INTERNATIONAL TELECOMMUNICATION UNION

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H.323

Annex F

(05/99)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Systems and terminal equipment for audiovisual services

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Packet based multimedia communications systems

Annex F: Simple endpoint types

ITU-T Recommendation H.323 – Annex F

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION H.323

PACKET BASED MULTIMEDIA COMMUNICATIONS SYSTEMS

ANNEX F

Simple endpoint types

Summary

This annex introduces the notion of Simple Endpoint Types (SETs) that are designed to operate in well-defined set scenarios and with a restricted functionality range – in contrast to full-fashioned H.323 multimedia systems – thereby explicitly reducing the overall system and hence the implementation complexity. In particular, this annex defines Simple Endpoint Types for audio communication (Audio SETs) that operate using a well-defined subset of H.323 protocols and are well-suited for IP Telephony applications while retaining interoperability with regular H.323 (1998) devices.

NOTE – The subset of H.323 defined in this annex is derived from the specific requirements for Audio SETs and also documents current practice as observed in the market place and at interoperability events.

Source

Annex F to ITU-T Recommendation H.323, was prepared by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 27 May 1999.

FOREWORD

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

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

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

NOTE

In this Recommendation the term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration, ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

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

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PACKET BASED MULTIMEDIA COMMUNICATIONS SYSTEMS

ANNEX F

Simple endpoint types

(Geneva, 1999)

F.1 Introduction

Simple Endpoint Types, i.e. devices manufactured for a single purpose, may comprise a significant fraction of the overall set of H.323 capable end systems. In contrast to full-featured H.323 devices (many implementations of which are PC-based), the so-called Simple Endpoint Types (SETs) may be implemented in inexpensive stand-alone boxes, the most prominent example being the simple telephone.

NOTE – Sample application scenarios for such systems were found to include:

1) palmtop computer with audio communications capabilities (voice, file transfer, fax, ...);

2) telephone with an RJ-45 connector;

3) text telephones (using Recommendation T.140);

4) cellular IP phone;

5) mobile system with integrated voice and data communications (UMTS, IMT-2000).

All these systems have in common that they support a relatively fixed set of functionality: voice and/or rudimentary (i.e. not T.120) data communication facilities. It is important to note that this functionality does not need to be extended for the respective system's purpose: a telephone set without (an elaborate) display does not need to support video functionality, neither does it require data conferencing capabilities.

All of these systems have a limited amount of resources available (e.g. processing power, communication bandwidth, memory).

This annex outlines the scope of SET devices in general and defines the procedural and protocol details of a Simple Audio Endpoint Type (Audio SET device). In particular, this annex defines the functional baseline for all types of Simple Endpoint Types; hence, further SETs are to be defined by referencing this annex and then only specifying additions to the procedures and conventions set forth in this annex.

This annex defines a subset of H.323 functionality and any deviations from Recommendation H.323 are explicitly identified. Any procedures not explicitly described in this annex are covered by the main body of Recommendation H.323.

The development of SET devices has potential implications on other H.323 devices: in particular, MC(U)s and gateways should be aware of their potentially minimal support for H.323 (1998) functionality in order to provide SET devices with seamless access to enhanced H.323 services such as multipoint conferences and supplementary services. Alternatively, external proxy devices may be provided to bridge the different functional ranges between SET devices and full-featured H.323 (1998) endpoints. Interoperability issues are addressed in more detail in clause F.9.

F.2 Specification Conventions

This annex specifies only those services, procedures, protocol messages, etc. that are mandatory for the implementation of a SET device, which is a subset of the mandatory functionality of an H.323 (1998) system. This implies that a SET device shall not assume any functionality beyond what is specified mandatory in this annex from another SET device.

In addition to the mandatory components, several clauses of this annex specify conditionally mandatory services, procedures, protocol messages, etc. based on the concept of functional blocks that are optional as a whole. However, a SET device that decides to implement a particular functional block, must support all the components defined as mandatory for this functional block; optional components may be supported.

All other features defined in Recommendation H.323 are, by definition, optional, and their implementation in a SET device is entirely at the discretion of the manufacturer.

F.3 Scope

This annex specