony numbering plan</i> or <i>Unknown</i>	Correct complete number	Calling party number parameter			
			Number provided by the user	001 <i>ISDN numbering plan</i>	000 0011 <i>National number, or</i> 000 0100 <i>International Number</i>	01 <i>User provided, verified and passed</i>
			No generic number parameter indicating <i>additional calling party number</i> is sent			
<i>Unknown</i>	<i>ISDN/telephony numbering plan</i> or <i>Unknown</i>	Incomplete number	Calling party number parameter			
			Completion of the number provided by the user	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	01 <i>User provided, verified and passed</i>
			No generic number parameter indicating <i>additional calling party number</i> is sent			
NOTE 1 – Validity conditions of the calling party number information element are defined in 3.5.2.1/Q.951.x [19].						
NOTE 2 – In the case of an IAM message sent by an interworking function to the ISDN, the interworking function shall copy the Calling Party Number IE from the Setup message from the packet network, or if this IE is not present, the gateway shall form the Calling Party Number IE using the sourceAddress (assuming it is one of the telephone number alias types), and presentationIndicator from Setup-UUIE. If the presentation indicator in the Calling party number IE is in conflict with the presentationIndicator, the presentation indicator of the Calling party number IE shall be used. The screening indicator of the Calling Party Number IE shall be set according to the result of the validation function. Network provided relates to the Gatekeeper and User Provided relates to the endpoint.						

SETUP received from Gatekeeper

Tables C.20.1 and C.20.2 apply.

The address presentation restricted indicator of the calling party number parameter shall be set according to the CLIR supplementary service.

The calling party number incomplete indicator of the calling party number parameters shall be set to "0" (*complete*).

Calling party subaddress

If provided, the calling party subaddress is transported transparently in the access transport parameter.

C.6.2.2 Calling Party Name Restriction (H.450.8)/Calling Line Identification Restriction (CLIR)

If **additionalSourceAddresses** field is not present, then the address presentation restricted indicator of the calling party number and of the generic number parameters is coded as described in Table C.22.

NOTE – If the calling user does not have the Calling Party Name Restriction, the address presentation restricted indicator of the calling party number parameter is set to presentation allowed (see 4.10/Q.951.x [19]).

Table C.22/H.246 – Coding of the address presentation restricted indicator of the calling party number and generic number parameters

Internal data (User profile data)		SETUP→	IAM→
Permanent mode	Temporary mode default setting	Calling party number information element/ User-to-user information element	Calling party number/ generic number parameter
		Presentation indicator	Address presentation restricted indicator
Yes	Value non-significant	Value non-significant	Presentation restricted
No	Restricted	Presentation restricted	Presentation restricted
		Absent	Presentation restricted
		Presentation allowed	Presentation allowed
	Allowed	Presentation allowed	Presentation allowed
		Absent	Presentation allowed
		Presentation restricted	Presentation restricted
NOTE – The presentationIndicator field in Setup-UUIE carries information identical to the presentation indicator found in the Calling Party Number IE. If both presentationIndicator and the presentation indicator of the Calling Party Number IE are present and are in conflict, the presentation indicator of the Calling Party Number IE shall be used. The meaning and use of the presentation indicator is defined in ITU-T Rec. Q.951.x.			

If **additionalSourceAddresses** field is present, then the address presentation restricted indicator of the calling party number and of the generic number parameters is coded as described in Table C.23.

Table C.23/H.246 – Coding of the address presentation restricted indicator of the calling party number and generic number parameters

Internal data (User profile data)		SETUP→	IAM→	
Permanent mode	Temporary mode default setting			
Yes	Value non-significant	Calling party number information element/ User-user information element Presentation indicator Value non-significant	Generic number presentation indicator Presentation restricted	
		additionalSourceAddresses presentation indicator Value non-significant	Calling party number presentation indicator Presentation restricted	
No	Restricted	Calling party number information element/ User-user information element Presentation indicator	Generic number presentation indicator	
		Presentation restricted	Presentation restricted	
		Absent	Presentation restricted	
		Presentation allowed	Presentation allowed	
		additionalSourceAddresses presentation indicator	Calling party number presentation indicator	
		Presentation restricted	Presentation restricted	
	Allowed	Allowed	Calling party number information element/ User-user information element Presentation indicator	Generic number presentation indicator
			Presentation allowed	Presentation allowed
			Absent	Presentation allowed
			Presentation restricted	Presentation restricted

Table C.23/H.246 – Coding of the address presentation restricted indicator of the calling party number and generic number parameters

Internal data (User profile data)		SETUP→	IAM→
		additionalSourceAddresses presentation indicator	Calling party number presentation indicator
		Presentation allowed	Presentation allowed
		Absent	Presentation allowed
		Presentation restricted	Presentation restricted
<p>NOTE – The presentationIndicator field in Setup-UUIE carries information identical to the presentation indicator found in the Calling Party Number IE. If both presentationIndicator and the presentation indicator of the Calling Party Number IE are present and are in conflict, the presentation indicator of the Calling Party Number IE shall be used for the ISUP generic number with the qualification "additional calling party number". The meaning and use of the presentation indicator is defined in ITU-T Rec. Q.951.x.</p>			

C.6.2.3 Connected Party Name Presentation (H.450.8)/Connected Line Identification Presentation (COLP)

If the calling user has the Connected Party Name Presentation, the connected line identity request indicator of the optional forward call indicators parameter in the Initial Address Message (IAM) is coded to *requested*.

If the calling user has the Connected Party Name Presentation, only one connected number information element is sent in the CONNECT message.

CONNECT sent to a Terminal or Gateway

Tables C.24, C.25, C.26 and C.27 apply.

Table C.24/H.246 – COLP information sent to the calling user

←CONNECT	←ANM/CON	
COLP information sent to the calling user	Connected number parameter	Generic number parameter with number qualifier set to additional connected number
	Address presentation restricted indicator	
Connected number IE (see Table C.25)	<i>Presentation allowed</i>	Absent
Connected number IE (see Table C.26)	<i>Presentation allowed</i>	Present
Connected number IE Option 1: Type of number As received Numbering plan As received Presentation ind. <i>Presentation restricted</i> Screening ind. As received Number digits No digit Option 2: Type of number <i>Unknown</i> Numbering plan <i>Unknown</i> Presentation ind. <i>Presentation restricted</i> Screening ind. <i>Network provided</i> Number digits No digit	<i>Presentation restricted</i> (Note)	Value non-significant
Connected number IE Type of number <i>Unknown</i> Numbering plan <i>Unknown</i> Presentation ind. <i>Not available due to interworking</i> Screening ind. <i>Network provided</i> Number digits No digit	<i>Address not available</i> or No connected number parameter	Value non-significant

Table C.24/H.246 – COLP information sent to the calling user

<p>NOTE 1 – As a national option, the presentation restriction indication received in the connected number parameter can be overridden for specific calling access categories. In such a case, the same actions are taken as if <i>presentation allowed</i> was received, except for the presentation restriction indication, which is passed transparently into the connected number information element.</p> <p>NOTE 2 – When address information represents a telephone number, the relevant information can appear in the Connected Number IE, including the presentation indicator and screening indicator. This is the recommended mode of operation for the case where a gateway sends a Connect message on the packet network.</p> <p>Alternatively, connected party information may appear in the connectedAddress, presentationIndicator, and screeningIndicator fields of Connect-UUIE. This mode of operation is required when connectedAddress is not in any form of telephone number (IE, connectedAddress is not type e164 or partyNumber).</p> <p>NOTE 3 – The presentationIndicator field in Connect-UUIE carries information identical to the presentation indicator found in the Connected Number IE. The meaning and use of the presentation indicator is defined in ITU-T Rec. Q.951.x.</p> <p>NOTE 4 – The screeningIndicator field in Connect-UUIE carries information identical to the screening indicator found in the Connected Number IE.</p> <p>The meaning and use of the screening indicator is defined in ITU-T Rec. Q.951.x.</p>
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Table C.25/H.246 – Coding of the connected number information element according to the connected number parameter

←CONNECT	←ANM/CON
Connected number IE	Connected number parameter
Type of number (Note) <i>National number</i> <i>International number</i>	Nature of address indicator <i>National number</i> <i>International number</i>
Numbering plan identification <i>ISDN/Telephony numbering plan</i>	Numbering plan indicator <i>ISDN/Telephony numbering plan</i>
Presentation indicator <i>Presentation allowed</i>	Address presentation restricted indicator <i>Presentation allowed</i>
Screening indicator <i>User provided, verified and passed</i> <i>Network provided</i>	Screening indicator <i>User provided, verified and passed</i> <i>Network provided</i>
Number digits	Address signals
NOTE – As a network option, the type of number may be coded <i>unknown</i> when a prefix is added to the number.	

Table C.26/H.246 – Coding of the connected number information element according to the generic number parameter

←CONNECT	←ANM/CON
Connected number IE	Generic number parameter with number qualifier set to <i>additional connected number</i>
Type of number (Note) <i>National number</i> <i>International number</i>	Nature of address indicator <i>National number</i> <i>International number</i>
Numbering plan identification <i>ISDN/Telephony numbering plan</i>	Numbering plan indicator <i>ISDN/Telephony numbering plan</i>
Presentation indicator <i>Presentation allowed</i>	Address presentation restricted indicator <i>Presentation allowed</i>
Screening indicator <i>User provided, not verified</i>	Screening indicator <i>User provided, not verified</i>
Number digits	Address signals
NOTE – As a network option, the type of number may be coded <i>unknown</i> when a prefix is added to the number.	

Connected subaddress

See Table C.27.

Table C.27/H.246 – Sending of the connected subaddress

←CONNECT	←ANM/CON	
Content	Access transport parameter	Address presentation restricted indicator of the connected number parameter
Connected subaddress information element	Connected subaddress information element	<i>Presentation allowed</i>
No connected subaddress information element	Connected subaddress information element	<i>Presentation restricted (Note)</i> or <i>Address not available</i> or No connected number parameter
NOTE – As a national option, the presentation restriction indication received in the connected number parameter can be overridden for specific calling access categories. In such a case, the same actions are taken as if <i>presentation allowed</i> was received.		

CONNECT sent to a Gatekeeper

See Table C.28.

Table C.28/H.246 – Connected Party Number

←CONNECT	←ANM/CON
Connected Number	Connected Number or (Note) Generic Number (– additional Connected number)
connectedAddress	Connected Number
NOTE – If an additional Connected number is included in the Generic Number, then the additional Connected number should be sent in the Connected number.	

C.6.2.4 Connected Name Address restriction (H.450.8)/ Connected Line Identification Restriction (COLR)

See Table C.24.

C.6.2.5 Subaddressing (SUB)

The called party subaddress information element received from the H.323 network in the SETUP message is transferred transparently in the access transport parameter of the IAM.

C.6.2.6 Call diversion

Hereafter are only described the handling of notifications received from a public or private network at the interworking function. That is the Call forwarding service is provided by the ISUP network. The actions taken in the forwarding exchange/H.323 elements are described in ITU-T Recs Q.732.2-5 [4] and H.450.3 [10].

C.6.2.6.1 Interworking at the calling user's interworking function

C.6.2.6.1.1 Reception of a "call diversion may occur" notification

According to [4], the Address Complete Message (ACM), or the Call Progress Message (CPG) may be received with the optional backward call indicators parameter including the "call diversion may occur indicator" set to "call diversion may occur". No specific interworking action is required.

C.6.2.6.1.2 Reception of a "call is diverting" notification

According to [4], the Address Complete message (ACM) or the Call Progress message (CPG) may be received with:

- the call diversion information parameter;
- the generic notification indicators parameter coded *call is diverting*; and
- the redirection number parameter.

At least the call diversion information and generic notification indicators parameters should be available in the Address Complete (ACM) or Call Progress (CPG) message.

First diversion

The number information contained in the redirection number parameter is stored.

A notification of diversion is sent to the calling user as shown in Table C.29 applicable to standard or H.450.3 capable endpoint.

Table C.29/H.246 – First diversion: notification of diversion sent to the calling user

←H.225.0 message	←ACM/CPG	
	Call diversion information parameter	Generic notification indicator parameter
	Notification subscription option	
Standard end point (Note) Notification indicator IE <i>Call is diverting</i> or H.450.3 Capable endpoints FACILITY diversionReason cfr	<i>Presentation allowed with redirection number</i> or <i>Presentation allowed without redirection number</i>	<i>Call is diverting</i>
Not sent	<i>Unknown</i> or <i>Presentation not allowed</i>	

NOTE – The determination of the H.225.0 message sent upon the Address Complete (ACM) or Call Progress (CPG) message is described in C.6.1.3 and C.6.1.4. If no message is to be sent, the notification indicator information element is sent in a NOTIFY message.

Subsequent diversion

The number information contained in the redirection number parameter is stored (i.e., the latest received diverted-to number replaces the one received previously).

If it has been previously determined (i.e., through subscription option) that notification of diversion is not allowed, no specific interworking action is required towards the calling user: see C.6.1.

If it has been previously determined (i.e., through subscription option) that notification of diversion is allowed, Table C.30 is applicable. Table C.30 is applicable to standard or H.450.3 capable endpoint.

Table C.30/H.246 – Subsequent diversion: notification of diversion sent to the calling user

←H.225.0 message	←CPG		
	Call diversion information parameter		Generic notification indicator parameter
	Redirecting reason	Notification subscription option	
No notification sent		<i>Unknown</i> or <i>Presentation not allowed</i>	<i>Call is diverting</i>
Standard end point (Note 1) Notification indicator IE <i>Call is diverting</i> or H.450.3 Capable endpoints FACILITY diversionReason cfr	<i>Deflection during alerting</i> or <i>No reply</i>	<i>Presentation allowed with redirection number</i> or <i>Presentation allowed without redirection number</i>	
No notification sent	Other reason		

NOTE 1 – The determination of the H.225.0 message sent upon Call Progress message (CPG) is described in C.6.1.3 and C.6.1.4. If no message is to be sent, the notification indicator information element is sent in a NOTIFY message.

NOTE 2 – The latest received diverted-to number replaces the one received previously.

C.6.2.6.1.3 Reception of the redirection number restriction parameter

If a backward message (ACM, CPG, ANM or CON) is received containing the redirection number restriction parameter:

- if it has been determined that the notification of diverted-to number is not allowed, no specific interworking action are required: see C.6.1;
- if it has been determined that the notification of diverted-to number is allowed, a redirection number information element is sent to the calling user as shown in Table C.31. Table C.31 describes the signalling that a H.450.3 capable interworking function would generate and H.450.3 endpoint would receive.

Table C.31/H.246 – Notification of the diverted-to number

←H.225.0 FACILITY	Redirection number parameter stored in the interworking function node	←ACM, CPG, ANM or CON
divertingLegInformation1.ind		Presentation restriction parameter
NominatedNr <i>Type of number</i> <i>According to the nature of address indicator (Note)</i> <i>Numbering plan identification</i> <i>ISDN (telephony) numbering plan</i> <i>Number of digits</i> <i>Digits received in the address signal</i> SubscriptionOption <i>NotificationWithDivertedNoNr</i>	Nature of address indicator <i>National number, or International number</i> Numbering plan indicator <i>ISDN (telephony) numbering plan</i> Address signal	<i>Presentation allowed</i>
NominatedNr <i>Type of number</i> <i>Unknown</i> <i>Numbering plan identification</i> <i>Unknown</i> <i>Number digits</i> <i>Not included</i> SubscriptionOption <i>NotificationWithoutDivertedToNr</i>	Nature of address indicator <i>National number, or International number</i> Numbering plan indicator <i>ISDN (telephony) numbering plan</i> Address signal	<i>Presentation restricted</i>
NominatedNr <i>Type of number</i> <i>Unknown</i> <i>Numbering plan identification</i> <i>Unknown</i> <i>Number digits</i> <i>Not included</i> SubscriptionOption <i>noNotification</i>	No redirection number stored	Value non-significant
NOTE – As a network option, the type of number may be coded <i>unknown</i> .		

C.6.2.7 Call Waiting (CW)

See Table C.32.

Table C.32/H.246 – Mapping of ACM, CPG for CW procedure in H.323 access

←ALERTING	←ACM, CPG
callWaiting	Generic notification indicator parameter
	Notification indicator
Invoke	110 0000 <i>Call is a waiting call</i>
NOTE – See ITU-T Rec. H.450.6 for a description of Call Waiting in a H.323 network.	

C.6.2.8 Call Hold (HOLD)

NOTE – ITU-T Rec. H.225.0 does not support the HOLD, HOLD ACKNOWLEDGE, HOLD REJECT, RETRIEVE, RETRIEVE ACKNOWLEDGE or RETRIEVE REJECT messages. This service uses the FACILITY UU-IE for Hold and Retrieve.

C.6.2.8.1 Notification received from the network

See Table C.33.

Table C.33/H.246 – Receipt of HOLD notification from the network

← FACILITY	←CPG
	Generic notification indicator parameter
	Notification indicator
holdNotific <i>invoke</i>	111 1001 <i>Remote hold</i>
retrieveNotific <i>invoke</i>	111 1010 <i>Remote retrieval</i>
NOTE – See ITU-T Rec. H.450.4 for a description of Call Hold in a H.323 network.	

C.6.2.8.2 Notification received at the T reference point

See Table C.34.

Table C.34/H.246 – Receipt of HOLD notification from the H.323 access

FACILITY→	CPG→
	Generic notification indicator parameter
	Notification indicator
RemoteHold <i>invoke</i> HoldNotific <i>invoke</i>	111 1001 <i>Remote hold</i>
RemoteRetrieve <i>invoke</i> retrieveNotific	111 1010 <i>Remote retrieval</i>
NOTE – See ITU-T Rec. H.450.4 for a description of Call Hold in a H.323 network.	

C.6.2.9 Terminal Portability (TP)

Terminal Portability is not explicitly supported in a H.323 network and is not described in ITU-T Rec. H.323 or H.450.x-series Recommendations. However the messages and IEs to support Terminal Portability exist in ITU-T Rec. H.225.0.

C.6.2.9.1 Notification received from the ISDN network

See Table C.35.

Table C.35/H.246 – Receipt of TP notification from the network

←NOTIFY	← Message received from the ISUP
Notification indicator IE Notification description	
000 0000 <i>User suspended</i>	SUS message Suspend/resume indicator <i>ISDN subscriber initiated</i>
000 0001 <i>User resumed</i>	RES message Suspend/resume indicator <i>ISDN subscriber initiated</i>
000 0000 <i>User suspended</i>	CPG message Generic notification indicator <i>User suspended</i>
000 0001 <i>User resumed</i>	CPG message Generic notification indicator <i>User resumed</i>

ITU-T Rec. H.225.0 does not support the sending of SUSPEND or RESUME messages. See ITU-T Rec. Q.953.4 for a description of the Terminal Portability service on the access side.

The actions taken on the ISUP side upon sending of the Suspend (SUS) and Resume (RES) messages are described in 4.5.2.1/Q.733 [5].

Upon the T2 or T307 expiry (see Note), a Release message (REL) is sent with the cause value No. 102, *recovery on timer expiry*. No action is taken on the H.225.0 side.

NOTE – T2 start, stop, and expiry are described in 4.5.2.1/Q.733 [5] and Annex A/Q.764 [1]. T307 start, stop and expiry are described in 5.6/Q.931.

C.6.2.9.2 Notification received at T reference point

See Table C.36.

Table C.36/H.246 – Receipt of a TP notification from a private network

NOTIFY→	CPG→	
Notification indicator information element	Generic notification indicator parameter	Event information parameter
Notification description	Notification indicator	Event indicator
000 0000 <i>User suspended</i>	000 0000 <i>User suspended</i>	000 0010 <i>Progress</i>
000 0001 <i>User resumed</i>	000 0001 <i>User resumed</i>	000 0010 <i>Progress</i>

C.6.2.10 Conference calling (CONF)

Establishing a conference call in H.323 is described in 8.4.3/H.323 [6].

NOTIFY messages are optional for conference calling notification. ITU-T Recs Q.954.1 and Q.734.1 describe the operation of Conferencing calling in ISDN networks. The NOTIFY message is optional in H.323 networks.

The tables in this subclause describe the notifications sent to and received from terminal lying in the ISDN network when a Conference Calling supplementary service is active.

The Conferencing device may reside in the H.323 network in the form of an endpoint containing MC functionality or a stand-alone MCU. Alternatively the Conferencing may be implemented in the ISDN network.

The following terminology is used:

served user: The user that requests the conference call. The served user will be the user controlling the conference call. The served user may also be referred to as user A.

conferee: The users involved in the conference not controlling the conference, i.e., all participants except the served user are referred to as conferees or parties. The conferees may also be known as users B, C, etc.

isolate: An action at the access that restricts communication in both directions with a participant of the conference. (Call Hold.)

reattach: An action at the access that re-establishes the communication with a participant of the conference. (Call Retrieve.)

split: An action at the access that creates a private communication between the served user and a remote user. The private communication is a normal "two-party" call.

drop: An action at the access that clears the connection to a remote party.

floating: The situation where the conference calling supplementary service exists without the served user.

C.6.2.10.1 Notification received from the network

Table C.37 represents the backwards indication received from the conference calling device located on the ISUP network side.

Table C.37/H.246 – Conference calling notification

Message to H.323 endpoint ←NOTIFY (Note 1)	←CPG
	Generic notification indicator parameter
	Notification indicator
Not applicable (Note 2)	100 0010 <i>Conference established</i>
Not applicable	100 0011 <i>Conference disconnected</i>
Not applicable (Note 3)	100 0100 <i>Other party added</i>
Not applicable (Note 4)	100 0101 <i>Isolated</i>
Not applicable (Note 5)	100 0110 <i>Reattached</i>
Not applicable	100 0111 <i>Other party isolated</i>
Not applicable	100 1000 <i>Other party reattached</i>
Not applicable	100 1001 <i>Other party split</i>
Not applicable (Note 6)	100 1010 <i>Other party disconnected</i>
Not applicable	100 1011 <i>Conference floating</i>

NOTE 1 – The format values below represent the 'Notification indicator information element' and the 'Notification description'.

NOTE 2 – **H.245 ConferenceIndication.TerminalNumberAssign** may also be used to indicate the establishment of a conference.

NOTE 3 – **H.245 ConferenceIndication.TerminalJoinedConf** may also be used to indicate that a terminal has joined the conference.

NOTE 4 – H.225.0 FACILITY indicating **holdNotific.invoke** may also be used to indicate 'remote hold'.

NOTE 5 – H.225.0 FACILITY indicating **retrieveNotific.invoke** may also be used to indicate 'remote retrieve'.

NOTE 6 – **H.245 ConferenceIndication.TerminalLeftConf** may also be used to indicate that a terminal has left the conference.

C.6.2.10.2 Invocation at coincident S and T reference point

Tables C.38 and C.39 show procedures, which may be attempted in an SCN conference call, and how these map to procedures that may be achieved through a H.323 conference.

The served user resides in a H.323 network (i.e., the MCU [conference device] is in the H.323 network). The tables also show the notifications that may be sent to users in the ISDN network.

User B and the other remote user reside in the SCN network.

The resulting Notification Message sent to B shall be generated by the interworking function. The notification message sent to all other remote users in ISDN network shall be generated by the interworking function.

Table C.38/H.246 – Conference calling

Procedure	Message received from served user →	Resulting notification message sent to B →	Notification message sent to all other remote users in ISDN network →
Beginning the conference from an active call (with B)	H.225.0 SETUP ConferenceGoal = Create	CPG Generic notification indicator parameter <i>Conference established</i>	Not applicable
Adding a remote user (B)	H.225.0 SETUP ConferenceGoal = Invite	CPG Generic notification indicator parameter <i>Conference established</i>	Not applicable
	H.245 terminalJoinedConf	Not applicable	CPG Generic notification indicator parameter <i>Other party added</i>
Isolate a remote user (B)	H.225.0 FACILITY <i>HoldNotific.inv</i>	CPG Generic notification indicator parameter <i>Remote hold</i> (Note 1)	(Note 2)
Reattach a remote user (B)	H.225.0 FACILITY <i>retrieveNotific.inv</i>	CPG Generic notification indicator parameter <i>Remote Retrieval</i> (Note 3)	(Note 4)
Splitting a remote user (B) (Note 5)	Not applicable	Not applicable	Not applicable
Disconnect a remote user (B)	H.245 conferenceRequest <i>DropTerminal</i>	REL	Not applicable
	H.245 conferenceRequest <i>terminalLeftConf</i>	Not applicable	CPG Generic notification indicator parameter <i>Other party disconnected</i>
Terminate the conference	H.245 conferenceCommand <i>dropConference</i>	REL	
Disconnect the served user (Note 6)	Not applicable	Not applicable	
Call clearing by served user	RELEASECOMPLETE	REL	

Table C.38/H.246 – Conference calling

<p>NOTE 1 – H.323 (H.450.4) does not allow the indication of '<i>isolated</i>' when placing a user on hold. Therefore a CPG message is generated indicating '<i>remote hold</i>'.</p> <p>NOTE 2 – In ISUP-based conferencing a CPG message indicating '<i>other party isolated</i>' would be sent to remote users. However, as H.323 (H.450.4) does not support this, no message is sent.</p> <p>NOTE 3 – H.323 (H.450.4) does not allow the indication of '<i>reattached</i>' when retrieving a user from hold. Therefore a CPG message is generated indicating '<i>remote retrieve</i>'.</p> <p>NOTE 4 – In ISUP-based conferencing a CPG message indicating '<i>other party isolated</i>' would be sent to remote users. However, as H.323 (H.450.4) does not support this, no message is sent.</p> <p>NOTE 5 – Procedure not supported in H.323.</p> <p>NOTE 6 – H.323 does not support the functionality to indicate that a 'Conference Chair' is floating.</p>
--

Table C.39/H.246 – Conference calling: a remote user clears

Procedure	Message sent to served user ←	Message received from B ←
Remote user clears	H.245 ConferenceIndication <i>TerminalLeftConf</i>	REL

C.6.2.10.3 Notification received at T reference point

Table C.40 represents the situation where the conferencing device belongs to the H.323 network.

Table C.40/H.246 – Receipt of a conference calling notification from a private H.323 Network

Message from H.323 endpoint→ (Note 4)	CPG→	
	Generic notification indicator parameter	Event information parameter
	Notification indicator	Event indicator
H.225.0 SETUP ConferenceGoal = Invite	100 0010 <i>Conference established</i>	000 0010 <i>Progress</i>
H.245 ConferenceIndication <i>TerminalJoinedConf</i>	100 0100 <i>Other party added</i>	000 0010 <i>Progress</i>
H.225.0 FACILITY <i>HoldNotific.inv</i> (Note 2)	111 1001 <i>Remote hold</i>	000 0010 <i>Progress</i>
H.225.0 FACILITY <i>RetrieveNotific.inv</i> (Note 3)	111 1010 <i>Remote Retrieval</i>	000 0010 <i>Progress</i>
H.245 ConferenceIndication <i>TerminalLeftConf</i>	100 1010 <i>Other party disconnected</i>	000 0010 <i>Progress</i>
<p>NOTE 1 – 'Conference Disconnection' results from when a conference chair initiates a 'conference out of consultation' with one of the conferees. H.323 does not identify this situation and thus no indication of 'conference disconnected' is generated toward the ISUP network.</p> <p>NOTE 2 – H.323 does not support the indication of 'isolated'. The equivalent is FACILITY indicating 'holdNotific'.</p> <p>NOTE 3 – H.323 does not support the indication of 'reattached'. The equivalent is FACILITY indicating 'retrieveNotific'.</p> <p>NOTE 4 – H.323 (H.450.4) does not support the indication of 'other party isolated', 'other party reattached', 'other party split' or 'conference floating'; therefore, these indications are not generated toward the ISUP network.</p>		

C.6.2.11 Three-party (3PTY)/Conference out of Consultation

Establishing a Conference out of Consultation call in H.323 is described in 8.4.3.8/H.323 [6].

NOTIFY messages are optional for 3PTY calling notifications. ITU-T Recs Q.954.2 and Q.734.2 describe the operation of 3PTY service in ISDN networks. The NOTIFY message is optional in H.323 networks.

The tables in this subclause describe the notifications sent to and received from terminal lying in the ISDN network when a 3PTY supplementary service is active.

The 3PTY Conferencing device may reside in the H.323 network in the form of an endpoint containing MC functionality or a stand-alone MCU. Alternatively the Conferencing may be implemented in the ISDN network.

Tables C.41, C.42, C.43 and C.44 show procedures which may be attempted in a 3PTY call and how these may be signalling when the serving user resides in a H.323 network. The tables also show the notifications, which may be sent to users in the ISDN network.

The following terminology is used:

served user: The user that requests the conference call. The served user will be the user controlling the conference call. The served user may also be referred to as user A.

conferee: The users involved in the conference not controlling the conference, i.e., all participants except the served user are referred to as conferees or parties. The conferees may also be known as users B, C, etc.

C.6.2.11.1 Notification received from the ISDN network

Table C.41 represents the backward indication received from a 3PTY conference where the conference lies on the ISUP network side.

Table C.41/H.246 – 3PTY notification

Message to H.323 endpoint ←NOTIFY (Note 1)	←CPG
	Generic notification indicator parameter
	Notification indicator
Not applicable (Note 2)	100 0010 <i>Conference established</i>
Not applicable	100 0011 <i>Conference disconnected</i>
Not applicable (Note 3)	111 1011 <i>Remote hold</i>
<p>NOTE 1 – The format values below represent the 'Notification indicator information element' and the 'Notification description'.</p> <p>NOTE 2 – H.245 ConferenceIndication.TerminalNumberAssign may also be used to indicate the establishment of a conference.</p> <p>NOTE 3 – H.225.0 FACILITY indicating holdNotific.invoke may also be used to indicate 'remote hold'.</p>	

If the call progress message (CPG) contains two generic notification indicator parameters, one with the notification indicator coded *conference disconnected*, the other with the notification indicator coded *remote hold*,

- either a NOTIFY message is sent containing:
 - a notification indicator information element with the notification description *conference disconnected*; and
 - a notification indicator information element with the notification description *remote hold*;
- or:
 - a NOTIFY message is sent containing a notification indicator information element with the notification description *conference disconnected*; and
 - a subsequent NOTIFY message is sent containing a notification indicator information element with the notification description *remote hold*.

C.6.2.11.2 Invocation at coincident S and T reference point

Tables C.42 and C.43 show procedures that may be attempted in an SCN-based Conference out of Consultation call and how these map to procedures that may be achieved through a H.323 Conference out of Consultation Conference calls.

The served user (b) resides in a H.323 network (i.e., the MCU [conference device] is in the H.323 network). The tables also show the notifications that may be sent to users in the ISDN network.

Users B and C reside on the ISUP network side.

The resulting Notification Message sent to B shall be generated by the interworking function. The notification message sent to all other remote users in ISDN network shall be generated by the interworking function.

Table C.42/H.246 – Three-party (3PTY)

Procedure (Note 2)	Message received from served user →	Call A-B: Active-held connection message sent to B →	Call A-C: Active-idle connection message sent to C →
Beginning the 3PTY	(Note 1)	CPG→ Generic notification indicator parameter <i>Conference established</i>	CPG→ Generic notification indicator parameter <i>Conference established</i>
Creation of a private communication with B	FACILITY→ HoldNotific <i>invoke</i> Sent to B	CPG→ Generic notification indicator parameter <i>Remote hold</i>	No message sent
	FACILITY→ HoldNotific <i>invoke</i> Sent to C	No message sent	CPG→ Generic notification indicator parameter <i>Remote hold</i>
	FACILITY→ RetrieveNotific <i>invoke</i> Sent to B	CPG→ Generic notification indicator parameter <i>Remote Retrieve</i>	No message sent
Creation of a private communication with C	FACILITY→ HoldNotific <i>invoke</i> Sent to B	CPG→ Generic notification indicator parameter <i>Remote hold</i>	No Message sent
Disconnect the remote user B	H.245 conferenceRequest DropTerminal Sent to B	REL→	No Message sent
Disconnect the remote user C	H.245 conferenceRequest DropTerminal Sent to B	No Message sent	REL→
	FACILITY→ RetrieveNotific <i>invoke</i> Sent to B	CPG→ Generic notification indicator parameter <i>Remote Retrieve</i>	Not applicable

NOTE 1 – Clause 8.4.3.8/H.323 [6] Conference out of Consultation discusses the various methods to achieve the establishment of a 3-party conference.

NOTE 2 – As the conference is performed by the H.323 network, no indication of 'conference disconnected' is generated.

Table C.43 describes the actions taken when user B or user C disconnects.

Table C.43/H.246 – Three-party (3PTY): user B or user C disconnects

Messages sent to or received from served user (Note)	Call A-B: Active-held connection messages sent to B or received from B	Call A-C: Active-idle connection message sent to C or received from C	Procedure
←RELEASECOMPLETE received from B	←REL	No message sent	User B disconnects
←RELEASECOMPLETE received from C	No message sent	←REL	User C disconnects
FACILITY→ RetrieveNotific <i>invoke</i> Sent to B	CPG→ Generic notification indicator parameter <i>Remote Retrieve</i>	Not applicable	
NOTE – As the conference is performed by the H.323 network, no indication of 'conference disconnected' is generated.			

C.6.2.11.3 Notification received at T reference point

Table C.44 represents the situation where the conferencing device belongs to the H.323 network.

Table C.44/H.246 – Receipt of a 3PTY notification from a private H.323 network

Message from H.323 endpoint→	CPG→	
	Generic notification indicator parameter	Event information parameter
	Notification indicator	Event indicator
H.245 ConferenceIndication → <i>TerminalNumberAssign</i>	100 0010 <i>Conference established</i>	000 0010 <i>Progress</i>
FACILITY → <i>HoldNotific invoke</i>	111 1011 <i>Remote hold</i>	000 0010 <i>Progress</i>
NOTE – As the conference is performed by the H.323 network, no indication of 'conference disconnected' is generated.		

C.6.2.12 Closed User Group (CUG)

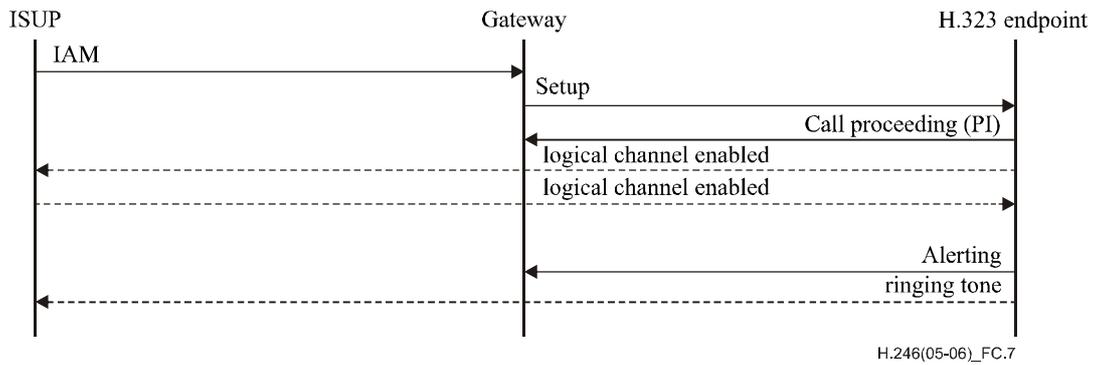
Not supported in H.323 network.

C.6.2.13 User-to-User Signalling (UUS)

User-to-user Services 1, 2 and 3 are not supported in a H.323 network. Whilst H.225.0 contains User Data to carry the UUS signalling, there is no definition of the User-to-user Service information.

C.7 Incoming call – Interworking from ISUP to H.225.0

In general, operation with an SS7 network where the call is from the circuit network to the packet network would be best if media is through-connect in both directions on the IAM (that is, through-connect occurs on the first response to a Setup in the H.323 network) as shown in the following diagram:



The notation "Call Proceeding (PI)" indicates the presence of the progress indicator as described in 8.1.7.4/H.323.

C.7.1 Basic call

C.7.1.1 Sending of the SETUP message

The call information is received in the Initial Address Message (IAM), possibly followed by one or several Subsequent Address Messages (SAM) (see C.7.1.2).

If the continuity check indicator of the nature of connection indicators is coded 01, *continuity check required on this circuit*, or 10, *continuity check required on a previous circuit*, the setting up of the call must be prevented until the receipt of the result of the continuity check procedure. The method describing how this is done is out of scope of this annex.

When the interworking function has received all the information required to go on with the call, and performed the various checks to determine that the call is allowed, a SETUP message is sent to the called user.

The information elements carried in the access transport parameter of the Initial Address Message (IAM) are taken into account whatever the order of receipt. The sending of some information elements (like the calling party number, the calling or called party subaddress) may depend on other checks: see C.7.2.

Only the information elements involved in the interworking are described hereafter.

The information elements used for the supplementary services are described in C.7.2.

Bearer capability

See Table C.45.

Table C.45/H.246 – Coding of the Bearer Capability information element (BC)

IAM→	SETUP→
Content	Bearer capability information element
No USI present TMR <i>Speech</i>	Coding standard <i>ITU-T standardized coding</i> Information transfer capability <i>Speech</i> Transfer mode <i>Circuit mode</i> Information transfer rate <i>64 kbit/s</i>
No USI present TMR <i>3.1 kHz audio</i>	Coding standard <i>ITU-T standardized coding</i> Information transfer capability <i>3.1 kHz audio</i> Transfer mode <i>Circuit mode</i> Information transfer rate <i>64 kbit/s</i>
No USI present TMR <i>64 kbit/s unrestricted</i>	Coding standard <i>ITU-T standardized coding</i> Information transfer capability <i>Unrestricted digital information</i> Transfer mode <i>Circuit mode</i> Information transfer rate <i>64 kbit/s</i>
USI present No USI prime	BC = USI (Note 1)
USI <i>Speech, or 3.1 kHz audio</i> USI prime <i>Unrestricted digital information with tones and announcements</i>	BC = USI (Notes 1 and 2)
NOTE 1 – Octet 1 (information element identifier) and octet 2 (length) are recreated.	
NOTE 2 – In case USI prime is received, the interworking function must perform fallback as described in 5.11.2/Q.931 [3].	
NOTE 3 – For a call originating from an ISDN endpoint, the interworking function shall simply pass on the <i>Information Transfers Capability</i> and <i>Rate Multiplier</i> information that it receives from the ISDN.	
NOTE 4 – If the called system is another H.323 endpoint, the Rate Multiplier value may reflect the bandwidth to be used on the packet-based network but the receiving terminal is not required to follow this information. The bandwidth needed for the call is the bandwidth needed on the SCN side, and may or may not match the bandwidth allowed on the packet-based network by the ACF H.225.0 RAS messages.	

Facility

NA.

Sending complete

This information element is included, in case of *en bloc* sending used, to indicate that the SETUP message contains all the information required by the called user to process the call. This is indicated by the presence of ST in the Called Party Number.

Calling Party’s Category

Coded according to the internal data of the interworking unit, except when the IAM contains a CPC value set to the IEPS call marking (0000 1110 [14]) or a nationally assigned emergency call value. In this case, the interworking function should include the Call Priority Designation parameter in the outgoing ARQ and SETUP messages. This parameter should be set to a priority value of emergencyAuthorized and the call establishment proceeds with priority. The priority extension coding is for future study. See ITU-T Rec. H.460.4 [21] for specific procedures.

Progress indicator

See Table C.46.

Table C.46/H.246 – Coding of the progress indicator information element

IAM→			SETUP→
Forward call indicators parameter		Access transport parameter	Progress indicator information element
ISDN User Part indicator	ISDN access indicator		
0 (ISDN User Part not used all the way)	Value non-significant	Value non-significant	No. 1
1 (ISDN User Part used all the way)	0 (originating access non-ISDN)	Value non-significant	No. 3
1 (ISDN User Part used all the way)	1 (originating access ISDN)	p.i. No. x	No. x

NOTE 1 – Coding Standard in the SETUP shall indicate ITU-T standardized coding.
NOTE 2 – Location in the SETUP only 'user', 'private network serving the local user', and 'private network serving the remote user' are permitted.

Calling party number

In the case of GK routed call, the interworking function should send the Calling Party number as received from the ISUP from Calling Party number parameter or from H.225.0 ACF.

In the case of Direct Routed call, for interworking function, see C.7.2.3.

Calling party subaddress

In the case of GK routed call, the interworking function should send the Calling Party Subaddress as received from the ISUP in the Access Transport Parameter.

In the case of Direct Routed call, for interworking function, see C.7.2.3.

Called party number

In the case of GK routed call, the interworking function should send the Called Party number as received from the ISUP.

Called party subaddress

In the case of GK routed call, the interworking function should send the Called Party Subaddress as received from the ISUP in the Access Transport Parameter.

LocationSourceAddress

This parameter is sent only if the parameter Location Number is present inside IAM message. See ITU-T Rec. H.460.20.

- Address: partyNumber: e.164Number: publicTypeOf Number:
According to the field Nature of address indicator of the location number parameter.
- Address: PartyNumber: e.164Number: publicNumberDigits:
According to the field address signal of the location number parameter.

- PresentationIndicator:
According to the field address presentation restricted indicator of the location number parameter.
- ScreeningIndicator:
According to the field address screening indicator of the location number parameter.

Low layer compatibility

FFS.

High layer compatibility

FFS.

User-to-user

The user-to-user information element contains the Setup-UUIE defined in the H.225.0 Message Syntax.

C.7.1.2 Receipt of the Subsequent Address Message (SAM)

If *en bloc* sending is used on the H.225.0 side, the SETUP message shall contain all the information required by the called user to process the call (see C.7.1.1).

If overlap sending is used as indicated by 'canoverlapsend', and if the SETUP message has already been sent and the SETUP ACKNOWLEDGE message received, an INFORMATION message is sent upon receipt of each Subsequent Address Message (SAM).

C.7.1.3 Sending of the Address Complete Message (ACM)

C.7.1.3.1 ACM with cause parameter

The following cases are possible trigger conditions of sending the address complete message (ACM) with cause parameter:

- a) It has been determined, in case of call failure, that a special in-band tone or announcement has to be returned to the calling party from the destination exchange.

Table C.46a/H.246 – Sending of ACM with a cause parameter

PROGRESS→	ACM→
Cause information element Progress indicator No. 8	Cause parameter (Note 1) Optional backward call indicators parameter In-band information ind. <i>In-band info...</i> (Note 2)
<p>NOTE 1 – If the cause value received in the H.225.0 message is unknown in ISUP, the unspecified cause value of the class is sent.</p> <p>NOTE 2 – Even when the progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) in a PROGRESS message is received, In-band information indicator is sent only when the BC received in the IAM is coded <i>speech or 3.1 kHz audio</i>.</p> <p>NOTE 3 – If a bearer is available, then end interwork should apply the far-end tone/announcement.</p>	

C.7.1.3.2 ACM without cause parameter

The following cases are possible trigger conditions of sending the address complete message (ACM) without cause parameter:

- a) The destination has determined independently of access indications that the complete called party number has been received.
- b) Overlap receiving is used on the H.225.0 side and a CALL PROCEEDING is received.
- c) *En bloc* receiving is used on the H.225.0 side and a Progress indicator information element is received in a CALL PROCEEDING message or in a PROGRESS message.
- d) The first ALERTING message is received.

On *speech* or *3.1 kHz* calls, the awaiting answer indication (e.g., ring tone) is sent to the calling party upon receipt of the first ALERTING message.

NOTE 1 – In all cases, it is assumed that no Address Complete Message (ACM) has already been sent.

NOTE 2 – The case of the sending of the Address Complete Message (ACM) when the call is forwarded is not described hereafter: see C.7.2.

C.7.1.3.2.1 Mandatory parameters

Backward call indicators

bits	DC	Called party's status indicator
	0 1	<i>subscriber free</i> if the ALERTING message has been received
	0 0	<i>no indication</i> otherwise
bits	FE	Called party's category indicator
	0 0	<i>no indication</i> if the user's characteristics (internal data) have not been analysed, or
	0 1	<i>ordinary subscriber</i> , or
	1 0	<i>payphone</i> according to the user's characteristics
bit	I	Interworking indicator
	0	no interworking encountered. Set for H.323 terminated or originated calls. Set when endpoint type is NOT a gateway
	1	<i>interworking encountered. Set for H.323 trunked calls; set when endpoint type indicates a gateway</i>

If bit I is 0 then:

bit	K	ISDN user part indicator
	1	<i>ISDN user part used all the way</i>
bit	M	ISDN access indicator
	1	<i>terminating access ISDN</i>

C.7.1.3.2.2 Optional parameters

Optional backward call indicators

bit	A	In-band information indicator
	1	<i>in-band information or an appropriate pattern is now available. (See C.7.1.3.1)</i>
	0	<i>no indication otherwise</i>
bit	B	Call diversion may occur indicator
		See C.7.2.

bit D MLPP user indicator
NA

User-to-user indicators

NA.

User-to-user information

User-to-user Information is carried in H.225.0 User Data.

NOTE – User-to-user information is MANDATORY in H.225.0 messages.

Access transport

This parameter carries the progress indicator information element possibly received from the called user (except the value No. 8).

It may carry other information element as well: see C.7.1.2 and Table C.47.

Generic notification indicator

NA.

Transmission medium used

See handling of fallback information at the end of this clause.

Access delivery information

NA.

Redirection number

FFS.

Call diversion information

FFS.

Redirection number restriction parameter

FFS.

Handling of fallback information

As H.323 does not perform bearer selection procedures, the interworking function must perform fallback as described in Table C.47.

When the terminating exchange has knowledge that the fallback capability was requested in the Initial Address Message (IAM), and if no progress indicator No. 1 or No. 2 has been received from the H.225.0 side, Table C.47 is applicable.

Table C.47/H.246 – Handling of BC fallback information

←ACM	
Transmission medium used parameter	Access transport parameter
Value received in the TMR prime of the IAM message (<i>speech or 3.1 kHz audio</i>)	BC low (<i>speech or 3.1 kHz audio</i>) p.i. No. 5

C.7.1.4 Sending of the Call Progress message (CPG)

C.7.1.4.1 CPG with cause parameter

If the Address Complete Message (ACM) has already been sent, the following cases are possible trigger conditions of sending the Call Progress message (CPG) with cause parameter:

- a) It has been determined, in case of call failure that an in-band tone or announcement has to be returned to the calling party from the destination interworking function.

Table C.47a/H.246 – Sending of CPG with a cause parameter

PROGRESS→	CPG→
Cause information element	Cause parameter (Note 1)
Progress indicator No. 8	Event information parameter <div style="text-align: right; margin-right: 20px;"><i>In-band info...</i></div> Event indicator or Optional backward call indicators parameter <div style="text-align: right; margin-right: 20px;"><i>In-band info...</i></div> In-band information ind. (Note 2)
NOTE 1 – If the cause value received in the H.225.0 message is unknown in ISUP, the unspecified cause value of the class is sent.	
NOTE 2 – Even when the progress indicator No. 8 (<i>in-band information or an appropriate pattern is now available</i>) in a PROGRESS message is received, In-band information indicator is sent only when the BC received in the IAM is coded <i>speech or 3.1 kHz audio</i> .	
NOTE 3 – If the bearer is established, the interwork function should initiate far-end tone/announcement.	

C.7.1.4.2 CPG without cause parameter

If the Address Complete Message (ACM) has already been sent, the following cases are possible trigger conditions of sending the Call Progress message (CPG) without cause parameter:

- a) Receipt of a progress indicator information element in a CALL PROCEEDING message (except with value No. 8, *in-band information or an appropriate pattern is now available*, No. 3, *originating address is non-ISDN*, or No. 4, *call has returned to the ISDN*) or in a PROGRESS message (except with value No. 8, *in-band information or an appropriate pattern is now available* or No. 3 *originating address is non-ISDN*).
- b) Receipt of the first ALERTING message.

NOTE – The case of the sending of the Call Progress message (CPG) when the call is forwarded is not described hereafter: see C.7.2.

C.7.1.4.2.1 Mandatory parameters

Event information

bits	G-A	Event indicator
	0000001	<i>alerting</i> in case b) (see Note in C.7.1.4.2);
	0000010	<i>progress</i> in case a);
	0000011	<i>in-band information or an appropriate pattern is now available</i> (see C.7.1.4.1).

C.7.1.4.2.2 Optional parameters

User-to-user information

User-to-user Information is carried in H.225.0 User Data.

NOTE – User-to-user information is MANDATORY in H.225.0 messages.

C.7.1.4.2.3 Other parameters

The other parameters may have already been sent in a previous backward message. In this case they are not repeated unless new information is now available.

The coding of these parameters is described in C.7.1.3.

NOTE – If cases b) occur simultaneously, the event indicator of the event information parameter is coded *alerting* and the in-band information indicator of the optional backward call indicators parameter *in-band information or an appropriate pattern is now available* (for further study).

C.7.1.5 Sending of the Answer Message (ANM)

Upon receipt of the CONNECT message, if the address complete message has already been sent, the destination exchange shall:

- stop the sending of the awaiting indication (if any);
- send the Answer Message (ANM) to the preceding exchange.

The Answer Message (ANM) is coded as follows:

C.7.1.5.1 Optional parameters

Connected number

See C.7.2.5.

Connected subaddress

See C.7.2.5.

Generic number

See C.7.2.5.

Access transport

See Table C.48.

Table C.48/H.246 – Contents of the access transport parameter

←ANM	←Message received from the access
Access transport	Information elements
Progress indicator	Progress indicator

It may carry other information elements as well: See C.7.1.2 and Table C.48.

Transmission medium used

This parameter is only present in case where fallback occurs (see the end of this clause).

User-to-user information

User-to-user Information is carried in H.225.0 User Data.

NOTE – User-to-user information is MANDATORY in H.225.0 messages.

C.7.1.5.2 Other parameters

The other parameters may have already been sent in a previous backward message. In this case, they are not repeated unless new information is now available.

The coding of these parameters is described in C.7.1.3.

Handling of fallback information

Fallback is handled on the first backward message; see C.7.1.3.

C.7.1.6 Sending of the Connect message (CON)

Upon receipt of the first CONNECT message, if the Address Complete Message (ACM) has not yet been sent, the destination interworking function shall send the Connect message (CON) to the preceding exchange.

The Connect message (CON) is coded as follows.

C.7.1.6.1 Mandatory parameters

Backward call indicators

See C.7.1.3.

C.7.1.6.2 Optional parameters

Optional backward call indicators

See C.7.1.3.

Connected number

See C.7.2.5.

Access transport

See Table C.49.

Table C.49/H.246 – Contents of the access transport parameter

←CON	←CONNECT
Access transport parameter	Information elements
Connected subaddress	Connected subaddress
Progress indicator	Progress indicator

It may carry other information elements as well: see C.7.2 and Table C.51.

Access delivery information

bit A Access delivery indicator
0 *SETUP message generated*

Generic number

See C.7.2.5.

Generic notification indicator

NA.

Transmission medium used

This parameter is only present in case where fallback occurs (see the end of this clause).

User-to-user indicators

NA.

User-to-user information

User-to-user Information is carried in H.225.0 User Data.

NOTE – User-to-user information is MANDATORY in H.225.0 messages.

Handling of fallback information

As H.323 does not perform bearer selection procedures, the interworking function must perform fallback as described in Table C.50.

When the terminating interworking function has knowledge that the fallback capability was requested in the Initial Address Message (IAM), and if no progress indicator No. 1 or No. 2 has been received from the H.225.0 side, Table C.50 is applicable.

Table C.50/H.246 – Handling of BC fallback information
T reference point

←CON		←CONNECT
Transmission medium used parameter	Access transport parameter	Content
No TMU	BC (<i>unrestricted digital information with tones and announcements</i>)	BC (<i>unrestricted digital information with tones and announcements</i>)
Value received in the TMR prime of the IAM message (<i>speech or 3.1 kHz audio</i>)	BC (<i>speech or 3.1 kHz audio</i>)	BC (<i>speech or 3.1 kHz audio</i>)
Value received in the TMR prime of the IAM message (<i>speech or 3.1 kHz audio</i>)	BC (<i>speech or 3.1 kHz audio</i>) p.i. No. 5	BC (<i>speech or 3.1 kHz audio</i>) p.i. No. 5
Value received in the TMR prime of the IAM message (<i>speech or 3.1 kHz audio</i>)	BC received in the USI of the IAM message (<i>speech or 3.1 kHz audio</i>) p.i. No. 5	No BC
NOTE – Progress Indicator (p.i.) No. 5 indicates ' <i>interworking has occurred</i> '.		

C.7.1.7 Receipt of the Release message (REL)

Cause

See Table C.51.

Table C.51/H.246 – Receipt of the Release message (REL)

REL→	RELEASE COMPLETE→ (Note 1)
Cause parameter	Cause information element
Cause value No. x	Cause value No. x (Note 2)
NOTE 1 – If the cause value received in the Release message (REL) is unknown in H.225.0, the unspecified cause value of the class is sent. NOTE 2 – Mapping the Cause Value to ReleaseCompleteReason is not required as packet-based network entities are required to decode the Cause IE.	

User-to-user information

The user-to-user information element contains the ReleaseComplete-UUIE defined in the H.225.0 Message Syntax.

The handling of the other parameters is described in C.7.2.

The receipt of the Release message (REL) during the user suspend/resume procedure is described in C.7.2.

C.7.1.8 Sending of the Release message (REL)

See Table C.52.

Table C.52/H.246 – Call clearing during call establishment

←REL	←RELEASE COMPLETE
Cause parameter	Cause information element
Cause value No. x (Note)	Cause value No. x
Cause parameter	ReleaseCompleteReason
34 – No circuit/channel available	noBandwidth
47 – Resource unavailable, unspecified	gatekeeperResources
3 – No route to destination	unreachableDestination
16 – Normal call clearing	destinationRejection
88 – Incompatible destination	invalidRevision
127– Interworking, unspecified	noPermission
38 – Network out of order	unreachableGatekeeper
42 – Switching equipment congestion	gatewayResources
28 – Invalid number format	badFormatAddress
41 – Temporary failure	adaptiveBusy
17 – User busy	inConf
31 – Normal, unspecified	undefinedReason
16 – Normal call clearing	facilityCallDeflection
31 – Normal, unspecified	securityDenied
20 – Subscriber absent	calledPartyNotRegistered
31 – Normal, unspecified	callerNotRegistered
47 – Resource Unavailable	newConnectionNeeded
127– Interworking, unspecified	nonStandardReason
31 – Normal, unspecified	replaceWithConferenceInvite
31 – Normal, unspecified	genericDataReason
31 – Normal, unspecified	neededFeatureNotSupported
127– Interworking, unspecified	tunnelledSignallingRejected
3 – No route to destination	invalidCID
NOTE – If the cause value received in the H.225.0 message is unknown in ISUP, the unspecified cause value of the class is sent.	

The Release message (REL) contains the access delivery information parameter coded to *Setup message generated* if this information has not been sent before.

The handling of the other parameters possibly present in the Release message (REL) is described in C.7.2.

User-to-user information

User-to-user information is carried in H.225.0 User Data.

NOTE – User-to-user information is MANDATORY in H.225.0 messages.

C.7.1.9 Receipt of the Reset Circuit message (RSC), Circuit Group Reset message (GRS) or Circuit Group Blocking message (CGB) with the indication *hardware failure oriented*

See Table C.53.

Table C.53/H.246 – Receipt of RSC, GRS or CGB messages

Message received from ISUP→	RELEASE COMPLETE→
	Cause information element
Reset Circuit message (RSC)	Cause value No. 31 <i>Normal, unspecified</i>
Circuit Group Reset message (GRS)	Cause value No. 31 <i>Normal, unspecified</i>
Circuit Group Blocking message (CGB) with the type indicator of the circuit group supervision message type indicator parameter coded "01" (<i>hardware failure oriented</i>)	Cause value No. 31 <i>Normal, unspecified</i>

User-to-user information

See C.7.1.7.

C.7.1.10 H.225.0 Transport Level reset and Transport Level failure procedures

The data link reset and data link failure procedures are respectively described in 5.8.8/Q.931 and 5.8.9/Q.931 [3]. See Table C.54.

Table C.54/H.246 – H.225.0 Transport level reset and Transport level failure procedures

←REL	Trigger event	RELEASE COMPLETE→
Cause parameter		Cause information element
Cause value No. 41 (<i>temporary failure</i>)	Transport level reset in overlap receiving state	AdaptiveBusy <i>call is dropping due to LAN crowding</i>
Cause value No. 27 (<i>destination out of order</i>)	Transport Level failure in another state than active state	(Note 1)
Cause value No. 27 (<i>destination out of order</i>)	Failure of the transport level re-establishment procedure after a transport level failure in active state. (Note 2)	(Note 1)
NOTE 1 – The call is cleared internally. No RELEASECOMPLETE message is sent on the access.		
NOTE 2 – These errors correspond to the H.225.0 Release reason <i>unreachableDestination</i> .		

C.7.1.11 Release by the interworking function

See Table C.55.

Table C.55/H.246 – Release from the destination interworking Function

←Message sent to the ISUP	Trigger event	Message sent to the H.225.0 →
REL Cause value No. 18 <i>No user responding</i>	No response to the SETUP message (T303 expiry)	RELEASE COMPLETE Cause value No. 102 <i>Recovery on timer expiry</i>
REL Cause value No. 18 <i>No user responding</i>	No ALERTING, CONNECT after CALL PROCEEDING (T310 expiry)	RELEASE COMPLETE Cause value No. 102 <i>Recovery on timer expiry</i>
REL Cause value No. 19 <i>No answer from user (user alerted)</i>	No CONNECT after ALERTING (T301 expiry)	RELEASE COMPLETE Cause value No. 102 <i>Recovery on timer expiry</i>
REL Cause value No. 97 or No. 99	Call release due to the ISUP compatibility procedure	RELEASE COMPLETE Cause value No. 97 or No. 99
REL Cause value coded according to [1]	Other cases of failure on the ISUP side	RELEASE COMPLETE Same cause value as in the REL message (Note 1)
REL Same cause value as in the RELEASE COMPLETE message (Note 2)	Other cases of failure on the H.225.0 side	RELEASE COMPLETE Cause value coded according to Table C.53
NOTE 1 – If the cause value sent in the REL message is unknown in H.225.0, the unspecified cause value of the class is sent.		
NOTE 2 – If the cause value sent in the RELEASE COMPLETE message is unknown in ISUP, the unspecified cause value of the class is sent.		

Access Delivery Information

NA.

If the SETUP message has been sent, the Release message (REL) contains the access delivery information parameter coded to *Setup message generated* if this information has not been sent before.

The handling of the other parameters possibly present in the Release message (REL) is described in C.7.2.

C.7.2 ISUP supplementary services and H.323 services

C.7.2.1 Direct-Dialling-In (DDI)

There is no specific interwork relating to the DDI supplementary service. For an indication of the actions taken in the ISUP network, see ITU-T Rec. Q.731.1. FFS.

C.7.2.2 Multiple Subscriber Number (MSN)

There is no specific interwork relating to the MSN supplementary service. For an indication of the actions taken in the ISDN network, see ITU-T Rec. Q.951.x. FFS.

C.7.2.3 Calling Line Identification Presentation (CLIP)/Calling Party Name Presentation (H.450.8)

If the called user has CLIP, one or two calling party number information elements are sent in the SETUP message by performing the conversion specified in Tables C.56 and C.60.

SETUP message sent to Terminal or Gateway

See Table C.56.

Table C.56/H.246 – CLIP information sent to the called user

IAM→		SETUP→
Calling party number parameter Address presentation restricted indicator	Generic number parameter with number qualifier set to <i>additional calling party number</i>	CPAP information sent to the calling user
<i>Presentation allowed</i>	Absent	sourceAddress or Calling party number IE (see Table C.57)
<i>Presentation allowed</i>	Present	sourceAddress or Calling party number IE (Note 1) (see Table C.58) additionalSourceAddresses (Note 1) (see Table C.58 <i>bis</i>)
<i>Presentation restricted</i> (Note 2)	Value non-significant	sourceAddress or Calling party number IE and additionalSourceAddresses Option 1: Type of number As received Numbering plan As received Presentation ind. <i>Presentation restricted</i> Screening ind. As received Number digits No digit Option 2: Type of number <i>Unknown</i> Numbering plan <i>Unknown</i> Presentation ind. <i>Presentation restricted</i> Screening ind. <i>Network provided</i> Number digits No digit

Table C.56/H.246 – CLIP information sent to the called user

IAM→		SETUP→										
<p><i>Address not available</i></p> <p>or</p> <p>No calling party number parameter</p>	<p>Value non-significant</p>	<p>sourceAddress</p> <p>or</p> <p>Calling party number IE</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">Type of number</td> <td><i>Unknown</i></td> </tr> <tr> <td style="padding-left: 20px;">Numbering plan</td> <td><i>Unknown</i></td> </tr> <tr> <td style="padding-left: 20px;">Presentation ind.</td> <td><i>Not available due to interworking</i></td> </tr> <tr> <td style="padding-left: 20px;">Screening ind.</td> <td><i>Network provided</i></td> </tr> <tr> <td style="padding-left: 20px;">Number digits</td> <td>No digit</td> </tr> </table>	Type of number	<i>Unknown</i>	Numbering plan	<i>Unknown</i>	Presentation ind.	<i>Not available due to interworking</i>	Screening ind.	<i>Network provided</i>	Number digits	No digit
Type of number	<i>Unknown</i>											
Numbering plan	<i>Unknown</i>											
Presentation ind.	<i>Not available due to interworking</i>											
Screening ind.	<i>Network provided</i>											
Number digits	No digit											
<p>NOTE 1 – If the "two calling party number delivery option" does not apply:</p> <ul style="list-style-type: none"> – only one calling party number information element is sent on H.225.0 side. The generic number is used (see Table C.58). <p>If the "two calling party number delivery option" applies:</p> <ul style="list-style-type: none"> – The additionalSourceAddresses is sent and is coded according to the calling party number parameter received, and the Calling Party Number IE is coded according to the generic number parameter (see Table C.58). <p>NOTE 2 – As a national option, the presentation restriction indication received in the calling party number parameter can be overridden for specific calling access categories. In such a case, the same actions are taken as if <i>presentation allowed</i> was received, except for the presentation restriction indication, which is passed transparently into the calling party number information element.</p>												

Table C.57/H.246 – Coding of the calling party number information element according to the calling party number parameter

IAM→	SETUP→
Calling party number parameter	sourceAddress or Calling party number IE
Nature of address indicator <i>National number</i> <i>International number</i>	Type of number (Note 1) <i>National number</i> <i>International number</i>
Numbering plan indicator <i>ISDN/Telephony numbering plan</i>	Numbering plan identification <i>ISDN/Telephony numbering plan</i>
Address presentation restricted indicator <i>Presentation allowed</i> <i>Presentation restricted</i>	Presentation indicator (Note 2) <i>Presentation allowed</i> <i>Presentation restricted</i>
Screening indicator <i>User provided, verified and passed</i> <i>Network provided</i>	Screening indicator (Note 3) <i>User provided, verified and passed</i> <i>Network provided</i>
Address signals	Number digits
<p>NOTE 1 – As a network option, the type of number may be coded <i>unknown</i> when a prefix is added to the number.</p> <p>NOTE 2 – The Presentation Indicator may be coded as part of the Calling Party Number or as a H.225.0 presentationIndicator IE.</p> <p>NOTE 3 – The Screening Indicator may be coded as part of the Screening Indicator or as a H.225.0 screeningIndicator IE.</p>	

Table C.58/H.246 – Coding of the calling party number information element according to the generic number parameter

IAM→	SETUP→
Generic number parameter with number qualifier set to <i>additional calling party number</i>	sourceAddress or Calling party number IE
Nature of address indicator <i>National number</i> <i>International number</i>	Type of number (Note 1) <i>National number</i> <i>International number</i>
Numbering plan indicator <i>ISDN/Telephony numbering plan</i>	Numbering plan identification <i>ISDN/Telephony numbering plan</i>
Address presentation restricted indicator <i>Presentation allowed</i> <i>Presentation restricted</i>	Presentation indicator (Note 2) <i>Presentation allowed</i> <i>Presentation restricted</i>
Screening indicator <i>User provided, not verified</i>	Screening indicator (Note 3) <i>User provided, not verified</i>
Address signals	Number digits
NOTE 1 – As a network option, the type of number may be coded <i>unknown</i> when a prefix is added to the number.	
NOTE 2 – The Presentation Indicator may be coded as part of the Calling Party Number or as a H.225.0 presentationIndicator IE.	
NOTE 3 – The Screening Indicator may be coded as part of the Screening Indicator or as a H.225.0 screeningIndicator IE.	

Table C.58 bis/H.246 – Coding of the additionalSourceAddresses information element according to the calling party number parameter

IAM→	SETUP→
Calling party number parameter	additionalSourceAddresses
Nature of address indicator <i>National number</i> <i>International number</i>	Type of number (Note) <i>National number</i> <i>International number</i>
Numbering plan indicator <i>ISDN/Telephony numbering plan</i>	Numbering plan identification <i>ISDN/Telephony numbering plan</i>
Address presentation restricted indicator <i>Presentation allowed</i> <i>Presentation restricted</i>	Presentation indicator <i>Presentation allowed</i> <i>Presentation restricted</i>
Screening indicator <i>User provided, verified and passed</i> <i>Network provided</i>	Screening indicator <i>User provided, verified and passed</i> <i>Network provided</i>
Address signals	Number digits
NOTE – As a network option, the type of number may be coded <i>unknown</i> when a prefix is added to the number.	

Calling party subaddress

See Table C.59.

Table C.59/H.246 – Sending of the calling party subaddress

IAM→		SETUP→
Address presentation restricted indicator of the Calling party number parameter	Access transport parameter	Content
<i>Presentation allowed</i>	Calling party subaddress information element	Calling party subaddress information element
<i>Presentation restricted</i> (Note) or <i>Address not available</i> or No calling party number parameter	Calling party subaddress information element	No calling party subaddress information element
NOTE – As a national option, the presentation restriction indication received in the calling party number parameter can be overridden for specific calling access categories. In such a case, the same actions are taken as if <i>presentation allowed</i> was received.		

SETUP Message sent to Gatekeeper

- a) If the calling party number is absent in ISUP, then Table C.60.1 applies:

Table C.60.1/H.246 – Calling Party Number

←SETUP	←IAM
sourceAddress or Calling Party Number IE Type of number <i>Unknown</i> Numbering plan <i>Unknown</i> Presentation ind. <i>Not available due to interworking</i> Screening ind. <i>Network provided</i> Number digits No digit	

- b) If only the calling party number is present in ISUP, then Table C.60.2 applies:

Table C.60.2/H.246 – Calling Party Number

←SETUP	←IAM
Calling Party Number	Calling Party Number

- c) If the calling party number and the generic number (with the qualification additional Calling Party Number) are present, then Table C.60.3 applies:

Table C.60.3/H.246 – Calling Party Number

←SETUP	←IAM
Calling Party Number	Generic Number (– additional Calling Party number)
additionalSourceAddresses	Calling Party Number

C.7.2.4 Calling Line Identification Restriction (CLIR)/Calling Party Name Restriction (H.450.8)

See Table C.56.

C.7.2.5 Connected Line Identification Presentation (COLP)/Connected Party Name Presentation (H.450.8)

If the connected line identity request indicator of the optional forward call indicators parameter in the Initial Address Message (IAM) is received coded to *requested*, then the connected number and possibly the generic number parameter and the connected subaddress are sent in the answer or connect message as described in Tables C.57 and C.58.

C.7.2.5.1 Special arrangement applies

CONNECT received from Terminal or Gateway

See Table C.61.

Table C.61/H.246 – COLP – Special arrangement applies

←ANM, CON				←CONNECT	
Coding of the connected number and generic number parameters				Connected number IE	
Address signals	Numbering plan indicator	Nature of address indicator	Screening indicator	Numbering plan identification	Type of number
Connected number parameter				No or invalid (Note 1) connected number information element	
Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>		
No generic number parameter indicating <i>additional connected number</i> is sent				<i>ISDN/telephony numbering plan</i> or <i>unknown</i>	<i>National number</i>
Connected number parameter					
Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>		
Generic number parameter (Note 2)					
Number provided by the user	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	00 <i>User provided, not verified</i>		
Connected number parameter				<i>ISDN/telephony numbering plan</i> or <i>unknown</i>	<i>International number</i>
Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>		
Generic number parameter (Note 2)					
Number provided by the user	001 <i>ISDN numbering plan</i>	000 0100 <i>International number</i>	00 <i>User provided, not verified</i>		
NOTE 1 – Validity conditions of the connected number information element are defined in 5.5.2.3/Q.951.x [19].					
NOTE 2 – The generic number parameter contains the number qualifier indicator coded "0000 0101" (<i>additional connected number</i>).					

The address presentation restricted indicator of the connected number and generic number parameters shall be set according to the COLR supplementary service.

The number incomplete indicator of the generic number parameter shall be set to "0" (*complete*).

Connected subaddress

If provided, the connected subaddress is transported transparently in the access transport parameter of the Answer (ANM) or Connect (CON) message.

CONNECT received from a Gatekeeper

See Table C.62.

Table C.62/H.246 – Connected Party Number

CONNECT→	ANM/CON→
Connected Party Number	Connected Party Number or (Note) Generic Number (– additional Connected Party number)
connectedAddress	Connected Party Number
NOTE – If a Connected Party number is included in the connectedAddress , then the Calling party number should be sent in the Generic Number.	

C.7.2.5.2 Special arrangement does not apply

CONNECT received from Terminal or Gateway

See Table C.63.

Table C.63/H.246 – COLP – Special arrangement does not apply

←ANM, CON				←CONNECT		
Coding of the connected number and generic number parameters				Connected number information element		
Address signals	Numbering plan indicator	Nature of address indicator	Screening indicator	Type of number	Numbering plan identification	Number digits
Connected number parameter				No or invalid (Note) connected number information element		
Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>			
No generic number parameter indicating <i>additional connected number</i> is sent				Failure of the screening function		
Connected number parameter						
Default number	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	11 <i>Network provided</i>			
No generic number parameter indicating <i>additional connected number</i> is sent				<i>Subscriber number</i> <i>National number</i> or <i>International number</i>		
Connected number parameter						
Number provided by the user	001 <i>ISDN numbering plan</i>	As received	01 <i>User provided, verified and passed</i>			
No generic number parameter indicating <i>additional connected number</i> is sent						

Table C.63/H.246 – COLP – Special arrangement does not apply

←ANM, CON				←CONNECT		
Connected number parameter						
Completion of the number provided by the user	001 <i>ISDN numbering plan</i>	000 0011 <i>National number</i>	01 <i>User provided, verified and passed</i>	<i>Unknown</i>	<i>ISDN/telephony numbering plan</i> or <i>Unknown</i>	Incomplete number
No generic number parameter indicating <i>additional connected number</i> is sent						
NOTE – Validity conditions of the connected number information element are defined in 5.5.2.3/Q.951.x [19].						

The address presentation restricted indicator of the connected number parameter shall be set according to the COLR supplementary service.

CONNECT received from a Gatekeeper

See Table C.64.

Table C.64/H.246 – Connected Party Number

CONNECT→	ANM/CON→
Connected Party Number	Connected Party Number or (Note) Generic Number (– additional Connected Party number)
connectedAddress	Connected Party Number
NOTE – If a Connected Party number is included in the connectedAddress , then the Calling party number should be sent in the Generic Number.	

Connected subaddress

If provided, the connected subaddress is transported transparently in the access transport parameter of the Answer (ANM) or Connect (CON) message.

C.7.2.6 Connected Line Identification Restriction (COLR)/Connected Party Name Restriction (H.450.8)

CONNECT received from a Terminal or Gateway

The address presentation restricted indicator of the connected number and of the generic number is coded as described in Table C.65.

NOTE – If the called user has not subscribed to the COLR supplementary service, the address presentation restricted indicator of the connected number parameter is set to *presentation allowed* (see 6.10/Q.951.x [19]).

Table C.65/H.246 – Coding of the address presentation restricted indicator of the connected number and generic number parameters

←ANM/CON	←CONNECT	Internal data (User profile data)	
Connected number/ generic number parameter Address presentation restricted indicator	Connected number information element Presentation indicator	Temporary mode default setting	Permanent mode
Presentation restricted	Value non-significant	Value non-significant	Yes
Presentation restricted	Presentation restricted	Restricted	No
Presentation restricted	Absent		
Presentation allowed	Presentation allowed		
Presentation allowed	Presentation allowed	Allowed	
Presentation allowed	Absent		
Presentation restricted	Presentation restricted		

CONNECT received from a Gatekeeper

See Table C.66.

Table C.66/H.246 – Calling Party Number

CONNECT→	ANM/CON→
Connected Party Number	Connected Party Number or (Note) Generic Number (– additional Connected Party number)
connectedAddress	Connected Party Number
NOTE – If an additional Connected Party number is included in the connectedAddress , then the additional Connected party number should be sent in the GenericNumber .	

C.7.2.7 Subaddressing (SUB)

The called party subaddress information element received in the access transport parameter of the Initial Address Message (IAM) is transferred transparently in the SETUP message.

C.7.2.8 Call diversion

C.7.2.8.1 Interworking at the interworking function where a call is diverted within or beyond the H.323 network

For further study.

C.7.2.8.2 Interworking at the coincident S and T reference point where a diverted call is presented

For further study.

C.7.2.8.3 Interworking at the exchange where a diverted call is presented to a H.323 network

C.7.2.8.3.1 Gateways supporting H.450.3

If a PSTN to H.323 gateway receives an IAM message containing redirecting number and redirection information parameters, it forwards a H.225 SETUP message that includes an H.450.3 divertingLegInformation2 invoke APDU. The gateway is to operate as a combined H.450.3 rerouting endpoint and H.450.3 calling endpoint. The original called number may also be present in the IAM message.

Table C.67/H.246 – Mapping ISUP redirecting parameters to H.450.3 APDU

IAM→	SETUP→
	divertingLegInformation2
Redirecting number	divertingNr
Redirection information	
Redirecting reason	diversionReason
Redirection counter	diversionCounter
Original redirection reason	originalDiversionReason
Original called number	originalCalledNr

If the gateway receives an ALERTING, CONNECT or FACILITY message that contains a divertingLegInformation3 invoke APDU, it sends an ISUP message to the calling party.

Table C.68/H.246 – Mapping of H.450.3 APDU fields to ISUP parameters

←ACM, CPG, ANM	←ALERTING, FACILITY, CONNECT
	divertingLegInformation3
Generic notification indicator <i>Call is diverting</i>	
Redirection number	redirectionNr
Redirection number restriction	presentationAllowedIndicator

C.7.2.8.3.2 Gateways not supporting H.450.3

If a gateway that does not support H.450.3 procedures receives an IAM message containing redirecting number and redirection information parameters, it maps these parameters to a H.225.0 SETUP message that includes a redirecting number information element as shown in Table C.69. In the case of multiple diversions within the PSTN an original called number parameter may be present in the IAM message. In this case two redirecting number information elements are included in the SETUP message as shown in Table C.70: the first redirecting number information element is for the first diversion and the second redirecting number information element is for the last diversion.

**Table C.69/H.246 – Mapping of ISUP redirecting parameters
for a non-H.450.3 gateway – Single diversion**

IAM→	SETUP→
Redirecting number parameter Nature of address (1) Numbering plan (2) Address signal (3)	Redirecting number information element Type of number (1) Numbering plan (2) Reason for diversion (4) Number digits (3)
Redirection information parameter Redirecting reason (4)	
The numbers in parentheses show the mapping of individual fields	

**Table C.70/H.246 – Mapping of ISUP redirecting parameters
for a non-H.450.3 gateway – Multiple diversions**

IAM→	SETUP→
Redirecting number parameter Nature of address (1) Numbering plan (2) Address signal (3)	Redirecting number information element Type of number (6) Numbering plan (7) Reason for diversion (5) Number digits (8)
Redirection information parameter Redirecting reason (4) Original redirection reason (5)	
Original called number parameter Nature of address (6) Numbering plan (7) Address signal (8)	Redirecting number information element carried as H.460.5 [20] information Type of number (1) Numbering plan (2) Reason for diversion (4) Number digits (3)
The numbers in parentheses show the mapping of individual fields	

C.7.2.8.4 Interworking at the exchange where partial rerouting is requested from a private ISDN

For further study.

C.7.2.9 Call Waiting (CW)

C.7.2.9.1 Procedure at the T reference point

If the call is presented with indication *no channel* in the information channel selection field of the channel identification information element in the SETUP message, and depending on the subscription options offered by the network, a notification is sent in the network upon receipt of the alerting indication. See Table C.71.

Table C.71/H.246 – Sending of CW notification

←ACM, CPG	←ALERTING
Generic notification indicator parameter	callWaiting
Notification indicator	
110 0000 <i>Call is a waiting call</i>	Invoke
NOTE – See ITU-T Rec. H.450.6 for a description of Call Waiting in a H.323 network.	

C.7.2.10 Call Hold (HOLD)

NOTE – H.225.0 does not support the HOLD, HOLD ACKNOWLEDGE, HOLD REJECT, RETRIEVE, RETRIEVE ACKNOWLEDGE or RETRIEVE REJECT messages. This service uses the FACILITY UU-IE for Hold and Retrieve.

C.7.2.10.1 Notification received from the network

See Table C.72.

Table C.72/H.246 – HOLD notification

CPG→	FACILITY→
Generic notification indicator parameter	
Notification indicator	
111 1001 <i>Remote hold</i>	holdNotific <i>invoke</i> APDU
111 1010 <i>Remote retrieval</i>	retrieveNotific <i>invoke</i> APDU

C.7.2.10.2 Notification received at T reference point

A HOLD notification may be received at T reference point in the active phase of the call. See Table C.73.

Table C.73/H.246 – Receipt of a HOLD notification from a H.323 network

←CPG		←FACILITY
Event information parameter	Generic notification indicator parameter	
Event indicator	Notification indicator	
000 0010 <i>Progress</i>	111 1001 <i>Remote hold</i>	holdNotific <i>invoke</i> APDU
000 0010 <i>Progress</i>	111 1010 <i>Remote retrieval</i>	retrieveNotific <i>invoke</i> APDU

C.7.2.11 Terminal Portability (TP)

Terminal Portability is not explicitly supported in a H.323 network and is not described in ITU-T Rec. H.323 or in H.450.x-series Recommendations. However, the messages and IEs to support Terminal Portability exist in ITU-T Rec. H.225.0.

C.7.2.11.1 Notification received from the network

See Table C.74.

Table C.74/H.246 – TP notification

Message received from the ISUP→	NOTIFY→
	Notification indicator IE Notification description
SUS message Suspend/resume indicator <i>ISDN subscriber initiated</i>	000 0000 <i>User suspended</i>
RES message Suspend/resume indicator <i>ISDN subscriber initiated</i>	000 0001 <i>User resumed</i>
CPG message Generic notification indicator <i>User suspended</i>	000 0000 <i>User suspended</i>
CPG message Generic notification indicator <i>User resumed</i>	000 0001 <i>User resumed</i>

C.7.2.11.2 Invocation at coincident S and T reference point

The sending of SUSPEND and RESUME is not supported in a H.323 network.

C.7.2.11.3 Notification received at T reference point

A TP notification may be received at T reference point in the active phase of the call. See ITU-T Rec. Q.953.4 for a description of the Terminal Portability service on the access side. See Table C.75.

Table C.75/H.246 – Receipt of a TP notification from a private network

←CPG		←NOTIFY
Event information parameter	Generic notification indicator parameter	Notification indicator information element
Event indicator	Notification indicator	Notification description
000 0010 <i>Progress</i>	000 0000 <i>User suspended</i>	000 0000 <i>User suspended</i>
000 0010 <i>Progress</i>	000 0001 <i>User resumed</i>	000 0001 <i>User resumed</i>

C.7.2.12 Conference calling (CONF)

Establishing a conference call in H.323 is described in 8.4.3/H.323 [6].

NOTIFY messages are optional for conference calling notification. ITU-T Recs Q.954.1 and Q.734.1 describe the operation of Conferencing calling in ISDN networks. The NOTIFY message is optional in H.323 networks.

The tables in this clause describe the notifications sent to and received from terminal lying in the ISDN network when a Conference Calling supplementary service is active.

The Conferencing device may reside in the H.323 network in the form of an endpoint containing MC functionality or a stand-alone MCU. Alternatively the Conferencing may be implemented in the ISDN network.

The following terminology is used:

served user: The user that requests the conference call. The served user will be the user controlling the conference call. The served user may also be referred to as user A.

conferee: The users involved in the conference not controlling the conference, i.e., all participants except the served user are referred to as conferees or parties. The conferees may also be known as users B, C, etc.

isolate: An action at the access that restricts communication in both directions with a participant of the conference. (Call Hold.)

reattach: An action at the access that re-establishes the communication with a participant of the conference. (Call Retrieve.)

split: An action at the access that creates a private communication between the served user and a remote user. The private communication is a normal "two-party" call.

drop: An action at the access that clears the connection to a remote party.

floating: The situation where the conference calling supplementary service exists without the served user.

C.7.2.12.1 Notification received from the network

Table C.76 represents the backwards indication received from the conference calling device located on the ISUP network side.

Table C.76/H.246 – Conference calling notification

CPG→	Message to H.323 endpoint
Generic notification indicator parameter	NOTIFY→
Notification indicator	(Note 1)
100 0010 <i>Conference established</i>	Not applicable (Note 2)
100 0011 <i>Conference disconnected</i>	
100 0100 <i>Other party added</i>	Not applicable (Note 3)
100 0101 <i>Isolated</i>	Not applicable (Note 4)
100 0110 <i>Reattached</i>	Not applicable (Note 5)
100 0111 <i>Other party isolated</i>	Not applicable
100 1000 <i>Other party reattached</i>	Not applicable
100 1001 <i>Other party split</i>	Not applicable
100 1010 <i>Other party disconnected</i>	Not applicable
100 1011 <i>Conference floating</i>	Not applicable

Table C.76/H.246 – Conference calling notification

NOTE 1 – The format values below represent the 'Notification indicator information element' and the 'Notification description'.
NOTE 2 – H.245 ConferenceIndication . <i>TerminalNumberAssign</i> may also be used to indicate the establishment of a conference.
NOTE 3 – H.245 ConferenceIndication . <i>TerminalJoinedConf</i> may also be used to indicate that a terminal has joined the conference.
NOTE 4 – H.225.0 FACILITY indicating holdNotific . <i>invoke</i> may also be used to indicate 'remote hold'.
NOTE 5 – H.225.0 FACILITY indicating retrieveNotific . <i>invoke</i> may also be used to indicate 'remote retrieve'.
NOTE 6 – H.245 ConferenceIndication . <i>TerminalLeftConf</i> may also be used to indicate that a terminal has left the conference.

C.7.2.12.2 Invocation at coincident S and T reference point

Tables C.77 and C.78 show procedures that may be attempted in an SCN conference call and how these map to procedures that may be achieved through a H.323 conference.

The served user resides in a H.323 network (i.e., the MCU [conference device] is in the H.323 network). The tables also show the notifications that may be sent to users in the ISDN network.

User B and the other remote user reside in the SCN network.

The resulting Notification Message sent to B shall be generated by the interworking function. The notification message sent to all other remote users in ISDN network shall be generated by the interworking function.

Table C.77/H.246 – Conference calling

Message sent to all other remote users ←	Message sent to B ←	Message received from served user ←	Procedure
Not applicable	CPG Generic notification indicator parameter <i>Conference established</i>	H.225.0 SETUP ConferenceGoal = Create	Beginning the conference from an active call (with B)
Not applicable	CPG Generic notification indicator parameter <i>Conference established</i>	H.225.0 SETUP ConferenceGoal = Invite	Adding a remote user (B)
CPG Generic notification indicator parameter <i>Other party added</i>	Not applicable	H.245 <i>terminalJoinedConf</i>	

Table C.77/H.246 – Conference calling

Message sent to all other remote users ←	Message sent to B ←	Message received from served user ←	Procedure
(Note 2)	CPG Generic notification indicator parameter <i>Remote Hold</i> (Note 1)	H.225.0 FACILITY <i>HoldNotific.inv</i>	Isolate a remote user (B)
(Note 4)	CPG Generic notification indicator parameter <i>Remote Retrieve</i> (Note 3)	FACILITY <i>RetrieveNotific.inv</i>	Reattach a remote user (B)
Not applicable	Not applicable	Not applicable	Splitting a remote user (B) (Note 5)
Not applicable	REL	H.245 conferenceRequest <i>dropTerminal</i>	Disconnect a remote user (B)
CPG Generic notification indicator parameter <i>Other party disconnected</i>	Not applicable	H.245 conferenceRequest <i>terminalLeftConf</i>	
REL		H.245 conferenceCommand <i>dropTerminal</i>	Terminate the conference
Not applicable		Not applicable	Disconnect the served user (Note 6)
REL		RELEASECOMPLETE	Call clearing by served user

NOTE 1 – H.323 (H.450.4) does not allow the indication of '*isolated*' when placing a user on hold. Therefore a CPG message is generated indicating '*remote hold*'.

NOTE 2 – In ISUP-based conferencing, a CPG message indicating '*other party isolated*' would be sent to remote users. However as H.323 (H.450.4) does not support this, no message is sent.

NOTE 3 – H.323 (H.450.4) does not allow the indication of '*reattached*' when retrieving a user from hold. Therefore a CPG message is generated indicating '*remote retrieve*'.

NOTE 4 – In ISUP-based conferencing, a CPG message indicating '*other party isolated*' would be sent to remote users. However as H.323 (H.450.4) does not support this, no message is sent.

NOTE 5 – Procedure not supported in H.323.

NOTE 6 – H.323 does not support the functionality to indicate that a 'Conference Chair' is floating.

Table C.78/H.246 – Conference calling: a remote user clears

Message received from B →	Message sent to served user →	Procedure
REL	H.245 ConferenceIndication <i>terminalLeftConf</i>	Remote user clears

C.7.2.12.3 Notification received at T reference point

Table C.79 represents the situation where the conferencing device belongs to the H.323 network.

Table C.79/H.246 – Receipt of a conference calling notification from a private network

←CPG		←Message from H.323 endpoint (Note 4)
Event information parameter	Generic notification indicator parameter	
Event indicator	Notification indicator	
000 0010 <i>Progress</i>	100 0010 <i>Conference established</i>	H.225.0 SETUP ConferenceGoal = invite
000 0010 <i>Progress</i>	100 0100 <i>Other party added</i>	H.245 ConferenceIndication <i>terminalJoinedConf</i>
000 0010 <i>Progress</i>	111 1001 <i>Remote Hold</i>	H.225.0 FACILITY <i>HoldNotific.inv</i> (Note 2)
000 0010 <i>Progress</i>	111 1010 <i>Remote Retrieve</i>	H.225.0 FACILITY <i>RetrieveNotific.inv</i> (Note 3)
000 0010 <i>Progress</i>	100 1010 <i>Other party disconnected</i>	H.245 ConferenceIndication <i>terminalLeftConf</i>

NOTE 1 – 'Conference Disconnection' results from when a conference chair initiates a 'conference out of consultation' with one of the conferees. H.323 does not identify this situation and thus no indication of 'conference disconnected' is generated toward the ISUP network.

NOTE 2 – H.323 does not support the indication of 'isolated'. The equivalent is FACILITY indicating 'holdNotific'.

NOTE 3 – H.323 does not support the indication of 'reattached'. The equivalent is FACILITY indicating 'retrieveNotific'.

NOTE 4 – H.323 (H.450.4) does not support the indication of 'other party isolated', 'other party reattached', 'other party split' or 'conference floating', therefore these indications are not generated toward the ISUP network.

C.7.2.13 Three-party (3PTY)

Establishing a Conference out of Consultation call in H.323 is described in 8.4.3.8/H.323 [6].

NOTIFY messages are optional for 3PTY calling notifications. ITU-T Recs Q.954.2 and Q.734.2 describe the operation of 3PTY service in ISDN networks. The NOTIFY message is optional in H.323 networks.

The tables in this clause describe the notifications sent to and received from terminal lying in the ISDN network when a 3PTY supplementary service is active.

The 3PTY Conferencing device may reside in the H.323 network in the form of an endpoint containing MC functionality or a stand-alone MCU. Alternatively the Conferencing may be implemented in the ISDN network.

Tables C.80, C.81 and C.82 show procedures that may be attempted in a 3PTY call and how these may be signalling when the serving user resides in a H.323 network. The tables also show the notifications that may be sent to users in the ISDN network.

The following terminology is used:

served user: The user that requests the conference call. The served user will be the user controlling the conference call. The served user may also be referred to as user A.

conferee: The users involved in the conference not controlling the conference, i.e., all participants except the served user are referred to as conferees or parties. The conferees may also be known as users B, C, etc.

C.7.2.13.1 Notification received from the network

Table C.80 represents the backward indication received from a 3PTY conference where the conference lies on the ISUP network side.

Table C.80/H.246 – 3PTY notification

CPG→	Message to H.323 endpoint→ (Note 1)
Generic notification indicator parameter	
Notification indicator	
100 0010 <i>Conference established</i>	Not applicable
100 0011 <i>Conference disconnected</i>	Not applicable
111 1001 <i>Remote hold</i>	Not applicable
NOTE 1 – The format values below represent the 'Notification indicator information element' and the 'Notification description'.	
NOTE 2 – H.245 ConferenceIndication . <i>TerminalNumberAssign</i> may also be used to indicate the establishment of a conference.	
NOTE 3 – H.225.0 FACILITY indicating holdNotific . <i>invoke</i> may also be used to indicate 'remote hold'.	

If the Call Progress Message (CPG) contains two generic notification indicator parameters, one with the notification indicator coded *conference disconnected*, the other with the notification indicator coded *remote hold*,

- either a NOTIFY message is sent containing:
 - a notification indicator information element with the notification description *conference disconnected*; and
 - a notification indicator information element with the notification description *remote hold*;
- or:
 - a NOTIFY message is sent containing a notification indicator information element with the notification description *conference disconnected*; and
 - a subsequent NOTIFY message is sent containing a notification indicator information element with the notification description *remote hold*.

C.7.2.13.2 Invocation at coincident S and T reference point

Tables C.81 and C.82 show procedures that may be attempted in an SCN-based Conference out of Consultation call and how these map to procedures that may be achieved through a H.323 Conference out of Consultation Conference calls.

The served user (B) resides in a H.323 network (i.e., the MCU [conference device] is in the H.323 network). The tables also show the notifications that may be sent to users in the ISDN network.

Users B and C reside on the ISUP network side.

The resulting Notification Message sent to B shall be generated by the interworking function. The notification message sent to all other remote users in ISDN network shall be generated by the interworking function.

Table C.81/H.246 – Three-Party (3PTY)

Call A-B: Active-held connection message sent to B ←	Call A-C: Active-idle connection message sent to C ←	Message received from served user ←	Procedure
←CPG Generic notification indicator parameter <i>Conference established</i>	←CPG Generic notification indicator parameter <i>Conference established</i>	(Note 1)	Beginning the 3PTY
←CPG Generic notification indicator parameter <i>Remote hold</i>	No message sent	←FACILITY <i>HoldNotific.inv</i> Sent to B	Creation of a private communication with B
No message sent	←CPG Generic notification indicator parameter <i>Remote hold</i>	←FACILITY <i>HoldNotific.inv</i> Sent to C	
←CPG Generic notification indicator parameter <i>Remote Retrieve</i>	No message sent	←FACILITY <i>retrieveNotific.inv</i> Sent to B	
No message sent	←CPG Generic notification indicator parameter <i>Remote Retrieve</i>	←FACILITY <i>holdNotific.inv</i> Sent to B	Creation of a private communication with C
←REL	No message sent	H.245 conferenceRequest <i>dropTerminal</i> Sent to B	Disconnect the remote user B

Table C.81/H.246 – Three-Party (3PTY)

Call A-B: Active-held connection message sent to B ←	Call A-C: Active-idle connection message sent to C ←	Message received from served user ←	Procedure
←CPG Generic notification indicator parameter <i>Remote hold</i>	←REL	H.245 conferenceRequest <i>dropTerminal</i> Sent to C	Disconnect the remote user C
←CPG Generic notification indicator parameter <i>Remote Retrieve</i>	Not applicable	←FACILITY <i>retrieveNotific.inv</i> Sent to B	
NOTE 1 – Clause 8.4.3.8/H.323 [6] Conference out of Consultation discusses the various methods to achieve the establishment of a 3-party conference.			
NOTE 2 – As the conference is performed by the H.323 network, no indication of 'conference disconnected' is generated.			

Table C.82 describes the actions taken when user B or user C disconnects.

Table C.82/H.246 – Three-party (3PTY): user B or user C disconnects

Procedure	Call A-C: Active-idle connection message sent to C or received from C	Call A-B: Active-held connection messages sent to B or received from B	Messages sent to or received from served user (Note)
User B disconnects	←CPG Generic notification indicator parameter <i>Conference disconnected</i>	REL→	RELEASECOMPLETE→ Received from B
User C disconnects	REL→	←CPG Generic notification indicator parameter <i>Remote hold</i>	RELEASECOMPLETE→ Received from C
	Not applicable	←CPG Generic notification indicator parameter <i>Remote Retrieve</i>	←FACILITY <i>retrieveNotific.inv</i> Sent to B
NOTE – As the conference is performed by the H.323 network, no indication of 'conference disconnected' is generated.			

Upon receipt from a remote user of a Release message (REL), that call is released according to normal call release procedure and a Call Progress message (CPG) is sent through the network to the other remote user with the event information parameter coded *progress* and the generic notification indicator coded *conference disconnected*.

C.7.2.13.3 Notification received at T reference point

Table C.83 represents the situation where the conferencing device belongs to the H.323 network.

Table C.83/H.246 – Receipt of a 3PTY notification from a private network

←CPG		←Message from H.323 endpoint
Generic notification indicator parameter	Event information parameter	
Notification indicator	Event indicator	
100 0010 <i>Conference established</i>	000 0010 <i>Progress</i>	H.245 ConferenceIndication <i>terminalNumberAssign</i>
111 1001 <i>Remote hold</i>	000 0010 <i>Progress</i>	FACILITY <i>HoldNotific.inv</i>

C.7.2.14 Closed User Group (CUG)

Not supported in a H.323 network.

C.7.2.15 User-to-User Signalling (UUS)

User-to-user Services 1, 2 and 3 are not supported in a H.323 network. Whilst H.225.0 contains User Data to carry the UUS signalling, there is no definition of the User-to-user Service information. When the *user-to-user indicators* is received with one of the B-C, D-E, or F-G bits set to 'request, essential', the call shall be cleared by the interworking function.

Annex E1

Mobile Application Part and H.225.0 interworking

E1.1 Scope

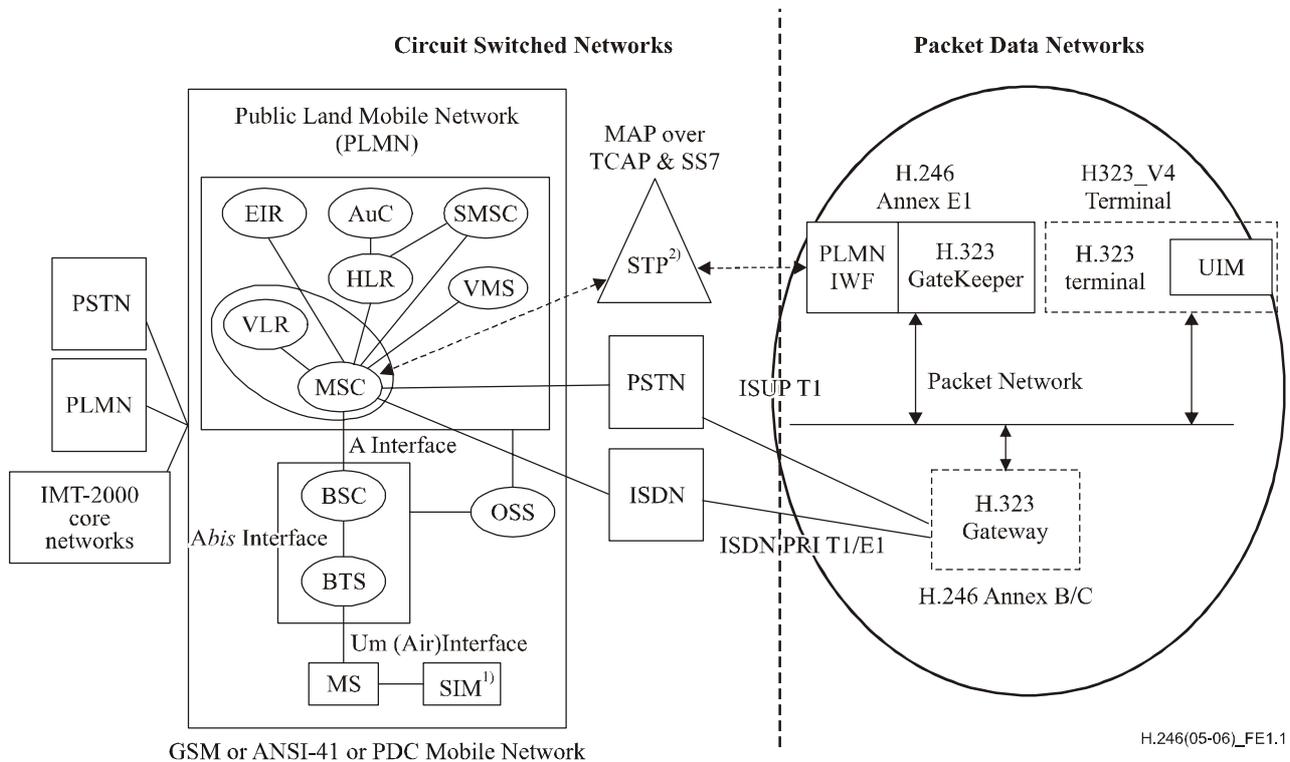
This annex specifies the Interworking Function (IWF) between 2nd Generation PLMNs and H.323 networks. The IWF includes the mapping of PLMN Mobile Application Part (MAP) with H.323 messages, some new messages, parameters and procedures within the H.323 network. This proposal does not require any changes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



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 Inter-working 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 Communication 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; 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.

- ITU-T Recommendation H.235.0 (2005), *H.323 security: Framework for security in H-series (H.323 and other H.245-based) multimedia systems*.
- ITU-T Recommendation X.680 (2002), *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.

- ITU-T Recommendation X.691 (2002), *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, *Wireless Features Description*.
- ETSI GSM 09.02 (1993), *Mobile Application Part (MAP) specification*.
- TTC JJ.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 (and later versions).

All other (optional) mobile features defined in ITU-T Rec. H.323 version 4 (and later versions) 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.

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 Interworking 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)	Setup, Connect, Info
Mapping of ISUP ↔ Q.931	Call Setup and Call Release messages	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	
Message Waiting Notification	SET MESSAGE WAITING DATA	
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.235.0 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.

Annex E2

ANSI-41 (Americas) Mobile Application Part and H.225.0 interworking

E2.1 Scope

This annex specifies the interworking function (IWF) between 2nd Generation ANSI-41 PLMNs and H.323 networks. The IWF includes the mapping of ANSI-41 PLMN Mobile Application Part (MAP) with H.323 messages, some new messages, parameters and procedures within H.323 networks. This annex does not require any changes in the mobile networks.

This annex also specifies how the ANSI-41 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 ANSI-41 PLMN terminals on the H.323 network. The PLMN interworking function between H.323 and ANSI-41 PLMNs networks allows the mobile 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 ANSI-41 PLMN and H.323 networks. End-to-end mobile phone codecs use (i.e. EIA/TIA-136-Rev.A, etc.) is for further study (FFS).
- Operations 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 the PLMN cannot be delivered to a regular H.323 terminal unless an association of the mobile phone number with the regular H.323 terminal exists.

The key areas of mobile networks are Mobility Management and Communication 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. ANSI-41 provides seamless network capabilities between network equipment manufactured by different manufacturers. Without the ANSI-41 Rev.D standardization, it will be difficult for a cellular/PCS Wireless service provider to provide mobility between systems. ANSI-41 Rev.D covers standard interface and procedures to achieve:

- call origination, call termination, supplementary services, short message services and data services anywhere in the wireless network;
- subscription transparency across networks;
- ease of use;
- secure service access:
 - fraud prevention,
 - authentication and privacy;
- billing capability, operation administration and management capability.

E2.2 Definitions

This annex defines the following terms:

E2.2.1 H323_UIM: An H.323 terminal with User Identification Module or User Identification Information of a current ANSI-41 Public Land Mobile Network.

E2.2.2 AnnexE2_GK: An H.323 gatekeeper with ANSI-41 PLMN Interworking function.

E2.3 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; 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.

- ANSI/TIA/EIA-41D-97, *Cellular Radiotelecommunications Intersystem Operations*.
- ANSI T1.707-1998, *Requirements for a User Identity Module (UIM) for Personal Communications Services (PCS)*.
- GSM 11.11 (1995), *Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM-ME) interface*.
- TSB50 (1993), *User Interface for Authentication Key Entry*.
- ANSI TIA/EIA-136-A-1999, *TDMA/Cellular/PCS*.
- TIA/EIA-136-510-A-2000, *Authentication, Encryption of Signalling Information/User Data and Privacy*.
- TIA/EIA-136-511-A-2000, *TDMA Third Generation Wireless – Messages Subject to Encryption*.

E2.3.1 Informative references

- EIA/TIA/553-A-1999, *Base Station – Compatibility Standard*.
- *Common Cryptographic Algorithms*, Revision D1 (2000), Contact the Telecommunications Industry Association, Arlington, VA.
- *Interface Specification for Common Cryptographic Algorithms* (2002), Contact the Telecommunications Industry Association, Arlington, VA.

E2.4 Abbreviations

This annex uses the following abbreviations:

ADN	Abbreviated Dialling Number
ANSI-41	American National Standards Institute Mobile Networks specifications – 41
AuC/AC	Authentication Centre
BSC	Base Station Controller
BTS	Base Trans-receiver Station
CAVE	Cellular Authentication and Voice Encryption
CDMA-2000	Code-Division Multiple Access – 2000
CHV1	Card Holder Verification 1
CHV2	Card Holder Verification 2
CMEA	Cellular Message Encryption Algorithm
EDGE	Enhanced Data Rates for GSM Evolution
EF	Elementary Files

EIR	Equipment Identification Register
ESN	Electronic Serial Number
GMSC	Gateway Mobile Switching Centre
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
H.323_UIM	H.323 User Identification Module
HLPI	Higher Layer Protocol Indicator
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
IK	Integrity Key
IMEI	International Mobile Equipment Identify
IMSI	International Mobile Subscriber Identity
IMT-2000	International Mobile Telecommunications-2000 (known as 3rd Generation Wireless standards group under ITU)
IRDB	Intelligent Roaming Database
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
ITU	International Telecommunication Union
MAP	Mobile Application Part
MC	ANSI-136 Message Centre (for SMS)
MDN	Mobile Directory Number
ME	Mobile Equipment
MGC	Media Gateway Controller
MGW	Media Gateway
MIN	Mobile Identification Number
MO	Mobile Originated
MS	Mobile Station
MSC	Mobile Switching Centre
MSCIN	MSC Identification Number
MSID	Mobile Station Identity
MSISDN	Mobile Subscriber ISDN Number
MSRN	Mobile Station Routing Number
MT	Mobile Terminated
MWN	Message Waiting Notification
NAM	Numeric Assignment Module
NNI	Network-to-Network Interface
NSDB	Network Selection Database

ODB	Operator Determined Barring
OTA	Over-the-Air Activation
PCS	Personal Communication Service
PDC	Personal Digital Cellular – the digital network used primarily in Japan
PDU	Packet Data Unit
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
PRN	Provide Roaming Number
PSAP	Public Safety Access Point
PSDN	Packet Switched Data Network
PSTN	Public Switched Telephone Network
SESN	SIM Electronic Serial Number
SGW	Signalling Gateway
SID	System Identity
SIM	Subscriber Identity Module
SMDPP	Short Message Delivery Point-to-Point
SMS	Short Message Service
SMSC	Short Message Service Centre
SOC	System Operator Code
SS7	Signalling System No. 7
STP	Signalling Transfer Point
TCAP	Transaction Capabilities Application Part
TDMA	Time Division Multiple Access
TIA	Telecommunications Industry Association
TLDN	Temporary Location Directory Number
TMSI	Temporary Mobile Station Identity
TP-FCS	TP Failure Cause
TS	Teleservice Server
TSAR	Teleservice Segmentation and Reassembly
UDH	Universal Data Header
UIM	User Identity Module
USIM	Universal Subscriber Identity Module
UWCC	Universal Wireless Communications Consortium
VLR	Visited Location Register
VMS	Voice Mail System

E2.6 H323_UIM Terminal contains an ANSI-41 User Identification Module

An H.323 terminal shall share and present the subscriber identity used in the ANSI-41 PLMN with which interworking is desired. This allows the H.323 terminal to provide the required subscriber identity to register with the ANSI-41 PLMN and gain access to User Mobility Services.

E2.6.1 A-Key

A-Key is accessible only to the algorithm used for Key generation. The A-Key may be programmed into the UIM directly by the service provider, or it may be programmed into the UIM through a specific over-the-air procedure. The A-Key is not accessible by the mobile equipment; therefore, the method of storage on the UIM is not specified in this annex.

A procedure for manual entry of the A-Key shall be provided, using the mobile equipment keypad and display. This procedure shall use the standard series of keystrokes and otherwise be consistent with the procedures defined in TIA/EIA Telecommunications Systems Bulletin TSB-50 User Interface for Authentication Key Entry. The UIM command A-KEY_VALIDATION is used to store the A-Key on the UIM.

Once an authentication key is entered, it shall not, under any circumstances or in any mode of operation, be viewed through a mobile station's display or through any device attached to the mobile station.

E2.6.2 Shared Secret Data (SSD)

The Shared Secret Data is accessible only to the Authentication and the Key Generation functions. SSD is not accessible by the mobile equipment; therefore the method of storage on the UIM is not specified in this annex.

E2.6.3 Authentication

The authentication CAVE algorithm, as per references below, shall be implemented on the UIM and has the following interface to the H.323 Terminal. All of these functions apply only to the EIA/TIA-553 directory 5F40. This DF (Data File) is expanded to include EFs (Elementary Files) and procedures for ANSI-41 H323_UIM operation.

E2.6.4 Assumptions

- The following data structures, all inputs to the CAVE algorithm, are located on the H323_UIM Terminal:
 - A-Key – Accessible only to CAVE Algorithm. May be programmed via H323_UIM Terminal keypad or over the air;
 - Shared Secret Data (SSD_A, SSD_B) – Accessible only to the CAVE Algorithm;
 - COUNTsp – Accessible by the H323_UIM Terminal;
 - Mobile Identification Number (MIN) – Accessible by the H323_UIM Terminal;
 - RANDBS – Calculated on the UIM, then passed to the H323_UIM Terminal for transfer to the system;
 - SIM Electronic Serial Number (S-ESN).
- The following data structures, all inputs to the CAVE algorithm, are located in H323_UIM Terminal memory:
 - Electronic Serial Number (ESN);
 - RANDs (combined Random Challenge A and B values, received in Global Action messages);
 - Last Dialed Digits;
 - RANDU;

- AUTHBSs (received from the system);
- RANDSeed.
- Encryption of Signalling data on the RAS Signalling is supported on the UIM. This function may also be performed in the H323_UIM Terminal.
- The UIM initiates the generation of keys for all ANSI-41 H323_UIM ciphering procedures. Traffic to be ciphered may include digitized voice, short messages, and Signalling data.
- The H323_UIM Terminal will perform some processing of keys that may be needed for Enhanced Privacy and Encryption (EPE) procedures.
- The H323_UIM Terminal will support manual entry of the A-Key into the H.323 Terminal, as done in ANSI-136 mobiles.
- Will use T = 0 transmission protocol.
- UIM task execution is context specific to first selecting the EIA/TIA-553 (5F40) directory.

E2.6.5 Description

It is necessary to provide six interfaces to the CAVE Algorithm and Secret Data areas, as listed below:

- Generation of Authentication Signature data, and generation of ciphering keys;
- Validation and storage of entered A-Keys;
- Ask Random task (generates RANDBS);
- Update Shared Secret Data (Generates SSD_A_NEW, SSD_B_NEW and AUTHBS values);
- Confirm Shared Secret Data (Updates SSD values);
- CMEA Encryption of voice channel data digits.

In addition, some commands are defined for manipulating the COUNTsp value.

NOTE 1 – For each task, the expected normal (i.e. success) status code is listed in the status word description. A list of possible error codes that apply to all tasks can be found in the UIM Status Codes.

NOTE 2 – The phrase "Use H323_UIM Terminal ESN (= "00")" in the tasks below is obsolete, and is preserved for backwards compatibility with legacy equipment. This byte is set to "00" in this annex. The four-byte parameter that is used by the UIM for the calculations shall be set to the value of the H323_UIM Terminal's ESN field if the "usage indicator" directs the UIM to use the H323_UIM Terminal's ESN. If the "usage indicator" directs the UIM to use its S_ESN, the internally stored S_ESN shall be used. In the latter instance, the four-byte parameter passed by the H323_UIM Terminal shall not be used as an input to the calculations in these sections.

E2.6.6 Generation of Authentication Signature Data and Ciphering Keys

This task produces an Authentication response, and shall be used during H323_UIM Terminal Registrations, Originations, and Terminations and for the Unique Challenge-Response Procedure. If Byte 0, Bit 1 is set, the UIM should also generate key bits after completing the Authentication function. Some of those ciphering octets may be passed back to the H323_UIM Terminal for use with supplementary crypto mechanisms, which reside in the H323_UIM Terminal. This task requires the following input parameters:

Task name: Internal_Authenticate

Class = "A0", INS = "88", P1 = "00", P2 = "00", Lc = "0F"

Data Bytes coding:

Byte 0 Process Control Byte

- bit 0 0 = RANDs, 1 = RANDU

- bit 1 Generate Key Bits flag (0 = No, 1 = Yes)
 - bit 2 Load Internal key flag
0 = pass all generated key bytes to handset
1 = load first 8 bytes of generated keys internally to UIM, pass all remaining key bytes to H323_UIM Terminal
 - bits 3-7 Unused, future expansion
 - Bytes 1-4* *Bytes 1-4:* RANDs (for Registrations, Originations, and Terminations)
 or
Bytes 1-3: RANDU (for Unique Challenge-Response Procedures)
Byte 4: = 0 (MIN2 will be filled in by UIM)
 - Byte 5* *Digits Length*
(in bits, = 0, 4, 8, 12, 16, 20 or 24, = 4 x number of digits in bytes 6-8)
 - Bytes 6-8* = 0,0,0 (for Registrations, Terminations, Unique Challenge Response Procedures)
= Last Dialed Digits, unused bits filled with 0's (for Originations). If more than 6 digits are dialed, these are the last 6 digits in the origination string. If less than 6 digits are dialed, MIN1 will be filled in by the UIM for the unused bits.
 - Byte 9* Use H323_UIM Terminal ESN (= "00")
 - Bytes 10-13* ESN (Electronic Serial Number)
 - Byte 14* Key_size
= 0 if Byte 0, bit 1 = 0
= "08"hex or "49"hex if Byte 0, Bit 1 = 1
- Where:
- "00"hex = no key generation
 - "08"hex = generate the CMEA Key
 - "49"hex = generate the CMEA Key + a 520-bit VPMASK Key

The output of this task shall be:

Status Bytes SW1 (= "9F" if success)
 SW2 (= "nn" if success)
 "nn" is 03+Key_size if Byte 0, Bit 2 above = 0
 "nn" is 03+Key_size-08 if Byte 0, Bit 2 above = 1

Task name: Get_Response

Class = "A0", INS = "C0", P1 = "00", P2 = "00", Le = "nn"

"nn" is 03+Key_size if Byte 0, bit 2 above = 0
"nn" is 03+Key_size-08 if Byte 0, bit 2 above = 1

The output of this task shall be:

Bytes 0-2 the 18-bit Authentication Signature (AUTHR/AUTHU) value.
Bytes 3-(n+2) Cipher octets for crypto mechanisms (n = Key_size or Key_size-8).
Status Bytes SW1 (= "90" if success)
 SW2 (= "00" if success)

The following values represent examples of this function:

To generate Authentication values only:

Byte 0

- bit 1 = 0 (No cipher keys need to be generated)
- bit 2 = 0 (No keys generated, not applicable)

Byte 14 = 0 (No cipher keys passed to H323_UIM Terminal, means bytes 3-(n+2) in Get_Response task do not exist).

To generate Authentication values and ciphering key for use with CMEA on UIM:

Byte 0

- bit 1 = 1 (ciphering keys need to be generated)
- bit 2 = 1 (Use first 8 bytes of generated ciphering keys in the UIM)

Byte 14 = 8 (8 bytes of ciphering keys should be generated, means bytes 3-(n+2) in Get_Response task do not exist as all generated ciphering key bytes are used in the UIM).

To generate Authentication values and ciphering keys for H323_UIM Terminal-based algorithms:

Byte 0

- bit 1 = 1 (ciphering keys need to be generated)
- bit 2 = 0 (pass all generated ciphering keys to the H323_UIM Terminal)

Byte 14 = n (n bytes of ciphering keys should be generated, means bytes 3-(n+2) in Get_Response task will be passed to the H323_UIM Terminal).

NOTE – Additional processing of ciphering keys may need to be performed by H323_UIM Terminal, for use with some H323_UIM Terminal-based ciphering methods.

E2.6.7 Validation and Storage of Entered A-Keys

With manual entry of the A-Key, the input A-Key must be validated prior to its storage in the UIM. If successful, the A-Key is saved in the UIM and the COUNTsp and Shared Secret Data (SSD) are reset to zero. This task requires the following input parameters:

Task name: AKEY_validation

Class = "A0", INS = "86", P1 = "00", P2 = "00", Lc = "12"

Data Bytes coding:

Bytes 0-12 Authentication digits string (first digit in Most-Significant nibble of byte 0, last digit in Least-Significant nibble of Byte 12, for a total of 26 digits)

Byte 13 Use H323_UIM Terminal ESN (= "00")

Bytes 14-17 ESN

The output of this task shall be:

Status Bytes SW1 (= "90" if success)

SW2 (= "00" if success)

E2.6.8 Ask Random Task

This task is used to generate the RANDBS random value. This task must be executed prior to updating the Shared Secret Data (SSD). The value RANDSeed must be generated by the H323_UIM Terminal prior to calling this task. This task requires the following input parameters:

Task name: Ask_Random

Class = "A0", INS = "8A", P1 = "00", P2 = "00", Lc = "04"

Data Bytes coding:

Bytes 0-3 RANDSeed

The output of this task shall be:

Status Bytes SW1 (= "9F" if success)

 SW2 (= "04" if success)

Task name: Get_Response

Class = "A0", INS = "C0", P1 = "00", P2 = "00", Le = "04"

The output of this task shall be:

Bytes 0-3 RANDBS

Status Bytes SW1 (= "90" if success)

 SW2 (= "00" if success)

E2.6.9 Update Shared Secret Data

This task is used to generate the preliminary new Shared Secret Data (SSD_A_NEW, SSD_B_NEW) and the AUTHBS value. The Ask Random Task (see above) must be executed prior to this routine. The task requires the following input parameters:

Task name: Update_SSD

Class = "A0", INS = "84", P1 = "00", P2 = "00", Lc = "0C"

Data Bytes coding:

Bytes 0-6 RANDSSD

Byte 7 Use H323_UIM Terminal ESN (= "00")

Bytes 8-11 ESN

The output of this task shall be:

Status Bytes SW1 (= "90" if success, = "98" if failure)

 SW2 (= "00" if success, = "04" if failure)

E2.6.10 Confirm Shared Secret Data

This task is used to validate the new Shared Secret Data (SSD_A_NEW, SSD_B_NEW) by comparing the internally computed AUTHBS with the AUTHBSs received from the system. If successful, the SSD_A and SSD_B values will be updated to match the SSD_A_NEW and SSD_B_NEW values, respectively. The task requires the following input parameters:

Task name: Confirm_SSD

Class = "A0", INS = "82", P1 = "00", P2 = "00", Lc = "03"

Data Bytes coding:

Bytes 0-2 AUTHBSs

The output of this task shall be:

Status Bytes SW1 (= "90" if success)

 SW2 (= "00" if success)

E2.6.11 CMEA Encryption of Voice Channel Data Digits

This task is used when the H323_UIM Terminal is on a Voice Channel, to encrypt and decrypt some portions of digital messages transmitted to the AnnexE1_GK. These will occur for the following message:

- Called Address Message (in response to a hookflash, up to 4 bytes per word, 4 words, total of 16 bytes)

This task requires the following input parameters:

Task name: CMEA_encrypt

Class = "A0", INS = "8C", P1 = "00", P2 = "00", Lc = "nn"

("nn" is hex value of data length n)

Data Bytes coding:

Bytes 0-(n-1) The n-byte data to be encoded, max. size = 32 bytes.

The output of this task shall be:

Status Bytes SW1 (= "9F" if success)

SW2 (= "nn" if success) ("nn" is hex value of data length n)

Task name: Get_Response

Class = "A0", INS = "C0", P1 = "00", P2 = "00", Le = "nn" ("nn" is hex value of data length n)

The output of this task shall be:

Bytes 0-(n-1) n-byte value, containing the encrypted bits, max. size = 32 bytes.

Status Bytes SW1 (= "90" if success)

SW2 (= "00" if success)

For example, encrypting a 16-byte hookflash string would result in the following sequence of data to/from the UIM:

TO UIM:

Class = "A0", INS = "8C", P1 = "00", P2 = "00", Lc = "10", Data: d0, d1, d2, ..., d14, d15

FROM UIM:

SW1 = "9F", SW2 = "10"

TO UIM:

Class = "A0", INS = "C0", P1 = "00", P2 = "00", Le = "10"

FROM UIM:

e0, e1, e2, ..., e14, e15, SW1 = "90", SW2 = "00"

E2.6.12 Updating of the COUNTsp Value

COUNTsp is a synchronization data unit that is passed back to the system in coordination with the ANSI-41 H323_UIM Terminal Authentication process. It may be updated by the ANSI-41 and AMPS system at any time while the H323_UIM Terminal is active. The H323_UIM Terminal must be able to fetch and increment COUNTsp.

Get Call Count

Task name: Read_Record (Get Call Count)

Class = "A0", INS = "B2", P1 = "00", P2 = "04", Le = "03"

The output of this task shall be:

Bytes 0-2 Returned COUNTsp value

Status Bytes SW1 (= "90" if success)

SW2 (= "00" if success)

Set Call Count

Task name: Update Record (Set Call Count)

Class = "A0", INS = "DC", P1 = "00", P2 = "03", Lc = "03"

Data Bytes coding:

Bytes 0-2 COUNTsp value

The output of this task shall be:

Status Bytes SW1 (= "90" if success)

SW2 (= "00" if success)

Update Call Count

Task name: Increase (Increment Call Count)

Class = "A0", INS = "32", P1 = "00", P2 = "00", Lc = "03"

Data Bytes coding:

Bytes 0-2 00, 00, 01 (increment amount)

The output of this task shall be:

Status Bytes SW1 (= "9F" if success)

SW2 (= "06" if success)

Task name: Get_Response

Class = "A0", INS = "C0", P1 = "00", P2 = "00", Le = "06"

The output of this task shall be:

Bytes 0-2 COUNTsp

Bytes 3-5 Value that was added

Status Bytes SW1 (= "90" if success)

SW2 (= "00" if success)

E2.6.13 H323_UIM status codes

The following status codes, returned by the UIM in response to the execution of any of the tasks specified in this annex, are valid. The first hex value is returned in SW1 (status word 1), the second hex value in SW2 (status word 2).

Success codes

90, 00 Generic success code

9F, xx Success, xx bytes of data available to be read via "Get_Response" task.

Error codes

92, 40	Error, memory problem
94, 08	Error, file is inconsistent with the command
98, 04	Error, no CHV1 (cardholder verification 1) has been presented successfully
98, 34	Error, Update SSD order sequence not respected (should be used if SSD Update commands are received out of sequence)
67, xx	Error, incorrect parameter P3 (ISO code)
6B, xx	Error, incorrect parameter P1 or P2 (ISO code)
6D, xx	Error, unknown instruction code given in the command (ISO code)
6E, xx	Error, wrong instruction class given in the command (ISO code)
6F, xx	Error, technical problem with no diagnostic given (ISO code)
6A, 80	Error, incorrect parameters in the data field

E2.7 H323_UIM management procedures

After H.323_UIM activation (see GSM 11.11, subclause 4.3.2) the H323_UIM Terminal follows the ANSI-41 initialization procedures up to and including the IMSI Request. The H323_UIM Terminal then attempts to select the Dedicated File $DF_{TIA/EIA-41}$. If $DF_{TIA/EIA-41}$ is present, then the UIM is an H.323/ANSI-136 UIM. If the $DF_{TIA/EIA-136}$ is not present, then UIM is not associated with the H323_UIM Terminal.

For an H.323/ANSI-41 UIM, the H323_UIM Terminal shall perform the H.323-ANSI-41 Phase ID Request. An H.323/ANSI-41 UIM is required to support the elementary files and procedures defined for the H.246 Annex E2 phase defined in the H.323-ANSI-41 UIM Phase ID EF, and any previous H.246 Annex E2 phases. The H323_UIM Terminal must operate at the level defined by the lower of its own H.323-ANSI-41 Phase ID or the H.323-ANSI-41 Phase ID of the UIM.

Also as part of the management phase, the H323_UIM Terminal shall retrieve the Protocol Priority Indicator value by performing an ANSI-Usage Indicator Request. The H323_UIM Terminal shall then perform the Home System Operator Code and Mobile Country Code Request, which shall be required to perform any personalization checks, if required, in order to determine if the current UIM will be allowed to operate or not.

If the personalization check fails, the H323_UIM Terminal enters the "limited service state" based on the Protocol Priority Indicator value in which only emergency calls can be attempted (see GSM 02.22 Annex A.2 and TIA/EIA-136-123). If the check is successful, then the H323_UIM Terminal continues with the session initialization based on the type of UIM.

Upon completion of this, the H323_UIM Terminal is free to request any user data information it may require, see GSM 11.11, subclause 11.5. Note however, that the reading of this information may occur prior to this point i.e. after reading the initial initialization data (ANSI-41).

Figures E2.2 and E2.3 below describe the process and are to be used for information only.

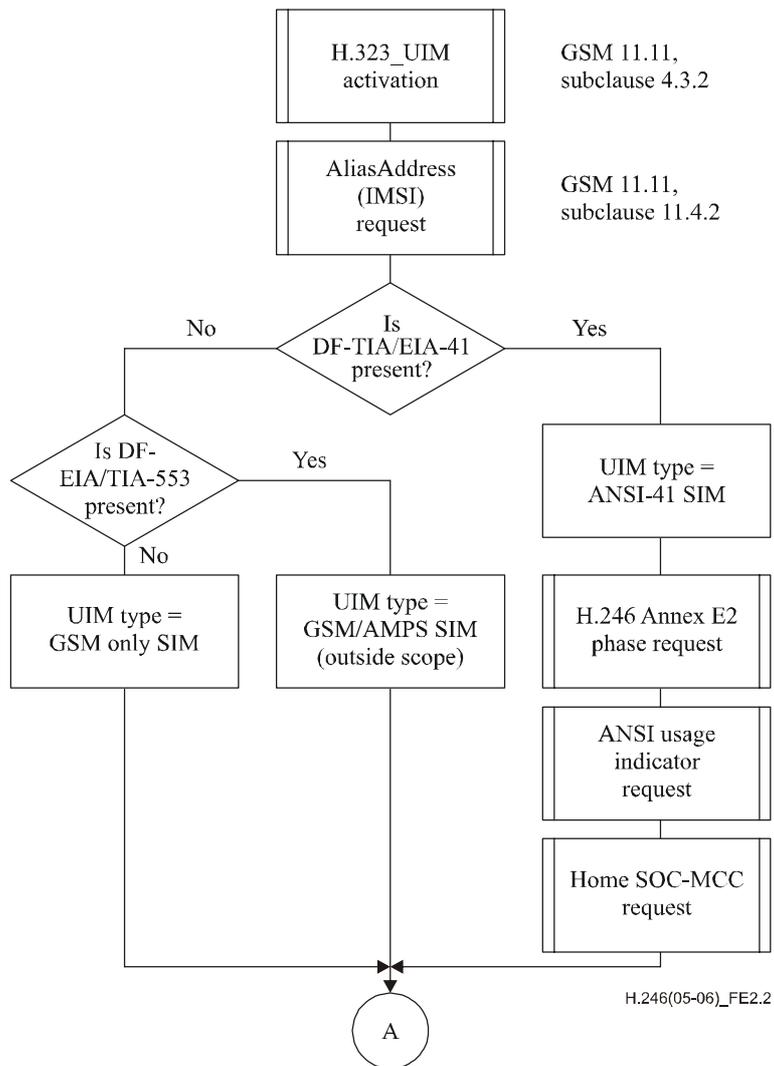
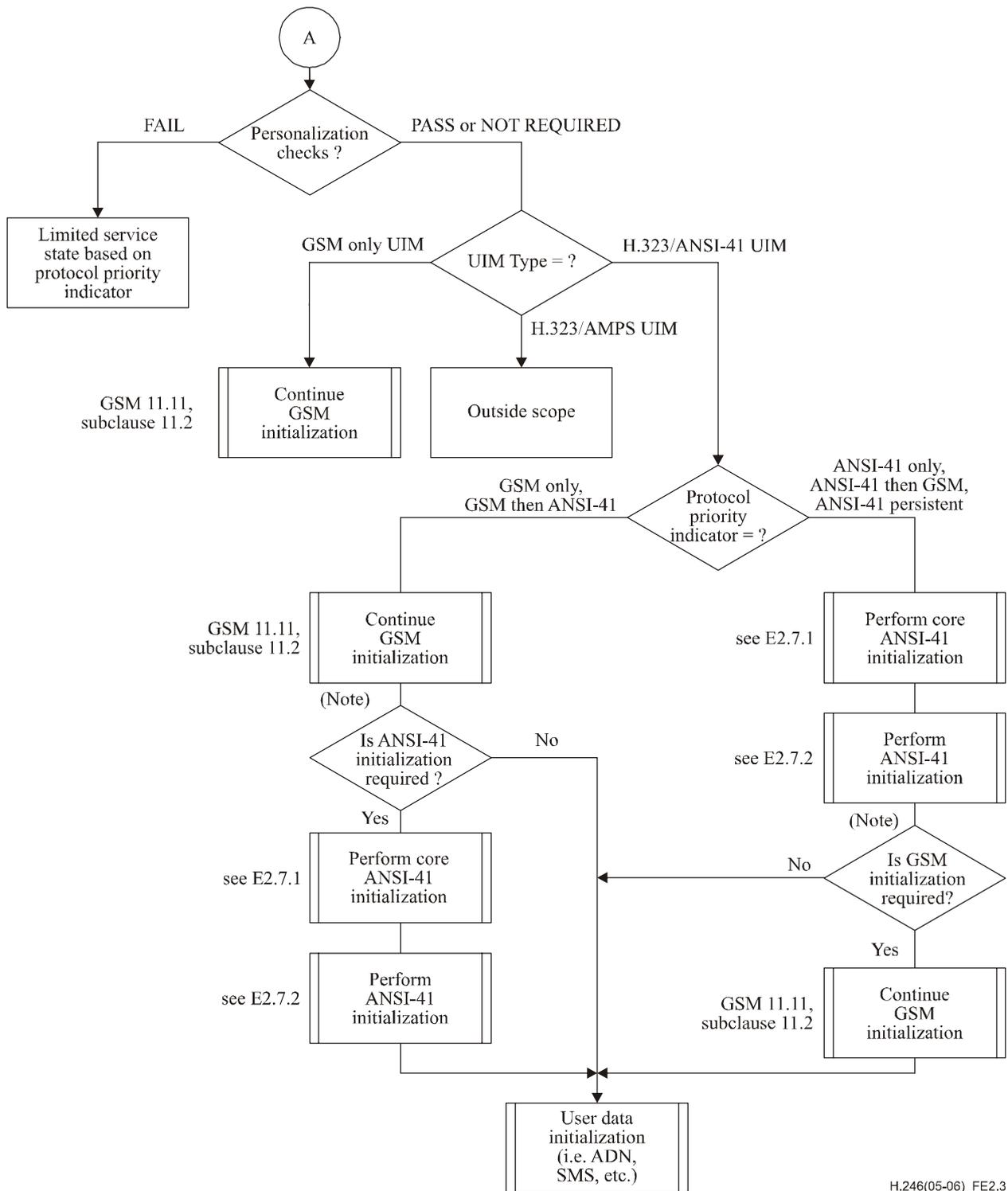


Figure E2.2/H.246 – UIM management procedures – 1 (informative)



H.246(05-06)_FE2.3

NOTE – User Data initialization may also occur at this point.

Figure E2.3/H.246 – UIM management procedures – 2 (informative)

E2.7.1 Core ANSI-41 initialization

The H323_UIM Terminal runs the following procedures:

- MIN Request;
- ACCOLC Request;

- SID request;
- Group ID request;
- S-ESN request;
- COUNTsp request;
- Positive/Favoured SID List request;
- Negative/Forbidden SID List request;
- Registration Threshold request.

There are other files in the DF_{PCS1900} which are required for the GSM/AMPS mobile station; however, the reading of these files is not required for a GSM/ANSI-136 mobile and as such is outside the scope of this annex.

E2.7.2 ANSI-41 H323_UIM initialization

The H323_UIM Terminal runs the following procedures:

- IRDB Parameters request;
- Additional User Registration Parameters request;
- Partner SID List request;
- Partner SOC List request;
- Favoured SOC List request;
- Forbidden SOC List request;
- Alpha Tag request;
- Triggered Scan Timers request;
- TeleService Server Address request;
- SS Feature Code Table request;
- IRDB Version Table request;
- User Group ID request;
- Cooperative SOC List request.

E2.7.3 UIM session termination

The H323_UIM Terminal shall perform the session termination procedures defined in GSM 11.11, subclause 11.2.2 in the following cases:

- ANSI-41 H323_UIM with the Protocol Priority Indicator set to ANSI-41, then to GSM.

The H323_UIM Terminal shall perform the following updates:

- Additional User Registration Parameters update.

For the following cases:

- ANSI-41 H323_UIM with the Protocol Priority Indicator set to ANSI-41 only.

As soon as the UIM indicates that these procedures are completed, the H323_UIM Terminal/UIM link may be terminated. Upon termination of the link, the H323_UIM Terminal shall delete all subscriber-related information from its memory. If the H323_UIM Terminal has already updated any of the subscriber related information during the UIM session and the value has not changed until UIM session termination, the H323_UIM Terminal may omit the respective update procedure.

E2.7.4 H323_UIM NAM information procedures

E2.7.4.1 Mobile Identification Number

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{MIN}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{MIN}

E2.7.4.2 Access Overload Class

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{ACCOLC}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{ACCOLC}

E2.7.4.3 System Identification of Home System

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{SID}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{SID}

E2.7.4.4 Home System Operator Code and Mobile Country Code

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{HSOC-MCC}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{HSOC-MCC}

E2.7.4.5 Initial Paging Channel

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{IPC}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{IPC}

E2.7.4.6 Group ID

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{GPI}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{GPI}

E2.7.4.7 SIM Electronic Serial Number

Request: The H323_UIM Terminal performs the reading procedure with the EF_{SESN}

E2.7.4.8 AMPS Usage Indicators

Request: The H323_UIM Terminal performs the reading procedure with the EF_{AMPS-UI}

E2.7.4.9 ANSI-41 Usage Indicators

Request: The H323_UIM Terminal performs the reading procedure with the EF_{ANSI-UI}

E2.7.4.10 Alpha Tags

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{A-TAG}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{A-TAG}

E2.7.5 H323_UIM authentication related procedures

E2.7.5.1 Call Count

Request: The H323_UIM Terminal performs the reading procedure with the EF_{COUNT-SP}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{COUNT-SP}

E2.7.6 UIM network selection related procedures

E2.7.6.1 Positive/Favoured SID List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{PSID}

E2.7.6.2 Negative/Forbidden SID List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{NSID}

E2.7.6.3 Cooperative SOC List

Requirement: The EF_{CNL} is marked "allocated" and "activated"

Request: The H323_UIM Terminal performs the reading procedure with the EF_{CSL}

E2.7.6.4 IRDB Version Table

Request: The H323_UIM Terminal performs the reading procedure with the EF_{IRDB-VER}

E2.7.6.5 Partner SID List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{PART-SID}

E2.7.6.6 Partner SOC List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{PART-SOC}

E2.7.6.7 Favoured SOC List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{FAV-SOC}

E2.7.6.8 Forbidden SOC List

Request: The H323_UIM Terminal performs the reading procedure with the EF_{FORB-SOC}

E2.7.6.9 IRDB Parameter

Request: The H323_UIM Terminal performs the reading procedure with the EF_{IRDB-PARAM}

E2.7.7 H323_UIM user interface related procedures

E2.7.7.1 SS (Supplementary Services) Feature Code Table

Request: The H323_UIM Terminal performs the reading procedure with the EF_{SSFC}

E2.7.8 H323_UIM timing related procedures

E2.7.8.1 Triggered Scan Timers

Request: The H323_UIM Terminal performs the reading procedure with the EF_{TS-TIMER}

E2.7.9 H323_UIM registration related procedures

E2.7.9.1 Registration Threshold

Request: The H323_UIM Terminal performs the reading procedure with the EF_{REG-THRESH}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{REG-THRESH}

E2.7.10 H323_UIM additional procedures

E2.7.10.1 H.246 Annex E2 UIM Phase ID

Request: The H323_UIM Terminal performs the reading procedure with the EF_{GA-PHASE}

E2.7.10.2 TeleService Server Address Info

Request: The H323_UIM Terminal performs the reading procedure with the EF_{TSAI}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{TSAI}

E2.7.10.3 Additional User Registration Parameters

Request: The H323_UIM Terminal performs the reading procedure with the EF_{AURP}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{AURP}

E2.7.10.4 User Group ID

Requirement: As per UIM specification

Request: The H323_UIM Terminal performs the reading procedure with the EF_{UGIDI}

Update: The H323_UIM Terminal performs the updating procedure with the EF_{UGIDI}

E2.7.10.5 SOC De-personalization control Key

Request: The H323_UIM TERMINAL performs the reading procedure with the EF_{SDCK}

E2.7.11 H323_UIM update management procedures

Under some circumstances it may be necessary for the H323_UIM to notify the Terminal of a change in its configuration i.e. an ANSI-41 Host SMS Teleservice update to the UIM's IRDB and/or NAM information. As such, the H323_UIM Terminal may be required to update any images of elementary files it may contain and/or perform some other procedures (i.e. power up scan after updating of the NAM). For these situations, the H323_UIM shall use the UIM Tool Kit Command REFRESH to notify the H.323 mobile terminal of such changes to its configuration. Refer to GSM 11.14 for further details.

Table E2.1 defines the guidelines to be used when UIM modifications have taken place. Upon receiving a REFRESH command, the H.323 mobile terminal shall take the actions defined in Table E2.1 if the appropriate file has been changed.

Table E2.1/H.246 – H323_UIM Terminal guidelines for UIM modifications

File Updated	H323_UIM Terminal Updates Image	H323_UIM Terminal performs Power Up Scan
MIN		✓ if in ANSI-41 H323_UIM
ACCOLC		NA
SID		✓
Group ID		NA
S-ESN	NA	NA
COUNTsp		NA
Positive/Favoured SID List		✓
Negative/Forbidden SID List		✓
Registration Threshold		NA
IRDB Parameters		✓
Additional User Registration Pars.	✓ if in GSM	NA
Partner SID List		✓
Partner SOC List		✓
Favoured SOC List		✓
Forbidden SOC List		✓
Alpha Tag		NA
Triggered Scan Timers		NA
TeleService Server Address		NA
SS Feature Code Table		NA
IRDB Version Table		NA
User Group ID		NA
SOC De-personalization Control Key	✓	

If a REFRESH command is received by the H.323 mobile terminal and as a result some files in the list above are changed, the H.323 mobile terminal shall update any images it may contain of that information regardless of whether it is in ANSI-41 or GSM mode and, as the table dictates, a power up scan may be required.

E2.8 AnnexE2_GK with PLMN Interworking Function (IWF) and H.323 Gatekeeper

The current ANSI-41 digital wireless networks mainly comprises of:

- 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.

The ANSI-41 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 ANSI-41 PLMN IWF provides interworking between the PLMN and an H.323 network.

The basic model of an AnnexE2_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 E2 Gatekeeper between an H.323 network and a PLMN network maps the operations and messages between Gateway, Gatekeeper and serving Mobile Switching Centre (MSC), Visitor Location Register (VLR). The interworking 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 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 Visitor Location Register (VLR) and a serving Mobile Switching Centre (MSC) from the PLMN.

E2.8.1 Mapping of ANSI-41 PLMN MAP messages to H.225.0 messages

Table E2.2/H.246 – ANSI-41 PLMN MAP ↔ H.225.0 messages mapping

Functions	ANSI-41 MAP messages	H.225.0 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)	Setup, Connect, Info
Mapping of ISUP ↔ Q.931	Call Setup and Call Release messages	Refer to H.248 contributions
MessageWaiting 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 Annex K (HTTP-based service control transport channel in H.323)
Wireless Application Protocol (WAP) services	WML Scripts and Web Browser	Annex K/H.323 (HTTP-based service control transport channel)
Deregistration	RegistrationCancellation (REGCANC) MSInactive (MSINACT) BulkDeregistration (BULKDEREG)	URQ, UCF, URJ, URQ, UCF, URJ URQ, UCF, URJ

E2.9 Mobility Management and Communication Management AnnexE2_GK procedures

E2.9.1 Additions of Mobility parameters and procedure to H.225 RAS messages

Extending the aliasAddress type with a new type MobileUIM that supports all the various mobile identification formats provides the H.323 mobile user identification information.

E2.9.2 Security aspects of mobile H.323 User Identity Module (UIM)

Follow procedures of H.235.0 to ensure privacy of the H323_UIM and ANSI-41 Authentication of H323_UIM.

E2.9.3 H.323 foreign mode

When an ANSI-41 native subscriber operates in H.323 foreign mode, the mobile station shall use the H.323 interface. The H.246 Annex E2 Interworking function (AnnexE2_GK) shall provide both H.323 HLR and ANSI-41 VLR emulation to allow the subscriber to automatically register and obtain service. To the visited H.323 network, the subscriber appears to register with the AnnexE2_GK, emulating an H.323 HLR. This emulated H.323 HLR acts as a limited proxy for the actual ANSI-41 HLR, with the true ANSI-41 HLR retaining ultimate control. At the same time, to the home ANSI-41 network, the subscriber appears to register from the AnnexE2_GK, emulating an ANSI-41 VLR. The AnnexE2_GK links H.225.0 operations and data to the equivalent ANSI-41 MAP operations and data, and vice versa, in order to support interoperability.

To support H.323 foreign mode operation, an H.323 Authentication Centre (AuC) can be integrated into the AnnexE2_GK gateway.

For SMS interoperability, the AnnexE2_GK shall also provide SMSC emulation using H.323 Annex K (Service Control protocol), acting as a limited proxy for the subscriber's ANSI-41 MC. In some cases, the AnnexE2_GK will need to originate short messages in order to support interoperability. In order to support late call forwarding, the AnnexE2_GK and H.246 Annex B/C also provides gateway MSC emulation.

E2.9.4 Subscriber data

The AnnexE2_GK does not duplicate the subscriber's existing HLR, but provides a gateway to any visited network that uses a foreign MAP protocol. The original source of subscription data remains in the home network's HLR. Most of this data shall not reside in the AnnexE2_GK, but shall be dynamically converted and translated between H.323 and ANSI-41 MAP messages as needed.

Nevertheless, some basic subscriber identity information shall need to be provisioned in the AnnexE2_GK to support this mapping process, such as:

- International Mobile Subscriber Identity (IMSI);
- Mobile Identification Number (MIN);
- Electronic Serial Number (ESN);
- Terminal type.

Authentication and encryption services are critical functions that shall be supported with network interoperability. These capabilities are managed in both H.323 and ANSI-41 networks by the Authentication Centre (AuC or AC), which can be physically separated from the associated HLR or integrated with it. Different authentication processes and algorithms are defined for H.323 and ANSI-41. Therefore, for phase 1 implementation, subscriber-specific authentication data shall be provisioned and maintained on both an H.323 AuC and ANSI-41 AC, in order to support service on either network. Subscriber data that needs to be maintained includes:

- Ki (H.323 subscriber authentication key);
- Triplets or groups of Kc (cipher key), CKSN (cipher key sequence number), and SRES (signed response) for H.323-based authentication and ciphering;

- A-key (ANSI-41 authentication key);
- SSD-A (ANSI-41 shared secret data for authentication);
- SSD-B (ANSI-41 shared secret data used for generated signalling message encryption (SME) and voice privacy (VP) masks).

The foreign mode Authentication Centre can be integrated into the AnnexE2_GK gateway or implemented as a separate network element.

E2.10 Automatic registration and authentication

The H.246 AnnexE2 mobile station shall use network selection to automatically obtain the best possible service in any geographic area. Upon automatic selection of a service provider in a particular area, the network shall support automatic registration from that serving area back to the home location register (HLR).

E2.10.1 Addressing

In H.323 foreign mode, the AnnexE2_GK shall support registration using the Mobile Identification Number (MIN) as the Mobile Station Identity (MSID). When MIN is used as identification for registration, the AnnexE2_GK shall correlate this MIN to the associated IP address for the H.323 native subscriber.

E2.10.2 Authentication, encryption, voice privacy

Authentication, encryption, and voice privacy in H323_UIM ANSI-41 modes shall be supported as defined in "Common Cryptographic Algorithms, Revision C", ANSI TIA/EIA-136-510, and ANSI TIA/EIA-136-511, with the exception that the ESN input to the CAVE algorithm shall be governed by the status of the ESN Usage Indicator in H323_UIM.

E2.11 UIM-based roaming

H323_UIM-based roaming identifies the capability of a UIM-based subscriber to place his UIM in any supporting H.323 terminal or mobile equipment to obtain service without operator or carrier intervention. Supporting H323 Terminal/mobile equipment refers to H323_UIM Terminal/mobile terminals that can read the required subscription identification and associated information on the H323_UIM.

UIM-based roaming allow subscribers to change H.323 terminal/mobile equipment for purpose of accessing specific bands or features which may not be available from existing H.323 terminal/mobile equipment. It also allows subscribers to easily change out H.323 terminal/mobile equipment for upgrade or repair, without operator or carrier intervention.

E2.11.1 Use of mobile equipment identifiers

ANSI-41 uses the Electronic Serial Number (ESN) to uniquely identify the mobile station; the IMEI is not currently transmitted from the mobile station to the ANSI-41 network. The ESN is currently used in ANSI-41 subscriber authorization, authentication, signalling message encryption, and voice privacy, and in AMPS subscriber authorization, authentication, and signalling message encryption. Some ANSI-41 service providers also use the ESN to track in-service mobile stations. Permanently attaching the ESN to the mobile transmitter is currently required by some federal regulatory bodies in order to reduce the potential for fraud by changing the ESN.

When all the subscriber data for authorization and authentication is stored on the H323_UIM, UIM-based roaming can be easily supported without additional network requirements. However, storing the mobile station identity (MSID) on the H323_UIM and the ESN on the mobile equipment makes it difficult to support UIM-based roaming in ANSI-41 networks because the MSID and ESN used for authentication, encryption, and voice privacy may not match the MSID and ESN combination

stored in the HLR/AC for the subscriber. Options may exist in the future to modify the current ESN usage in ANSI-41 networks. These options include:

- 1) changing the role of the ESN in authentication, encryption, and voice privacy;
- 2) allowing the ESN to be resident on the UIM with the mobile station identification; and
- 3) adding the IMEI to ANSI-41.

There are benefits and drawbacks to each option.

In order to allow for flexibility in implementing a solution to allow UIM-based roaming in ANSI-41, the H.246 AnnexE2 H323_UIM Terminal shall support the following method of using the ESN:

- 1) The H323_UIM Terminal shall contain an ESN.
- 2) The H323_UIM shall contain a SIM Electronic Serial Number (SESN) of the same length as the ESN. ***The SESN shall be permanently loaded by the H323_UIM Terminal manufacturer and shall not be alterable by any means.*** This SESN will not necessarily be related to any manufacturer or assigned by the ITU/TIA.
- 3) The SIM shall contain an ESN Usage Indicator (EUI) that determines how the ESN and SESN are used for security and identification. Security refers to the methods used to authenticate a mobile station and provide encrypted data (user and signalling) and voice communications. Identification refers to the method of reporting the H323_UIM mobile equipment to the network. The EUI field shall be protected from unauthorized programming. It shall identify to the mobile station which of the following modes of operation to use:
 - Mode 1 Use the ESN on the mobile equipment for security and identification.
 - Mode 2 Use the SESN on H323_UIM for security and the ESN on the mobile equipment for identification.
 - Mode 3 Use the SESN on the H323_UIM for security and identification.

Due to fraud prevention in existing legacy systems and pending regulatory issues, initial H.246 AnnexE2 mobile equipment shall not support Mode 3 operation. In the event that the EUI on the H.323_UIM is programmed to Mode 3, the mobile station shall default to Mode 1 operation.

E2.11.2 ANSI-41 mode support

With respect to IS-751, the mobile station identity (MSID) is tied to a specific ESN. This fixed MSID-ESN combination is used to validate the subscriber when the subscriber accesses the network. For AnnexE2_GK H323_UIM Terminals, the mobile station identity for ANSI-41 mode shall reside on the UIM. To support UIM-based roaming for an H.246 AnnexE2 subscriber operating in ANSI-41 mode when:

- the ESN remains solely with the mobile equipment (ME);
- the ESN Usage Indicator (EUI) indicates Mode 1 operation; and
- the SIM Electronic Serial Number (SESN) is not used.

The ANSI-41 HLR/AC and H.246 AnnexE2_GK for ANSI-41 operation shall support the following capabilities:

- 1) UIM-based roaming support for ANSI-41 operation is a service provisionable option in the HLR/AC and AnnexE2_GK for the ANSI-41 subscriber.
- 2) Both the home network and AnnexE2_GK authentication centre (AC) for ANSI-41 operation shall disable the initial validation of the MSID-ESN combination when the subscriber first accesses the network for registration. Instead, the AC shall use the reported, dynamic ESN when performing CAVE processing upon registration. If CAVE authentication upon registration is successful based on the reported, dynamic ESN, the AC

shall store this ESN as the current, validated ESN. MSID-ESN validation during subsequent network access attempts shall be performed based on the current, validated ESN.

- 3) When an ANSI-41 native subscriber registers in H.323 foreign mode, an initially provisioned, fixed ESN for this subscriber shall always be passed from the AnnexE2_GK to the subscriber's HLR. The HLR shall always authorize subscriber registration using this fixed ESN.
- 4) Both the home network HLR and AnnexE2_GK HLR emulation for ANSI-41 operation shall perform MSID-ESN validation based on the results of subscriber authentication upon registration. If authentication upon registration is successful based on any reported, dynamic ESN, that ESN shall then be stored as the current, validated, dynamic ESN. Subsequent MSID-ESN validation at the AnnexE2_GK HLR shall be performed based on the current, validated, dynamic ESN. Subsequent MSID-ESN validation at the home network HLR shall be performed based on either the initial provisioned, fixed ESN or the current, validated dynamic ESN. Any validated, dynamic ESN shall remain indefinitely as an authorized ESN for this subscriber until a newly reported ESN has been successfully used for authentication upon registration.

E2.11.3 Automatic call delivery

After successful registration in either ANSI-41 or H.323 foreign mode, incoming calls to the subscriber will be automatically delivered from the home network. The AnnexE2_GK shall query the serving network to obtain a Temporary Local Directory Number (TLDN) or Mobile Station Routing Number (MSRN) to provide back to the gateway or originating MSC in order to route the call to the serving network. In cases where the TLDN is not provided in international E.164 format, the AnnexE2_GK shall provide the necessary numbering plan conversion when mapping to and from the MSRN.

E2.11.4 Supplementary Service Feature Control

Subscribers shall transparently activate and use supplementary services without any regard or knowledge of the type of network which is being accessed, whether it is ANSI-41 or H.323 network.

E2.11.5 H.323 foreign mode support

When the subscriber invokes a supplementary service control in an H.323 network, the mobile station shall relay the requested action by issuing a REGISTER operation to the serving MSC, indicating the supplementary service action that is requested. The serving MSC shall initiate the appropriate H.225.0 operation or request to the subscriber's HLR.

In the case of an ANSI-41 native subscriber roaming in H.323 foreign mode, this H.225.0 operation or request shall be directed to the AnnexE2_GK. The AnnexE2_GK shall translate this request to an ANSI-41 FeatureRequest operation, populated with the appropriate *FC dialled digit string, and send this query to the HLR for the ANSI-136 subscriber. Once a return result or acknowledgement is received from the HLR, the AnnexE2_GK shall provide the appropriate acknowledgement back to the AnnexE2_GK serving MSC.

Typical call flows for supplementary service control in H.323 foreign mode are provided with the call forwarding description in ITU-T Rec. H.450.3.

E2.11.6 Feature code mapping

In order to support supplementary service feature control in foreign mode, the AnnexE2_GK shall map feature control requests to specific feature codes, and vice versa. A common set of supplementary service feature codes has not been implemented across all ANSI-41-based networks.

In some cases, A-side cellular networks, B-side cellular networks, and CDMA/ANSI-136 networks in the 1900 MHz hyperband (PCS) may use different feature code sets.

To best enable interoperability, the use of standard ANSI TIA/EIA-660 feature codes is recommended. The feature codes defined in Table E2.3 shall be recognized and used by the network for feature control interoperability.

Table E2.3/H.246 – Feature codes for Supplementary Service Feature Control

Supplementary Service Feature Control	Associated ANSI-660 Feature Code (FC)
Call Waiting Deactivation (per Call)	700
Call Forwarding Unconditional Activation	72
Call Forwarding Unconditional Deactivation	720
Call Forwarding Busy Activation	90
Call Forwarding Busy Deactivation	900
Call Forwarding No Answer Activation	92
Call Forwarding No Answer Deactivation	920

In most cases, these standard feature codes should not conflict with other existing feature code sets. Therefore, operators should be able to support these feature codes in addition to existing feature code sets.

Supplementary services shall be controlled and activated within ANSI-41-based networks using ANSI-660 feature codes and dialled digit strings as indicated in Table E2.4. When an ANSI-41 subscriber requests these feature controls in H.323 foreign mode, the AnnexE2_GK shall transmit these dialled digit strings to the HLR.

Table E2.4/H.246 – Dialled digit string for Supplementary Service Feature Control

Supplementary Service Control Request	Dialled Digit String in FeatureRequest
Call Forwarding Unconditional Activation – activate and register	*72 + forwarded-to number
Call Forwarding Unconditional Activation – activate only	*72
Call Forwarding Unconditional Deactivation	*720
Call Forwarding Busy Activation – activate and register	*90 + forwarded-to number
Call Forwarding Busy Activation – activate only	*90
Call Forwarding Busy Deactivation	*900
Call Forwarding No Answer Activation – activate and register	*92 + forwarded-to number
Call Forwarding No Answer Activation	*92
Call Forwarding No Answer Deactivation	*920

In order to allow different feature code implementations, the AnnexE2_GK shall allow for the storage of a Supplementary Service Feature Code Table consisting of one set of feature codes to be populated by the home service provider. The Supplementary Service Feature Code Table shall consist of entries supported in the H.323/ANSI-41 Common H.323 and Mobile Terminal Specification. If the Supplementary Service Feature Code Table is not populated, the AnnexE2_GK shall default to the use of standard ANSI TIA/EIA-660 feature codes.

E2.11.7 Call Barring and Operator Determined Barring

For an ANSI-41 native subscriber, operator control of incoming or outgoing calls, as well as roaming authorization, can also be provided by the subscriber's HLR.

E2.11.8 Outgoing Call Barring (Supplementary Service and ODB)

The following outgoing call barring capabilities shall be mapped in H.323 foreign mode:

- Barring of all outgoing calls (BAOC);
- Barring of outgoing international calls (BOIC);
- Barring of outgoing international calls except those directed to the Home Public Land Mobile Network (HPLMN) country (BOIC-exHC).

The mapping of ANSI-41 outgoing barring conditions in H.323 foreign mode (see Table E2.5) shall be performed according to the ANSI-41. OriginationIndicator is a parameter provided from the HLR to the VLR in the subscriber profile to designate which types of outgoing calls are authorized.

Table E2.5/H.246 – H.323 foreign mode mapping for Outgoing Call Barring

H.323 Call Barring Feature	Corresponding ANSI-41 OriginationIndicator
Bar all outgoing calls (BAOC)	Origination denied
Bar all international calls (BOIC)	National long distance (which includes local calls)
Bar all international calls except to HPLMN country (BOIC-exHC)	National long distance (which includes local calls)

E2.11.9 Incoming Call Barring (Supplementary Service and ODB)

Barring of incoming calls is controlled and invoked by the subscriber's HLR. The invocation of barring all incoming calls (BAIC) shall be supported in H.323 foreign mode. To support the invocation of barring all incoming calls when roaming outside the HPLMN country (BIC-Roam), the AnnexE2_GK shall provide a specific serving system or Visited Public Land Mobile Network (VPLMN) identifier to the ANSI-41 HLR when the subscriber registers in H.323 foreign mode. Each H.246 AnnexE2 serving system shall be uniquely identified with an appropriate E.164 address to the ANSI-41 HLR.

E2.11.10 Operator Determined Barring of Roaming

Operator determined barring of roaming is controlled by the ANSI-41 HLR. To support this feature, the AnnexE2_GK shall provide a specific serving system or VPLMN identifier to the ANSI-41 HLR when the subscriber attempts to register in H.323 foreign mode. Upon invocation of this feature, the GSM HLR shall deny registration. The degree of granularity to which roaming can be denied (e.g., roaming outside home PLMN country) will be determined by the HLR capabilities.

E2.11.11 Registration and Activation

ANSI-41 native subscribers can only register or activate call forwarding no reply (CFNR) in native mode, rather than CFNRy and CFNRc individually. Therefore, the registration or activation of either CFNRc or CFNRy in H.323 foreign mode shall result in registration or activation of CFNR. If either CFNRc or CFNRy is registered or activated in H.323 foreign mode, the other feature shall be registered or activated as well.

In H.323 foreign mode, the AnnexE2_GK shall query the HLR of the ANSI-41 subscriber with the Transfer to Number Request if either call forwarding busy (CFB) or CFNR is registered. The resulting forwarded-to numbers shall be provided to the AnnexE2_GK VLR to support early invocation of CFNRc and non-optimal routing for late call forwarding.

E2.11.12 Optimal routing for Late Call Forwarding

The AnnexE2_GK shall support the invocation of optimal routing for late call forwarding in H.323 foreign mode. With this capability, the AnnexE2_GK will receive a Resume Call Handling message from the H.246 AnnexE2 serving MSC and generate a Redirection Request to the ANSI-41 serving MSC. If a return error is received as a result of the Redirection Request INVOKE, the AnnexE2_GK will reject the Resume Call Handling request from the H.246 AnnexE2 serving MSC, causing the H.246 AnnexE2 serving MSC to forward the call using non-optimal routing.

E2.11.13 SMS Teleservice Support

The AnnexE2_GK with H.323 Annex K capabilities shall provide interworking between ANSI-41 SMS and H323_UIM Terminal for mobile originated and mobile terminated short messaging. When an ANSI-41 Forward Short Message (FSM) is delivered to the AnnexE2_GK, the AnnexE2_GK will convert it to an H.323 Annex K Service Control message carrying ANSI-41 Short Message data and deliver it through the H.323 network. Similarly, when a Short Message is originated from H323_UIM Terminal, an H.323 Annex K service control message is delivered to the AnnexE2_GK, the AnnexE2_GK will convert it to an ANSI-41 FSM and deliver it through the ANSI-41 network.

E2.11.14 Message Waiting Notification

The H323_UIM Terminal and AnnexE2_GK shall support delivery of Message Waiting Notification (MWN) from ANSI-41 network by converting the ANSI-41 MWN information into H.450.7 MWN information.

E2.11.15 Emergency Service

The AnnexE2_GK does not perform any direct role in the routing or completion of emergency calls from H323_UIM mobile stations. However, the ANSI-41 and H.323 serving networks provide "pass through" capability to ensure that the call will be routed and offered to a Public Safety Answering Point (PSAP).

Emergency service permits a subscriber to dial an emergency number and be connected to a Public Safety Answering Point (PSAP) to request an emergency response from the appropriate agency (e.g., fire, police, ambulance, poison control centre, or suicide prevention centre).

An emergency call shall bypass any authorization restrictions or call origination restrictions features.

Once the call is answered, the subscriber shall be able to communicate the type of emergency over a normal voice connection with the PSAP. (Encryption shall be removed on the connection to the PSAP.)

An emergency call does impact a subscriber's ability to originate or receive calls while the emergency call is in progress. Supplementary services and features controlled by activating the SEND key (such as Call Waiting, Three-Way Calling, Conference Calling, and Call Transfer) are suspended during the emergency call, except to reconnect a call placed on hold to place the emergency call. When the emergency call is released, the subscriber's normal calling capabilities are restored. Release occurs when either the subscriber or PSAP disconnects.

In ANSI-41 mode, the mobile station shall support the emergency call procedure as described in TIA/EIA-136-123-A. When an emergency call is dialled by the subscriber in ANSI-41 mode, the mobile station shall set the Emergency Call flag in the Origination message. If this flag is set, it indicates an emergency call, and the Called Party Number is ignored by the network.

Emergency calling shall meet all the regulatory requirements imposed by government agencies.

E2.11.16 Location services

It is not required that the H323_UIM Terminal include GPS functionality. Location services can be provided in H.323 and ANSI-41 modes via network solutions.

E2.11.17 WAP services

H323_UIM Terminals that support the Wireless Application Protocol (WAP) shall conform to the following requirements via H.323 Annex K Service Control transport channel. The H323_UIM Terminal shall support WAP as specified by the WAP Forum in the WAP Wireless Datagram Protocol Specification. It is desired that the H323_UIM Terminal support at least WAP 1.2. The bearers for WAP shall be, at a minimum, ANSI-41 SMS, GPRS Packet Data and Over-the-Air or Remote activation and programming. The H323_UIM Terminal shall support WAP Over-the-Air Provisioning (WAP 1.3) when this standard is finalized. The H323_UIM Terminal is not precluded from supporting WAP via the General UDP Transport Service (GUTS) while in ANSI-41 mode.

E2.12 Stage 2 descriptions of ANSI-41 PLMN Interworking and H323_UIM Terminal features

E2.12.1 Operational model and message flows

This clause describes some typical message flows for ANSI-41 PLMN interworking function (AnnexE2_GK) and H323_UIM Terminal function in an H.323 network. The following conventions are used in the figures of this clause.

1) The following notation is used:

- > H.323 and ANSI-41 MAP protocol message.
- > HTTP message.
-> Informative example primitive (implementation matter).

ANSI-41 MAP, HTTP and RAS messages are capitalized (ANSI-41: REGNOT(involve), REGNOT(response), HTTP:GET, RAS:ARQ), while H.225.0 call signalling messages are written with the first letters capitalized (Setup). ASN.1 codepoints in H.225.0 are written in bold (**ServiceControlAddress**).

The message parameters shown in the message flow tables, which are shown required (R), mandatory backward compatible (MBC) and optional (O) shall be given the same treatment in including the equivalent H.225.0 MobileUIM parameters in AnnexE2_GK related H.225.0 messages.

The following message flows shown in this annex are not limited, but are shown as example message flows.

Mobility Management areas message flows

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

Communication Management area message flows

- 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.

E2.12.2 Registration and Authentication of H323_UIM Terminal messages flow

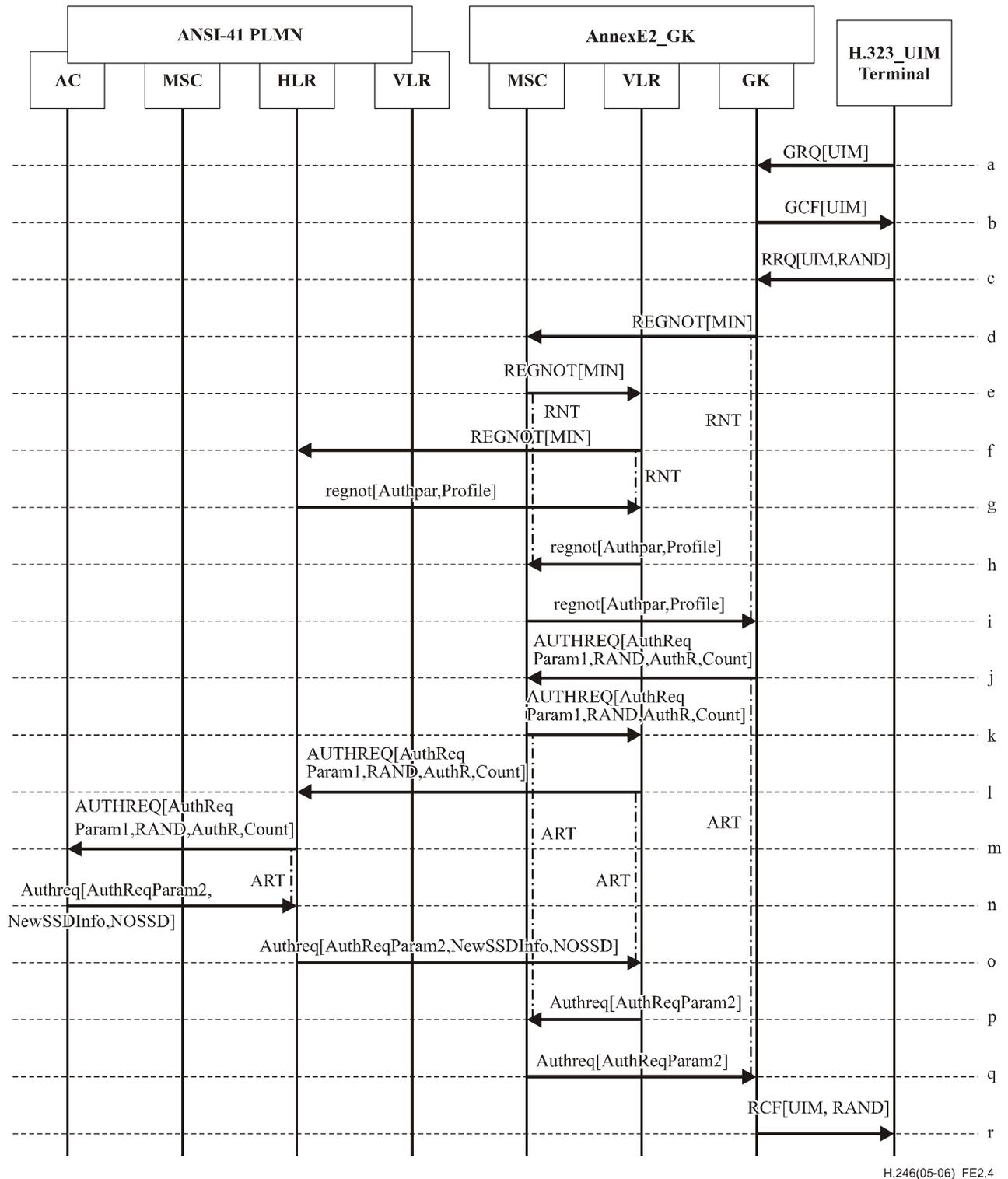


Figure E2.4/H.246 – H323_UIM Terminal Registration and Authentication messages flow

This operation scenario (Figure E2.4) describes the successful use of the GRQ, GCF, RRQ, and RCF interworking with the ANSI-41 PLMN RegistrationNotification, AuthenticationRequest operations to authenticate an H323_UIM Terminal (HUT) which is attempting initial access. The HUT is aware that Registration and Authentication is required on all PLMN system accesses. The result of these operations is to allow access.

- a) The H323_UIM Terminal with Encrypted Mobile User Identity and System Identity multicasts (or uses other methods as described in Appendix IV/H.225.0) a Gatekeeper Request (GRQ) message, asking, "Who is my AnnexE_GK?". This is sent to the AnnexE_GKs well-known Discovery Multicast Address within the PLMN IWF Networks Serving area.
- b) One or more AnnexE_GK may respond with the Gatekeeper Confirmation (GCF) message indicating "I can be your AnnexE_GK.", and returns the Transport Address of the AnnexE_GK Gatekeeper's RAS Channel.
- c) H323_UIM Terminal (HUT) shall send a Registration Request (RRQ) with UIM to an AnnexE_GK. This is sent to the AnnexE_GK's RAS Channel Transport Address. The HUT has the Network Address of the AnnexE_GK from the Gatekeeper discovery process and uses the well-known RAS Channel TSAP Identifier or the TSAP identifier returned in the GCF. The AnnexE_GK converts all the H323_UIM Terminal information to appropriate PLMN information in order to start transactions to PLMN as the serving MSC and servingVLR.
- d) The Gateway/Gatekeeper interworking function sends REGNOT (RegistrationNotification) message to serving MSC within the AnnexE_GK.
- e) The serving MSC determines that a roaming H323_UIM Terminal is within its service area; the serving MSC may detect the HUT's presence through autonomous registration, call origination, call termination or a service order. The serving MSC sends a REGNOT to its VLR the information in Table E2.6 as defined in the ANSI-41 PLMN specifications (refer to ITU-T Rec. X.691).

Table E2.6/H.246 – RRQ (UIM) and REGNOT message parameters

Parameters	Usage	Type
IDInfo:	Set of identification parameters in REGNOT:	
[MIN]	Served MS MIN.	R
[ESN]	Served MS ESN.	R
[MSCID]	Serving MSC MSCID.	R
[PC_SSN]	Serving MSC PC_SSN. Include if SS7 carriage services are used.	O
[LocationAreaID]	For paging served MS. Include if available.	O
[SystemMyTypeCode]	Serving MSC vendor identification.	MBC
QUALCODE	Type of qualification required	R
SYSACCTYPE	Type of system access	R
	System's transaction capability	R
TERMTYP	Identifies the radio-frequency interface standard supported by the associated MS	R
AVTYP	Indicates MS is unavailable for normal call delivery, if applicable	O
SMSADDR	Temporary routing address of SMS subscriber, if applicable	O
AuthError:	Parameters included if authentication parameters were requested by the serving MSC but not received from the MTH:	O
[SystemCapabilities]	Authentication capabilities of serving system.	
[ReportType]	Report of missing authentication parameters.	
AccessInfo:	Subscriber's access information. Included if system access is in a border cell. Includes:	O
[ReceivedSignalQuality]	Raw received signal strength from MS for use in multiple access signal strength arbitration.	
[ControlChannelData]	Includes: DCC and CHNO of analog access channel for use in multiple access detection; CMAC for use in signal strength arbitration.	
[SystemAccessData]	Indicates the serving MSC and cell site for use in multiple access detection.	
BORDACC	Indicates that system access is in a border cell, as determined by local procedures.	O

- f) The serving VLR determines that:
- i) either the HUT had previously registered with an MSC within the domain of the VLR but the HUT has been reported inactive by the VLR;
 - ii) or the HUT is not known to the VLR;
 - iii) or the requested information cannot be made available for the indicated HUT.

Under these conditions, the serving VLR forwards the REGNOT to the HLR associated with the HUT.

Table E2.7/H.246 – VLR → HLR REGNOT message parameters

Parameters are as in Step a, with the following modifications:		
Parameters	Usage	Type
[PC_SSN]	Serving VLR PC_SSN. Include if SS7 carriage services are used.	O
[MYTYP]	Serving VLR vendor identification.	MBC

- g) The HLR determines that authorization can be granted to the HUT. It returns the requested information to the serving VLR in the REGNOT.

Table E2.8/H.246 – HLR → VLR regnot message parameters

Parameters	Usage	Type
AUTHPER	Authorization confirmed indication with period of authorization.	O
MYTYP	VLR vendor identification.	MBC
Profile:	Subscriber's profile information. Include if profile requested in QUALCODE:	O
[CallingFeatures-Indicator]	Authorization and activity states for features.	
[OriginationIndicator]	Type of calls MS is allowed to originate.	
[Digits(Restriction)]	Selected leading digits or full Directory Number allowed for call origination as indicated in OriginationIndicator. Include if applicable.	
[Termination-RestrictionCode]	Type of calls MS is allowed to terminate.	
HLRID [MSCID]	HLR MSCID to key MS record against a subsequent UnreliableRoamerDataDirective.	R
[Digits(Carrier)]	Indicates MS's preferred IC, if applicable.	
[RoutingDigits]	Special routing instructions, if applicable.	
[Geographic-Authorization]	Include if applicable.	
[Authentication-Capability]	Include if authentication of the HUT is required.	
[DMH_AccountCode-Digits]	Include if applicable.	
[DMH_AlternateBillingDigits]	Include if applicable.	
[DMH_BillingDigits]	Include if applicable.	
[MobileDirectory-Number]	Include if applicable.	
[MessageWaiting-NotificationCount]	Include if MessageWaitingNotificationType is <i>Count Indication</i> .	
[MessageWaiting-NotificationType]	Include if Message Waiting Notification feature is active and an action is required.	
[OriginationTriggers]	Origination trigger points currently active for the subscriber. Include if applicable.	
[PACAIndicator]	Indicates the PACA permanent activation status and priority level assigned to the subscriber, if applicable.	
[PreferredLanguage-Indicator]	Indicates the preferred language associated with the subscriber, if applicable.	
[SMS_Origination-Restrictions]	Defines the type of messages the MS is allowed to originate, if applicable.	
[SPINIPIN]	Indicates Subscriber's PIN, if applicable.	
[SPINITriggers]	SPINI trigger points currently active for the subscriber. Include if applicable.	
[SMS_Termination-Restrictions]	Defines the type of messages the MS is allowed to terminate, if applicable.	

Table E2.8/H.246 – HLR → VLR regnot message parameters

Parameters	Usage	Type
[TerminationTriggers]	Termination trigger points currently active for the subscriber. Include if applicable.	

h) The VLR forwards the regnot to the serving MSC.

Table E2.9/H.246 – AnnexE2_GK (VLR → MSC) regnot message parameters

Parameters are as in Step c, with the exception that the HLRID parameter is not included and with the following modification:		
Parameters	Usage	Type
MYTYP	VLR vendor identification.	MBC

i) The serving MSC in turn forwards the regnot with subscriber profile information into the interworking function of Gateway/Gatekeeper.

j) On this initial access attempt by an authentication-capable HUT, the interworking function of Gateway/Gatekeeper sends an AUTHREQ to the serving MSC.

Table E2.10/H.246 – AnnexE2_GK (GK→MSC) AUTHREQ message parameters

Parameters	Usage	Type
AuthReqParameters1:	Set of parameters in AUTHREQ:	
[MIN]	Served MS MIN.	R
[ESN]	Served MS ESN.	R
[MSCID]	Serving MSC MSCID.	R
[PC_SSN]	Serving MSC PC_SSN. Include if SS7 carriage services are used.	O
[SystemCapabilities]	Authentication capabilities of the serving MSC.	R
[SystemAccessType]	Type of system access = registration.	R
[TerminalType]	Identifies the radio-frequency interface standard supported by the associated MS	R
RAND	Random number derived from the HUT-provided RANDC by the serving MSC.	R
AUTHR	Authentication result provided by the HUT.	R
COUNT	Value of CallHistoryCount provided by the HUT.	R

k) The serving MSC sends an AUTHREQ to the serving VLR with all parameters shown in Step j).

l) The VLR sends an AUTHREQ to the HLR associated with the HUT.

Table E2.11/H.246 – AnnexE2_GK (VLR) → HLR AUTHREQ message parameters

Parameters are as in Step a), with the following modifications:		
Parameters	Usage	Type
[SystemCapabilities]	Authentication capabilities of the serving VLR.	R
[PC_SSN]	Serving VLR PC_SSN. Include if SS7 carriage services are used.	O

- m) The HLR forwards the AUTHREQ to the AC. Parameters are as in Step k).
- n) The AC determines that the HUT should be allowed access. The AC sends an authreq to the HLR.

Table E2.12/H.246 – AuC→ HLR authreq message parameters

Parameters	Usage	Type
AuthReqParameters2: [CallHistoryCount] [RANDSSD] [RANDU] [AUTHU] [UpdateCount]	Set of parameters in authreq: Event counter used for clone detection. Included if SSD is shared. Random number for SSD generation. Included if a SSD update and a Unique Challenge to the HUT should be initiated by the serving system. Random number generated by the AC to produce AUTHU. Included if a Unique Challenge to the HUT should be initiated by the serving system. Expected HUT response to Unique Challenge Order as calculated by the AC. Included if a Unique Challenge to the HUT should be initiated by the serving system. Indicates that the COUNT update procedure should be initiated by the serving system.	O O O O O
NewSSDInfo: [AuthenticationAlgorithmVersion] [SSD]	New SSD information: Include if SSD included to select authentication algorithm other than default. New value of VLR and AC shared secret data. May be included if the SystemCapabilities of the VLR include "CAVE execution" and AC administration policies allow distribution of the SSD.	O O
NOSSD	Indicates that previously provided SSD is no longer valid and should be discarded.	O

- o) The HLR forwards the authreq to the serving VLR. Parameters are as in Step n).
- p) The serving VLR forwards the authreq to the serving MSC. Parameters are as in Step n), with the exception that the SSD, AAV and NOSSD parameters are not included.
- q) The serving MSC sends the authreq to interworking function Gateway/Gatekeeper to allow complete the authentication of the H323_UIM Terminal.
- r) The AnnexE_GK's Gatekeeper shall send Registration Confirmation (RCF) with AuthReqParam2 set of parameters to the H323_UIM Terminal indicating the successful registration and Authentication of H323_UIM Terminal in the AnnexE_GK PLMN area. After this step the HUT is ready to access Mobile Services from all preferred Service Providers PLMN and H.323 networks.

E2.12.3 Authentication of subscriber using PIN to invoke services message flow

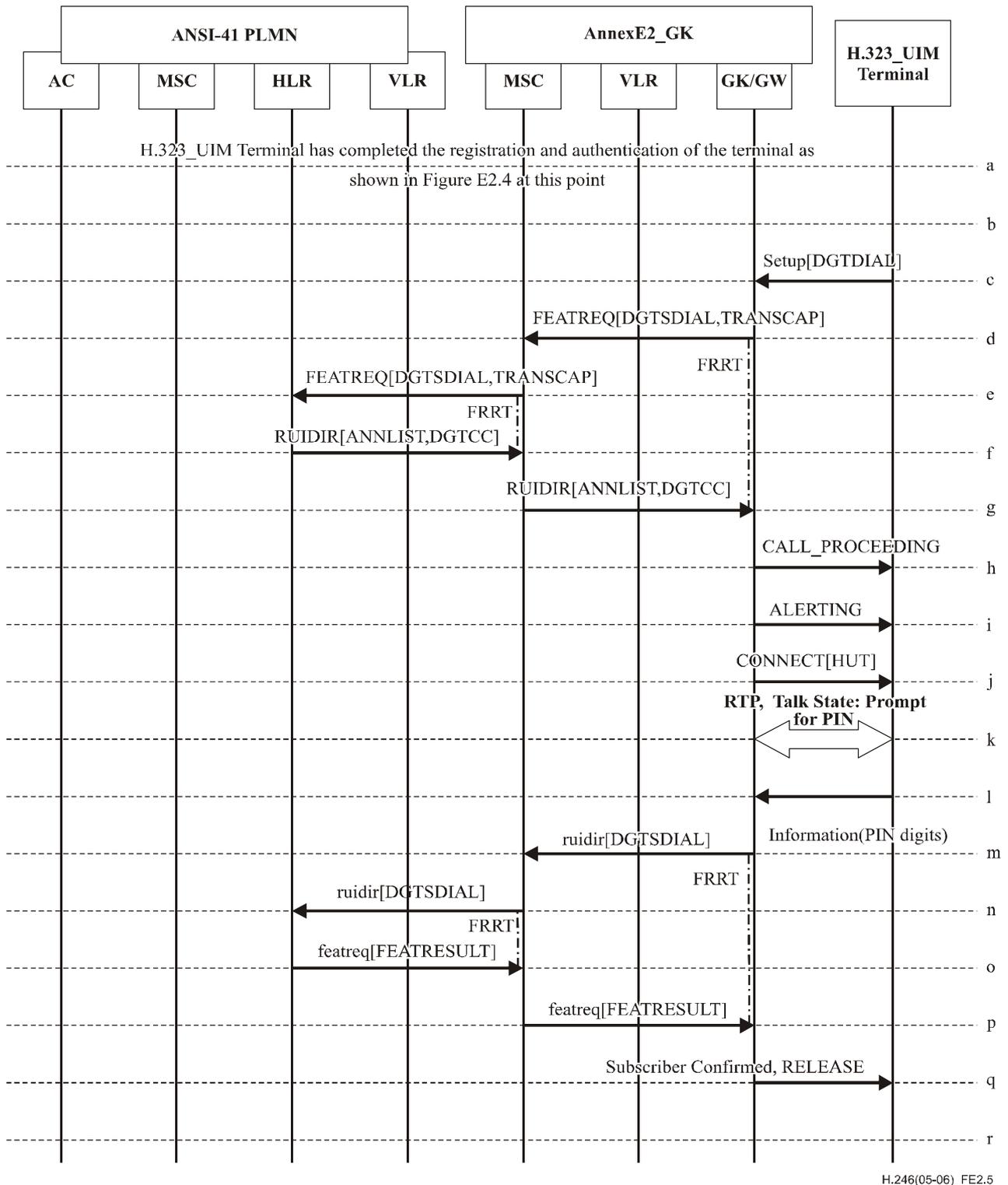


Figure E2.5/H.246 – Authentication of Subscriber using PIN messages flow

This operation messages flow in Figure E2.5 describes the successful use of the Q.931 messages (Setup, Call_proceed, Alerting, Connect, Release Complete and Information) interworking with ANSI-41 PLMN FeatureRequest (FEATREQ), RemoteUserInteractionDirective (RUIDIR) operation to authenticate a H323_UIM Subscriber, who is attempting initial mobile service access.

The Mobile subscriber is aware that authentication using PIN is required on all PLMN Service accesses. The result of these operations is to provide access to subscribed and active mobile users.

- a) Discover the Mobile Gateway using GRQ, GCF operations.
- b) Registration and Authentication of the H323_UIM Terminal using RRQ, RCF operations. Steps a) to b) functions, which are shown in Figure E2.1 are successfully completed at this point of the scenario.
- c) The H323_UIM Terminal with Encrypted Mobile User Identity and System Identity dials feature code digits (e.g., *1234), a Setup Message with Digits Dialed is sent from the HUT to AnnexE_GK (Mobile Gatekeeper).
- d) Mobile Gateway/Gatekeeper interworking function in AnnexE_GK detects the feature code in the SETUP message from the H323_UIM and sends a PLMN operation FeatureRequest with Dialed Digits to initiate subscriber authentication on PLMN.
- e) The serving MSC sends the FEATREQ to the HLR associated with the H323_UIM Subscriber. The TransactionCapability parameter is also included in the FEATREQ, indicating that the serving MSC supports receiving RUIDIRs.
- f) The HLR recognizes the dialed digits as a feature registration with a forward-to or diversion termination address that matches a SPINI Trigger. The HLR send a RUIDIR to the serving MSC.
- g) On receipt of the RUIDIR, the serving MSC turns off the FEATREQ timer (FRRT) and forwards the FEATREQ message to the IWF of H.323 Gateway/Gatekeeper in order to provide call treatment as indicated in the received message. In this case, the treatment is to answer the call (i.e., connect the calling party to the subsystem capable of user interaction), and prompt the user based on the information in the received RUIDIR (in the DigitCollectionControl parameter) and wait for digits.
- h) The AnnexE_GK sends the CallProceeding message to the H323_UIM Terminal (HUT).
- i) The AnnexE_GK sends the Alerting message to the HUT.
- j) The AnnexE_GK also sends the Connect message to the HUT.
- k) The HUT and AnnexE_GK are in Talk State with RTP media, The AnnexE_GK-IVR prompts the user for PIN.
- l) The user responds with the authentication PIN, which is sent in **Information (collected digits)** from HUT to AnnexE_GK.
- m) The IWF H.323 Gateway/Gatekeeper takes the collected digits and sends it to the serving MSC function in RUIDIR operation.
- n) The serving MSC sends a RUIDIR to the HLR and includes the digits dialed by the user. The serving MSC restarts the FRRT Timer.
- o) The HLR updates the served MS's feature registration information and sends a featreq including the FeatureResult parameter indicating successful feature operation to the Serving MSC.
- p) The Serving MSC turns off the FEATREQ timer (FRRT) and provides treatment to the served HUT as indicated in the received featreq. In this case, the treatment is to provide feature confirmation and release the call.
- q) The AnnexE_GK updates the subscriber confirmed profile and sends the Release Complete message to the HUT to teardown the call.
- r) The HUT subscriber is now ready to use Mobile Services until Deregistration of the Terminal and user.

E2.12.4 H323_UIM Terminal powers off

If a H323_UIM Terminal powers off while operating in ANSI-41 foreign mode (H.323 network), the AnnexE2_GK receives an MS INACTIVE message from the serving VLR. This results in the AnnexE2_GK setting the "IMSI Detached" Flag. If the H323_UIM Terminal remains inactive for an extended period of time (determined by operator), the AnnexE2_GK may delete the subscriber record associated with that H323_UIM Terminal and send an MS Purge (mobile station purge) to the HLR.

E2.12.5 H323_UIM powers on

If a H323_UIM Terminal powers on and registers on an AnnexE2_GK (serving MSC/VLR), while operating in ANSI-41 foreign mode, normal registration procedures apply.

E2.13 Automatic call delivery

Automatic call delivery is invoked when an incoming call attempt arrives for a subscriber who is roaming. Call delivery scenarios for the case in which an ANSI-41 subscriber is roaming in an H.323 network is provided.

E2.13.1 Call delivery to ANSI-41 subscriber roaming in H.323 network

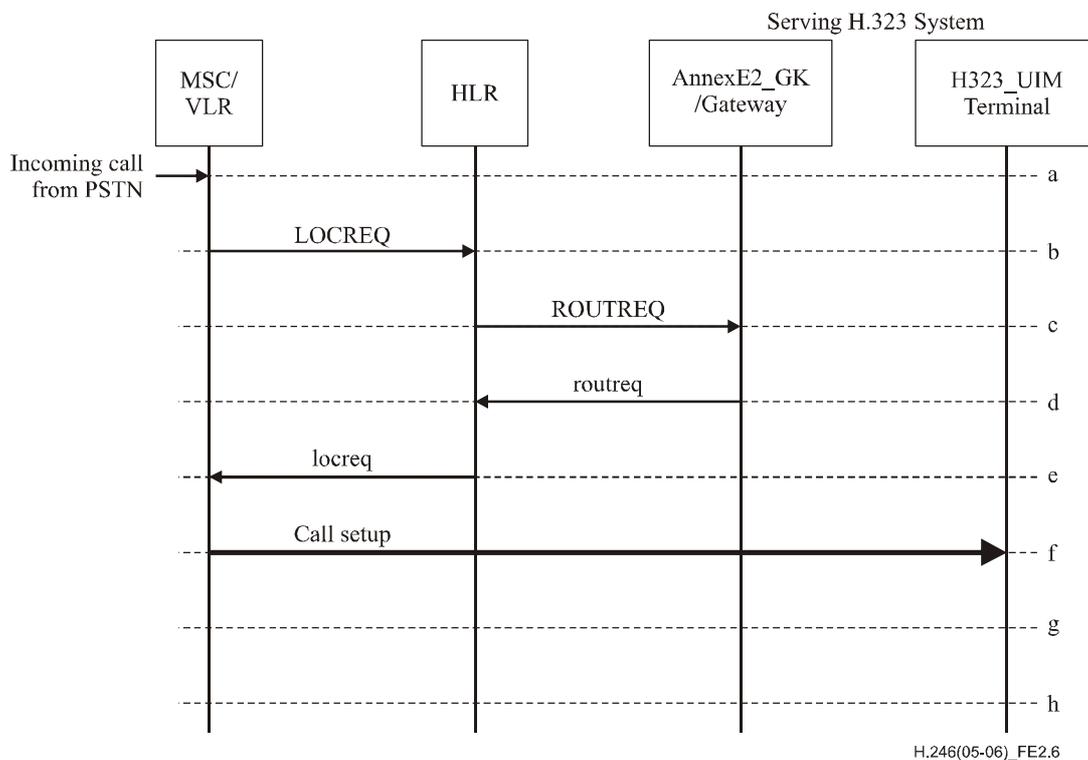


Figure E2.6/H.246 – Call delivery to ANSI-41 subscriber roaming in an H.323 network

- A call origination and the dialled MS address digits (i.e., directory number) are received by the Originating MSC from the PSTN destined to a subscriber to the ANSI-41 network.
- The Originating MSC sends a LOCREQ to the HLR associated with the called subscriber; this association is made through the dialled MS address digits.
- The HLR sends a ROUTREQ to the AnnexE2_GK emulating the VLR where the H323_UIM associated with MS is registered.

- d) The AnnexE2_GK returns a routreq message to the HLR that includes a TLDN (Temporary Local Directory Number), set to the received MSRN, in the Digits (Destination) parameter. Note that the MSRN is always in international format. It is assumed that the gateway MSC on the ANSI-41 side is capable of supporting internationally formatted TLDNs.
- e) When the routreq is received by the HLR, it returns a locreq to the Originating MSC. The locreq includes routing information in the form of the TerminationList parameter, along with an indication of the reason for extending the incoming call (i.e., for Call Delivery, in this case) in the DMH_RedirectionIndicator parameter.
- f) Upon receiving the locreq, the Originating MSC sets up a voice path to the Serving H.323 Network's AnnexE2_GK (using a protocol such as SS7 ISUP and H.225.0 Call Control messages).

E2.13.2 Delivery to an ANSI-41 subscriber roaming in an H.323 Network – Unsuccessful case

In the following scenario in Figure E2.7, call delivery to an ANSI-41 subscriber roaming in an H.323 network fails because the user does not answer a page sent by the serving system during the processing of the Provide Roaming Number message, and call forwarding is not active for the subscriber.

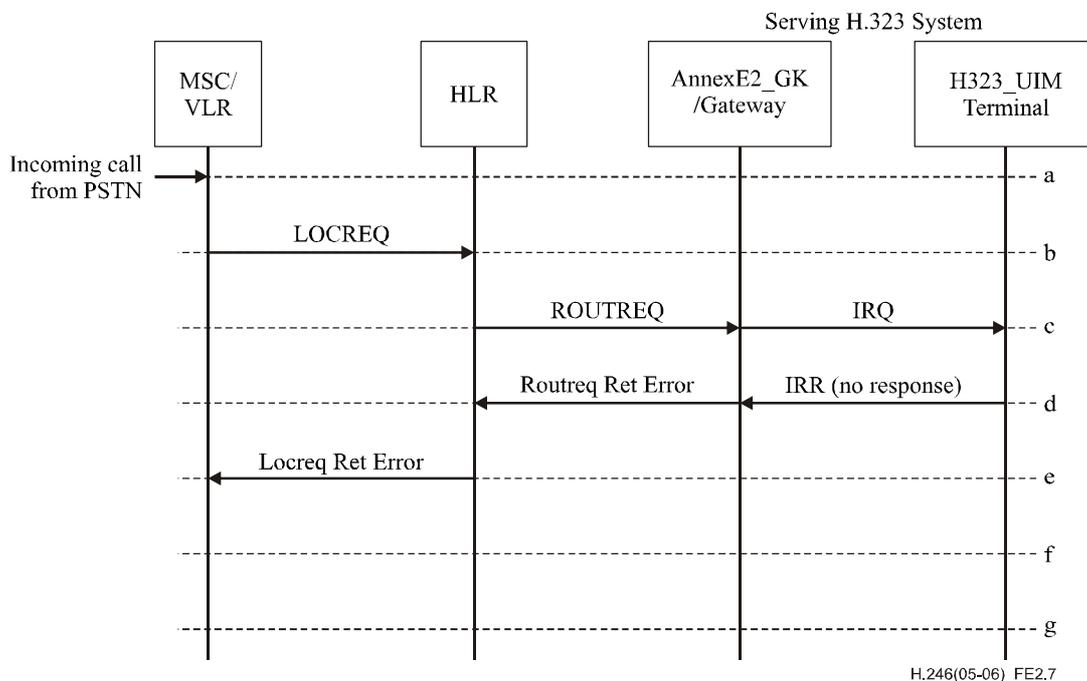


Figure E2.7/H.246 – Unsuccessful call delivery to an ANSI-41 subscriber roaming in an H.323 network

- a) A call origination and the dialled MS address digits (i.e., directory number) are received by the Originating ANSI-41 MSC from the PSTN destined to a subscriber to the ANSI-41 network.
- b) The Originating ANSI-41 MSC sends a LOCREQ message to the ANSI-41 HLR associated with the called subscriber; this association is made through the dialled MS address digits.
- c) The ANSI-41 HLR sends a ROUTREQ message to the AnnexE2_GK emulating the VLR where the H323_UIM associated MS is registered. If necessary, mapping from IMSI to MIN is done beforehand by the AnnexE2_GK. Also, AnnexE2_GK sends an IRQ (Information Request) message to the H323_UIM Terminal to get the status of the terminal for call delivery.

- d) The AnnexE2_GK sends a RoutingRequest RETURN ERROR message with the error code set to *ResourceShortage* to the subscriber's ANSI-41 HLR after getting IRR (no response) from the H323_UIM Terminal.
- e) The ANSI-136 HLR sends a LocationRequest RETURN ERROR message to the Originating ANSI-136 MSC with the *SystemFailure* error code.

With respect to other call delivery failure cases, Table E2.13 describes the following preferred mapping between H.323 and ANSI-41. Note that the response the AnnexE2_GK sends to the ANSI-41 HLR may differ based on the error code received from the H.323 AnnexE2_GK (VLR/MSC).

**Table E2.13/H.246 – ANSI-41 PLMN and H.323 networks call delivery
Roaming User error handling**

H.246 AnnexE2_GK Return Error User Error	AnnexE2_GK response to ANSI-41 HLR's ROUTREQ
Absent Subscriber	routreq with AccessDeniedReason set to <i>Unavailable</i>
No Routing Number Available	RETURN ERROR with Error Code set to <i>ResourceShortage</i>
OR Not Allowed	<i>(Outside of the scope of the Call Delivery capability for GAIT Phase 1.)</i>
Facility Not Supported	RETURN ERROR with Error Code set to <i>SystemFailure</i>
System Failure	RETURN ERROR with Error Code set to <i>SystemFailure</i>
Data Missing	RETURN ERROR with Error Code set to <i>System Failure</i>
Unexpected Data Value	RETURN ERROR with Error Code set to <i>System Failure</i>

E2.14 Successful Mobile Terminating ANSI-136 Short Message Service (CMT) mapped to H.323 Annex K Service Control message

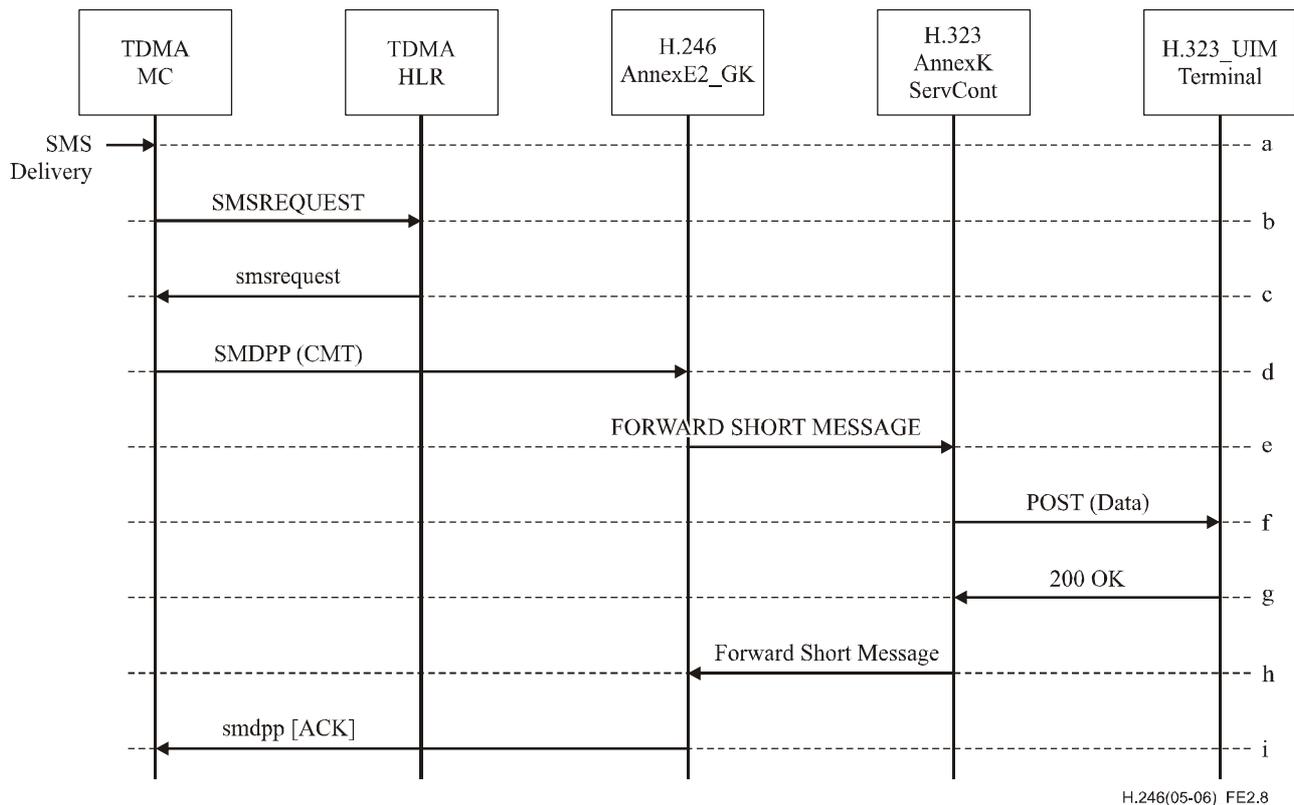


Figure E2.8/H.246 – Short Message Delivery to Subscriber's H323_UIM Terminal while roaming in H.323 network

- a) The ANSI-41 Message Centre (MC) receives a short message for a specific subscriber.
NOTE – This step is shown for completeness only and is not repeated in subsequent call flows.
- b) The Message Centre sends an SMS Request message to the ANSI-41 HLR of the short message recipient to request a routing address for delivering the short message to that subscriber.
- c) Since the subscriber has a current valid location stored in the HLR, the HLR returns it to the MC in the SMS Request Return Result message.
- d) The Message Centre then sends a Short Message Delivery Point to Point message to the H.246 AnnexE2_GK, which is seen as the current serving ANSI-41 MSC/VLR for that subscriber. Note that in this case, the format used by the MC is the CMT format (Cellular Messaging Transport).
- e) Upon reception of the Short Message Delivery Point-to-Point message from the ANSI-41 MC, the AnnexE2_GK originates a FORWARD SHORT MESSAGE to the Service Centre Server after having translated the short message into H.323 Annex K Service Control format.
- f) The Service Control Server sends the POST (Data) message to the H323_UIM Terminal.
- g) The H323_UIM Terminal acknowledges the delivery of the short message with response 200 OK message.
- h) The Service Centre Server sends the result of the Forward Short Message to the AnnexE2_GK.

- i) The AnnexE2_GK sends the result of the Short Message Delivery Point to Point to the ANSI-41 Message Centre.

E2.14.1 Error handling at the reception of a Forward Short Message in the H.246 AnnexE2_GK

- 1) If a mandatory parameter is missing (MAP V2), a **Forward Short Message Return Error** with the indication "Data Missing" is sent back to the SMS-GMSC.
- 2) If a mandatory parameter is missing (MAP V1), a **Forward Short Message Return Reject** with the indication "Mistyped Parameter" is sent back to the SMS-GMSC.
- 3) A **Forward Short Message Return Reject** with the problem code "Mistyped Parameter" is sent in the following cases:
 - a) A parameter tag is not one of those associated with the operation.
 - b) The received value is not a value of the type associated with the operation.
 - c) Erroneous tag and length information.
 - d) Exceeding of the defined size of an ASN.1 module.
- 4) If the *SM-RP-DA* parameter does not have an IMSI number, a **Forward Short Message Return Error** with the indication "Unexpected Data Value" is sent back to the SMS-GMSC.
- 5) If the *SM-RP-OA* parameter does not have an SC, a **Forward Short Message Return Error** with the indication "Unexpected Data Value" is sent back to the SMS-GMSC.
- 6) If the subscriber is not connected in the IIF or if the profile is not available, a **Forward Short Message Return Error** with the indication "Unidentified Subscriber" is sent back to the SMS-GMSC.
- 7) If location is unknown or inactive, send back to the SMS-GMSC a **Forward Short Message Return Error** message with the indication "Absent Subscriber".
- 8) If the subscriber has an ANSI SMS termination restriction, a **Forward Short Message Return Error** message with indication "Facility Not Supported" is sent back to the SMS-GMSC.
- 9) If the short message contents could not be extracted from the SM-RP-UI parameter, send back to the SMS-GMSC a **Forward Short Message Return Error** message with the indication "System Failure".

E2.14.2 Mapping of H.323 Annex K Service Control message into ANSI-136 SMDPP Message

The ANSI-41 CMT, forwarded to the ANSI-41 VLR/MSC as a **SMS Delivery Point-to-Point** message, will contain the following parameters:

- 1) *MIN*;
- 2) *ESN*;
- 3) *SMS Bearer Data* (see below for details);
- 4) *SMS Teleservice Identifier* (with value CMT or GSM Hosted SMS Teleservice);
- 5) *SMS Original Originating Address* (with the value received in parameter *Originating Address* of the GSM SMS-DELIVER message).

The *SMS Bearer Data* parameter sent in the message **SMS Delivery Point to Point** is structured as an ANSI-136 SMS-DELIVER message and has the following parameters:

- 1) *Message Type Indicator* (mandatory): Set to value "SMS-DELIVER";
- 2) *Message Reference* (mandatory): Number created by the IIF and increased with each message sent;

- 3) *Privacy Indicator* (mandatory): Set to value "Not restricted";
- 4) *Urgency Indicator* (mandatory): Set to value "Very Urgent" if parameter *Data Coding Scheme* indicates "class 0 message", otherwise set to value "Normal";
- 5) *Delivery Acknowledgement Request* (mandatory): Set to provided value;
- 6) *Manual Acknowledgement Request* (mandatory): Set to provided value;
- 7) *Message Updating* (mandatory): Set to value "New (do not overwrite)";
- 8) *Validity* (mandatory): Set to value "Indefinite";
- 9) *Display Time* (mandatory): Set to value "Default";
- 10) *User Data Unit* (mandatory): It contains the message itself and it is structured in the following way:
 - 10.1) Least Significant Byte of Length: Length of message.
 - 10.2) Encoding Identifier: Set to value "IRA" if received message is in GSM default alphabet; otherwise, set to value "User Specific".
 - 10.3) Length Modifier: Set to value "0".
 - 10.4) User Data Structure Type: Set to value "00".
 - 10.5) User Data: The ANSI-41 SMS message (parameter User Data). If encoding Identifier has value "IRA" translate short message to the ANSI-136 IRA alphabet.

E2.15 Message Waiting Notification

E2.15.1 H323_UIM Terminal in ANSI-41 Mode

For a native ANSI-41 subscriber roaming in an H.323 environment, there can be two events that trigger the H.246 AnnexE2_GK to send the Message Waiting Notification (MWN) using the H.450.7 Message Waiting Notification (MWN) to the H323_UIM Terminal. The first one is at registration (location update): if there is an indication in the ANSI-41 HLR that messages have been delivered to the subscriber's voice mail box, the ANSI-41 HLR will indicate that in the Registration Notification Return Result message. This will trigger the H.246 AnnexE2_GK to send an H.450.7 MWN information. The second event is when the HLR receives a Message Waiting Notification for a subscriber that is already registered. In this case, the ANSI-41 HLR will send a Qualification Directive message to the H.246 AnnexE2_GK which will translate it into a H.450.7 with MWN indication.

E2.15.2 MWN via ANSI-41 Qualification Directive message mapped to H.450.7 MWN

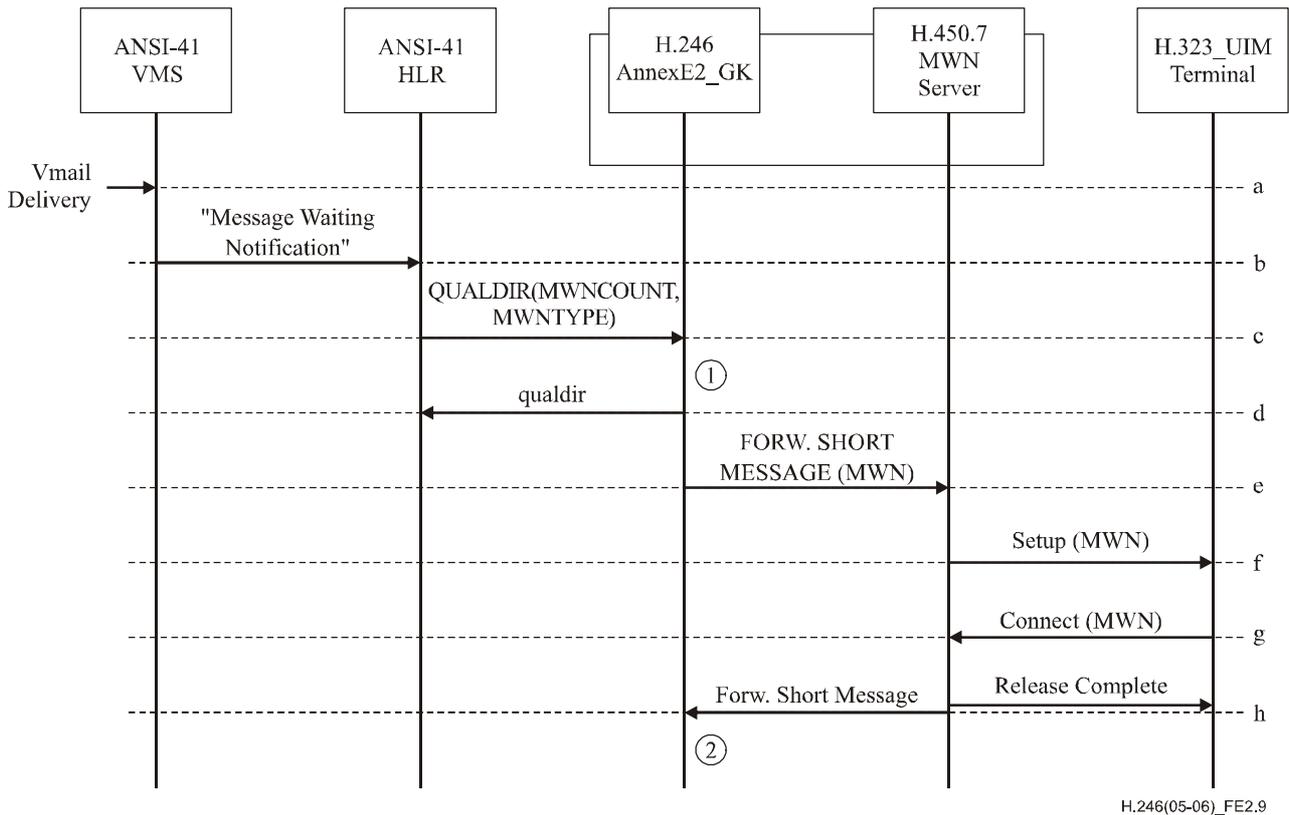


Figure E2.9/H.246 – Message Wait Notification for the ANSI-41 Subscriber roaming in H.323 Networks messages flow

- a) The ANSI-41 Voice Mail System (VMS) receives a voice mail for a specific subscriber.
- b) The ANSI-41 VMS sends the "Message Waiting Notification" (MWN) to the ANSI-41 HLR of the voice mail recipient. Note that the interface between the ANSI-41 VMS and the ANSI-41 HLR is not standardized in ANSI-41-D.
- c) Since the subscriber has a current valid location stored in the HLR, the HLR initiates a Qualification Directive message with the MWN information to the AnnexE2_GK/H.450.7 Server acting as the serving ANSI-41 MSC/VLR. The MWN information consists of two parameters: MessageWaitingNotificationCount (MWNCOUNT) and MessageWaitingNotificationType (MWNTYPE). For a description of these parameters, refer to the ANSI-41-D specifications (EIA/TIA-41-5-D), Chapter 5 (Signalling Protocols), Sections 6.5.2.78 and 6.5.2.79.
 - ① At this point, the AnnexE2_GK/H.450.7 Server sets the MWN flag. This is an indication that Message Waiting Notification is to be delivered to the H323_UIM Terminal.
- d) The AnnexE2_GK/H.450.7 Server sends the result of the Qualification Directive message to the ANSI-41 HLR.
- e) The AnnexE2_GK/H.450.7 Server converts the ANSI-41 MWN information into H.450.7 MWN format
- f) The serving AnnexE2_GK/H.450.7 Server sends the Setup message with the MWN information to the H323_UIM Terminal.
- g) The H323_UIM Terminal acknowledges the delivery of the MWN information and removes the MWN flag and replies with Connected (MWN) message.

- h) The serving AnnexE2_GK/H.450.7 Server clears the MWN flag in the H323_UIM Terminal subscriber's profile. Also, Sends a Release Complete message to the H323_UIM Terminal.

The reception of the Connected Message Result without error and sending Release complete message to the terminal indicates that the MWN information was delivered successfully to the H323_UIM Terminal.

E2.15.3 Encoding of Qualification Directive with MWN Information

The MWN information is encoded in the Qualification Directive (QUALDIR) operation using the MessageWaitingNotificationCount (MWNCOUNT) and the MessageWaitingNotificationType (MWNTYPE) parameters.

The Qualification Directive (ANSI-41) with MWN information sent from the H.246 AnnexE2_GK to the ANSI-41 MSC/VLR will contain the following parameters:

- 1) *SystemMyTypeCode* (mandatory) (use the value for the IIF vendor).
- 2) *QualificationInformationCode* (mandatory) (set to value "Profile only").
- 3) *ElectronicSerialNumber* (mandatory) (use the ESN of the MS).
- 4) *MobileIdentificationNumber* (mandatory) (use the MIN of the MS).

Profile (include the list of message waiting information below).

- 5) *MessageWaitingNotificationCount*
 - Octet 1: Type of message (set to 0 "Voice Messages").
 - Octet 2: Number of messages waiting. Set to the number of voice mail messages waiting (set from 1 to 253). If the number of voice mail messages is 254 or greater, set to value 254. If the number of voice mail messages is zero, the parameter shall be set with the value "no message waiting" (value 0). If the number of voice mail messages is not received but the Data Coding Scheme has value "disable indication" (i.e. bit number 3 has value 0) or the Originating Address has value "clear indicator" (i.e. Octet 3 – bit 0 has value 0) then set the number of pending messages to "no message waiting" (value 0). If the number of messages is not available, the parameter shall be set with value "Unknown" (value 255).
- 6) *MessageWaitingNotificationType*
 - Bit 0 (A) set value to "Pip Tone notification not required" (value 0).
 - Bit 1 (B) set value to "Alert Pip Tone notification not required" (value 0).
 - Bit 32 (DC) Set value to "MWI on" (value 2) if the number of messages is > 0 and if the number of messages has changed. Set value to "MWI off" (value 3) if the number of messages is 0 and if the number of messages has changed. If the number of messages has not changed set value to "No MWI" (value 0).

NOTE – For details, see EIA/TIA-41-5-D section 6.4.2.31.

Annex F

H.323-H.324 interworking

F.1 Scope

This annex specifies the interworking requirements of a H.323 to H.324 protocol conversion device called a H.323 to H.324 Gateway. This Gateway provides interworking by providing the conversion of protocols for control, audio, video, and data as specified in H.323 and H.324 system specifications.

The H.323 standard is the system specification for multimedia communications in packet-based networks and is the basis for many IP telephony applications. The H.324 standard is a system specification for multimedia terminals operating on circuit-switched networks including: terminals on the PSTN ("H.324/P"), terminals on wireless networks (Annex C/H.324, "H.324/M"), and terminals on the ISDN (Annex D/H.324, "H.324/I"). The scope of this annex covers a Gateway for interworking between H.323 endpoints and H.324 endpoints on PSTN, ISDN or mobile networks.

This annex is applicable to both monolithic gateways and decomposed gateways. A decomposed gateway that supports interworking according to this annex may use the H.248 packages defined in H.248.12 to realize the procedures defined in this annex.

F.2 Definitions

This annex defines the following terms:

F.2.1 endpoint: An endpoint is a terminal, Gateway, or MCU. An endpoint can call and be called. It generates and/or terminates media streams.

F.2.2 gateway: A Gateway as defined in this annex is an endpoint on the network which provides for real-time, two-way communications between H.323 endpoints on the packet-based network and H.324 Annex C terminals on the wireless network or the CSN.

F.3 Abbreviations

This annex uses the following abbreviations:

AL-SDU	Adaptation Layer – Service Data Unit
CLC	CloseLogicalChannel message
CSN	Circuit-switched network (mobile, GSTN/PSTN, or ISDN)
H.324	ITU-T Rec. H.324, including all of H.324/M, H.324/I, and H.324/P
H.324/I	Annex D/H.324 (ISDN)
H.324/M	Annex C/H.324 (mobile)
H.324/P	H.324 operating in the base PSTN mode using a V-series modem
MSD	Master Slave Determination
OLC	OpenLogicalChannel

F.4 Overview

A H.323 to H.324 Gateway shall support the mandatory functionality as specified in the H.324 system specifications (H.324/P, H.324/M, or H.324/I as appropriate), the mandatory functionality as specified in the H.323 system specifications, and the mechanism for interworking both the control protocols and the media streams.

In the case of call control, this requires interworking between H.225.0 and the call control protocol used by CSN network that the H.324 terminal is connected to. For the multiplex capability, the Gateway shall provide a mapping between the RTP ports and TCP ports of H.225.0 and the logical channels inside the H.223 multiplex stream. The Gateway which supports interworking with H.324/M endpoint may increase error robustness by utilizing higher H.223 levels (from level 0 to level 3) at the cost of progressively increased overhead and complexity.

For system control information, the Gateway should provide a mapping of the H.245 messages between the H.323 and the H.324 endpoints. The Gateway may use optional audio codecs, video codecs, and/or data application capabilities after negotiation through the H.245 control channel.

If the incoming call from one side (H.323 or H.324) is voice only call, the gateway should not initiate an audiovisual call on the other side. The identification of the type of incoming call is described in F.5.3.

Table F.1 summarizes the protocol requirements for a H.323 to H.324 Gateway.

Table F.1/H.246 – Protocol requirements for a H.323-to-M.324 gateway

Component	H.323	H.324/P	H.324/M	H.324/I
Call Control	H.225.0	(Note 1)	(Note 2)	(Note 1)
System Control	H.245	H.245	H.245	H.245
Multiplex	H.225.0	H.223	H.223	H.223
Audio	G.711	G.723.1 (If audio is supported)	G.723.1 (If audio is supported)	G.723.1 (If audio is supported)
Video (If video is supported)	H.261 QCIF	H.261 QCIF and H.263 SQCIF/QCIF	H.261 QCIF and H.263 SQCIF/QCIF	H.261 QCIF and H.263 SQCIF/QCIF
NOTE 1 – For H.324/P and H.324/I call control is per ITU-T Rec. H.324 and Annex D/H.324, respectively.				
NOTE 2 – The H.324 Annex C terminal uses the call set-up control protocol of the appropriate national standard.				

F.5 Mapping H.245 control

The following subclauses describe the H.245 procedures that require appropriate conversions or can cause conflict situations, and describe the required interworking procedures in the gateway. The gateway should perform the conversions described in this clause to facilitate the interworking in a way that is transparent to the remote endpoints. However, there may be some implementations that treat the terminations as two independent calls, and in this case the following conversions may not be required.

F.5.1 Capability exchange

The terminalCapabilitySet message shall be the first message among the H.245 control messages that the gateway sends to each remote endpoint.

When the TerminalCapabilitySet message is received from the remote endpoint (H.323 or H.324), the gateway shall initiate the Capability Exchange procedure with the opposite remote endpoint if it has not yet done so.

If either remote endpoint (H.323 or H.324) dynamically adds or removes/modifies capability by sending revised TerminalCapabilitySet message during the session, the gateway should send an updated TerminalCapabilitySet message to the opposite remote endpoint.

As for audio, video and data application capabilities, if the gateway detects interoperability problems due to limited capability sets on each side, the gateway shall resolve such problems by making appropriate adjustments to the incoming capability sets based on its transcoding or data application translation functionalities before relaying them to the opposite side.

The gateway shall make appropriate adjustments to the multiplexCapability in the incoming TerminalCapabilitySet message (i.e. from h223Capability to h2250Capability, and vice versa) before relaying them to the opposite side.

F.5.2 Master slave determination

If the gateway completes Master Slave determination procedure with each side independently of the other side, it shall set the TerminalType in the Master Slave Determination (MSD) message to the value as specified in the Table 1/H.323 for the H.323 side, and shall set it to a value of 150 for the H.324 side.

F.5.3 Logical channel signalling

When OpenLogicalChannel (OLC) messages (either unidirectional or bidirectional) are received from the remote endpoint (H.323 or H.324), the gateway should initiate the OLC procedure at the opposite endpoint of the gateway. The Gateway may initiate the OLC procedure before receiving OLC messages.

The gateway shall indicate appropriate multiplexParameters in the outgoing OpenLogicalChannel messages, because the two remote endpoints use different multiplex Recommendations.

If the dataType of the incoming OLC message specifies a type which is not supported by the opposite remote endpoint, but which the gateway is able to transcode or translate, the dataType in the outgoing OLC to the opposite side should be replaced with the dataType, supported by the opposite endpoint.

If the maxBitRate of the incoming OLC message is higher than the available bit rate on the other side, it shall be changed to the value that can be allocated for the logical channel when the OLC message is relayed to the opposite side.

NOTE (Informative) – There may be cases where a logical channel on one side of the gateway does not have a corresponding logical channel on the other side of the gateway. For example, in a multipoint call the gateway might use security services only with one of the endpoints in the call.

F.5.4 Close logical channel

When CloseLogicalChannel (CLC) messages are received from the remote endpoint (H.323 or H.324), the gateway should initiate the CLC procedure at the opposite endpoint of the gateway.

F.5.5 Mode request

The gateway should reject the incoming RequestMode message without relaying to the opposite endpoint, if the gateway will not change its mode of transmission regardless of the response from the opposite endpoint. For example, if h2250ModeParameters requested by the remote endpoint is not available, the H.323 endpoint of the gateway should reject this message without relaying to the H.324 endpoint.

It is desirable for the gateway to transmit a mode that could reduce the transcoding overhead and delay. Therefore, if the mode indicated by the modeDescription of the incoming request message is supported in the other remote endpoint, the gateway should pass the RequestMode message.

If the mode indicated by the modeDescription of the incoming request is not supported in the other remote endpoint but can be used via appropriate transcoding or translation, the gateway should pass the RequestMode message to the endpoint after making appropriate changes to the ModeDescription, or may reject the incoming request.

If the gateway receives a RequestModeAck in response to this message, then the RequestModeAck is sent to the other endpoint without modifications. However, if the gateway receives a RequestModeReject in response, then it will decide an appropriate response to the original RequestMode message.

F.5.6 Round trip delay

When RoundTripDelayRequest messages are received from the remote endpoint, the gateway should relay the incoming message to the remote endpoint in the opposite side, and should relay the response from the remote endpoint to the originating endpoint.

F.5.7 Communications mode messages

If the gateway receives CommunicationModeCommand on the H.323 side, it should determine whether it requires reconfiguration of logical channels. In some cases, such as when the command causes a switch between a centralized and decentralized conference or when the gateway cannot transcode the new dataType specified in the CommunicationModeTable, the gateway may require closing some or all existing logical channel and opening new ones. In other cases the gateway may be able to switch to a new mode, in a way that is transparent to the H.324 terminal, such as when the gateway can transcode the new dataType specified in the CommunicationModeTable.

F.5.8 Logical channel bit rate change messages

If the gateway receives a LogicalChannelRateRequest message, it may relay the message to the opposite endpoint after making appropriate changes. The gateway should relay any response to the LogicalChannelRateRequest message to the other endpoint.

The gateway may directly respond to a LogicalChannelRateRequest without relaying it to the opposite side.

The gateway may send a LogicalChannelRateRequest message before receiving any LogicalChannelRateRequest messages.

F.5.9 Flow control command

The gateway shall comply with incoming **FlowControlCommand**, and may send an appropriate **FlowControlCommand** to the endpoint on the opposite side, if it needs to do so to comply with the command. If, however, the gateway receives a **FlowControlCommand** to which it cannot comply, it should respond by stopping transmission on the logical channel and closing the corresponding logical channel for the opposite side.

F.5.10 End session command

When the gateway receives an EndSessionCommand from a remote endpoint (H.323 or H.324), the gateway shall immediately initiate the end session procedures at both endpoints of the gateway.

The gateway may initiate the end session procedure before receiving an EndSessionCommand.

F.5.11 Miscellaneous command

The gateway should comply with incoming MiscellaneousCommand and may forward the command to the opposite side.

F.6 Mapping call control information

The Gateway shall conduct an appropriate mapping between the Q.931 Call Signalling Channel on the H.323 side and the call signalling channel (if any) on the H.324 side.

For H.324/M endpoints, call set-up and call disconnect following the procedures of A.6 may be applied only if the wireless network to which the H.324/M terminal is connected supports a call signalling protocol such as Q.931 or Q.2931, replacing CSN by wireless network.

F.6.1 H.323 originated calls

If the incoming call from the H.323 endpoint is an audiovisual call (see 7.2.2.1/H.225.0), the gateway should make a H.324 call to the CSN network.

F.6.1.1 For H.324/P endpoints

If the incoming call from the H.323 endpoint is an audiovisual call (see 7.2.2.1/H.225.0), or if either the gateway or the H.324/P endpoint do not support ITU-T Rec. V.8 *bis*, the gateway should make a H.324/P call to the CSN network, and attempt to enter the digital communication mode immediately upon connection using the procedures of ITU-T Rec. V.8 as specified in clause 7/H.324.

If the incoming call from the H.323 endpoint is an audio-only call and both the gateway and the H.324/P terminal support ITU-T Rec. V.8 *bis*, the gateway may initiate a normal analogue telephony voice mode call to the H.324/P terminal. If at a later time the H.323 side attempts to open a data or video channel, the gateway should switch the H.324 side into digital communication mode according to the procedures of clause 7/H.324.

F.6.1.2 For H.324/M endpoints

If the call signalling protocol supported by the wireless network is Q.931, the gateway should signal the "Recommendations H.223 and H.245" BC and LLC information elements as described in ITU-T Rec. Q.931.

F.6.1.3 For H.324/I endpoints

If the incoming call from the H.323 endpoint is an audiovisual call (see 7.2.2.1/H.225.0), the gateway should make a H.324/I call to the ISDN network, and attempt to enter the multimedia communication mode according to the procedures of Annex D/H.324.

If the incoming call from the H.323 endpoint is an audio-only call, the gateway should make a call to the H.324/I endpoint using the ISDN network, according to the procedures of Annex D/H.324. The gateway may choose to enter any of the jointly-supported modes, as described in Annex D/H.324. If the resulting connection is an ordinary ISDN voice call, and at a later time the H.323 side attempts to open a data or video channel, the gateway should switch the H.324/I side into multimedia communication mode according to the procedures of clause 7/H.324.

F.6.2 H.324 originated calls

If the incoming call is an audiovisual call, the gateway should make an audiovisual call to the H.323 side-by-setting the information element of the outgoing message as specified in 7.2/H.225.0.

There are several strategies that can be used to identify the address of the H.323 endpoint, the called party. Some example methods include Direct Inward Dialling (DID), Multiple Subscriber Number (MSN), and ISDN sub-addressing.

F.7 Communication procedure

This clause gives an example of the communication procedures when the connection is established without using fast connect, early H.245 control, or H.245 tunnelling.

F.7.1 Phase A – Call Set-up

When the gateway receives an incoming call from either of remote (H.323 or H.324) endpoints, it shall initiate call set-up procedures at the opposite side, using the procedures defined in F.6.

F.7.2 Phase B – Initial communication and capability exchange

For connections to H.324/P and H.324/I terminals only, there may be an initial period of voice communication according to clause 7/H.324 and Annex D/H.324, respectively. For these terminals,

Phase B of this annex begins with entry into call set-up Phase D of ITU-T Rec. H.324 and Annex D/H.324.

After the establishment of the H.245 control channel, Capability Exchange shall be the first procedure initiated at both endpoints of the gateway. The gateway may wait for the remote endpoints to initiate the procedure, instead of itself initiating the capability exchange procedure. The gateway shall follow the procedures defined in F.5.1 for capability exchange.

The gateway shall complete MSD procedure with both remote endpoints using the procedures defined in F.5.2.

F.7.3 Phase C – Establishment of audiovisual communication

Following the exchange of capabilities and master slave determination, the procedures of F.5.3 and F.5.4 shall then be used to open logical channels for the various information streams.

During a session, the procedures for changing channel structure, capability, receive mode, etc. shall be carried out as defined in F.5.6.

The gateway shall follow the procedures of 8.4/H.323 for provision of call services on H.323 side. The procedures defined in this annex shall be followed where the provision of call services requires interworking with the H.324 terminal.

F.7.4 Phase D – Call termination

Either of the remote endpoints may terminate a call by sending a EndSessionCommand to the gateway, in which case the procedures defined in F.5.10 shall be followed by the gateway.

Also the gateway may terminate the call for reasons such as receiving a DRQ from the gatekeeper, in such case procedures defined in F.5.10 shall be followed.

F.8 Handling of fast connect

The gateway may support the Fast Connect procedures for in-bound calls from the H.323 endpoints. The gateway that uses Fast Connect in a call shall use H.245 tunnelling on the H.323 side when an H.245 Control Channel is required and shall always set the h245Tunneling field to TRUE. This clause describes an example of procedures for handling of Fast Connect.

F.8.1 Call establishment using fast connect procedures

F.8.1.1 Without initial voice conversation

The following procedure should be used with H.324/M endpoints. It may also be used with H.324/P and H.324/I endpoints when a period of initial voice communication before initiation of multimedia mode (Phase B of H.324 and Annex D/H.324) is not desired.

If the gateway receives a Setup message containing the fastStart element from the H.323 endpoint, the following steps should be followed.

Step 1: The Gateway detects the information provided in OpenLogicalChannel structures in the fastStart element of the SETUP message sent by the H.323 endpoint, to generate TerminalCapabilitySet and OpenLogicalChannel messages. The gateway should not send any media to either direction until the Connect message is sent.

Step 2: The gateway may send provisional (Call Proceeding, Progress or Alerting) Q.931 messages to the H.323 endpoint when appropriate.

Step 3: The Gateway establishes a digital communication channel with the H.324/M terminal.

Step 4: The gateway initiates the Capability Exchange procedure. If the gateway detects incompatibility in the TerminalCapabilitySet received from the H.324/M terminal and the dataType field of the OLC structures of fastStart element, and if the gateway has transcoding or protocol

translation functionalities that are capable of resolving these incompatibilities, it makes adjustments to TerminalCapabilitySet message prepared in step 1. Then the gateway sends this TerminalCapabilitySet message for capability exchange with the H.324/M terminal.

Step 5: The gateway initiates the Master Slave Determination (MSD) procedure at the H.324/M endpoint of the gateway. The terminalType in the MSD message shall be set to 150.

Step 6: The Gateway initiates the OpenLogicalChannel procedure at the H.324/M endpoint of the gateway. If the gateway made any adjustments to the TerminalCapabilitySet in step 4, the dataType of the OpenLogicalChannel structure present in the fastStart element is changed accordingly.

Step 7: After completing the OLC procedure, the gateway sends a Q.931 CONNECT message containing a fastStart element accepted in step 6.

After establishment of a call using the Fast Connect procedure, the remote H.323 endpoint might determine that it is necessary to invoke call features that require the use of H.245 procedures. In this case, the GW shall follow the procedure as described in 8.1.7.2/H.323.

If the gateway receives parallelH245Control in the SETUP message in step 1, the gateway shall respond using the procedures defined in 8.2.4/H.323. If the gateway supports the H.245 tunnelling in parallel with fast connect, it shall follow the procedures defined in F.5.1 to generate a response (MasterSlaveDeterminationAck message) to the MasterSlaveDetermination message received in parallelH245Control. The gateway shall use the TerminalCapabilitySet received in the parallelH245Control field of the SETUP instead of generating it from OLC structures as defined in step 1 above, then the gateway shall complete steps 2-7 as described above. If the gateway supports the H.245 tunnelling in parallel with fast connect, it shall send the TerminalCapabilitySetAck (for the terminal capability set received in parallelH245Control), TerminalCapabilitySet received from the H.324/M terminal in step 4 and MasterSlaveDeterminationAck (see above) in the h245Control field of the CONNECT message in step 6 above. The gateway may alter the TerminalCapabilitySet (being sent in the h245Control) to remove any capability mismatch (see F.5.2 above).

If however the gateway does not support fast connect, but understands the parallelH245Control, it may still send the TerminalCapabilitySetAck, TerminalCapabilitySet, and MasterSlaveDeterminationAck in the h245Control field of the H.225.0 message with fastStartRefused. This eliminates the need for MSD and capability exchange procedures once the H.245 procedures are started (either on a separate logical channel or through H.245 tunnelling) with the H.323 endpoint. If the gateway does not support either of fast connect and parallelH245Control, it shall not include TerminalCapabilitySetAck in the h245Control field of the H.225.0 message with fastStartRefused (see 8.2/H.323 for details).

If the gateway does not understand (or does not want to use) the parallelH245Control, it shall follow the procedures defined in 8.2.4/H.323 to indicate this to the H.323 endpoint. The gateway may however use the TerminalCapabilitySet received in the parallelH245Control field of the SETUP message for capability exchange with the H.324/M terminal.

F.8.1.2 With initial voice conversation

The following procedure should be used with H.324/P and H.324/I endpoints when a period of initial voice communication before initiation of multimedia mode (Phase B of H.324 and Annex D/H.324) is desired.

If the gateway receives a Setup message containing the fastStart element from the H.323 endpoint, the following steps should be followed.

Step 1: The Gateway detects the information provided in OpenLogicalChannel structures in the fastStart element of the SETUP message sent by the H.323 endpoint. If the content of this information indicates that the H.323 endpoint is attempting to open an audio-only channel, the

procedures of the remainder of this clause may be followed. Otherwise, the procedures of the previous clause should be followed.

The gateway should not send any audio to either direction until the Connect message is sent.

Step 2: The gateway may send provisional (Call Proceeding, Progress or Alerting) Q.931 messages to the H.323 endpoint when appropriate.

Step 3: The Gateway establishes a voice telephony communication channel with the H.324 terminal. Voice telephone mode may continue indefinitely until:

- a) the H.323 endpoint attempts to open additional logical channels. In this case, the gateway should begin the H.324 procedure to transition to multimedia communication mode, according to clause 7/H.324 or Annex D/H.324 as appropriate. The procedures of step 4-7 and the remainder of the previous clause should then be followed; or
- b) the H.324 endpoint begins the H.324 procedure to transition to multimedia communication mode. In this case the Gateway should respond according to clause 7/H.324 or Annex D/H.324, as appropriate. The procedures of step 4-7 and the remainder of the previous clause should then be followed.

If the gateway receives an audio-only call from the H.324 side, the following steps may be followed.

Step 1: The Gateway sends a Setup message containing the fastStart element to the remote H.323 endpoint. The gateway should not send any audio to either direction until the Connect message is received.

Step 2: The Gateway establishes a voice telephony communication channel with the H.324 terminal. Voice telephone mode may continue indefinitely until:

- a) the H.323 endpoint attempts to open additional logical channels. In this case, the gateway should begin the H.324 procedure to transition to multimedia communication mode, according to clause 7/H.324 or Annex D/H.324, as appropriate. The procedures of step 4-7 and the remainder of the previous clause should then be followed; or
- b) The H.324 endpoint begins the H.324 procedure to transition to multimedia communication mode. In this case the Gateway should respond according to clause 7/H.324 or Annex D/H.324, as appropriate. The procedures of step 4-7 and the remainder of the previous clause should then be followed.

F.8.2 Call termination from voice communication mode

If the connection with the H.323 side was established using Fast Connect procedures and no separate H.245 control channel was established in the duration of the connection, then on receipt of a H.225.0 Release Complete command from the H.323 endpoint, the Gateway shall terminate the call on the H.324 side according to the normal procedures for PSTN or ISDN telephony.

If the H.324 terminal terminates the voice call, the Gateway shall send a Q.931 Release Complete command on the call signalling channel to the H.323 endpoint.

F.8.3 Call termination from multimedia mode

If the connection with the H.323 side was established using Fast Connect procedures and no separate H.245 control channel was established in the duration of the connection, then on receipt of a H.225.0 Release Complete command from the H.323 endpoint, the Gateway shall send an EndSessionCommand to the H.324/M terminal using the procedures of clause 7.6/H.324.

If the H.324 terminal terminates the H.245 channel by sending a EndSessionCommand to the gateway, the Gateway shall send a Q.931 Release Complete command on the call signalling channel to the H.323 endpoint.

F.9 Handling of H.245 tunnelling

In order to conserve resources, synchronize call signalling and control, and reduce call set-up time, it may be desirable to convey H.245 messages within the Q.931 Call Signalling Channel instead of establishing a separate H.245 channel between the Gateway and the H.323 endpoint. The Gateway shall follow the H.245 tunnelling procedures specified in 8.2.1/H.323. However, since there is no mechanism of H.245 tunnelling in H.324, H.245 messages to/from the H.324 terminal are carried in a dedicated channel (logical channel 0) of the multiplex stream signal.

F.10 Security

For further study.

F.11 Mapping media channels

Since H.323 and H.324 are standards for multimedia systems, terminals that are compliant with these standards may support audio channel(s), video channel(s), or both audio and video channels. The number of audio and/or video channels and the codecs that are used is determined through the H.245 negotiation process. There are two distinct possibilities for each media channel:

- the H.323 endpoint and the H.324 terminal employ the same media codec; or
- the H.323 and the H.324 endpoint employ different media codecs.

In the case where the codecs are the same, the Gateway should provide a media channel mapping between the RTP port and a logical channel in the H.223 multiplex stream.

To support call scenarios where the media codecs of the two terminals are different, the Gateway may support media format conversion, such as audio transcoding, as well as the media channel mapping between the RTP port and logical channel.

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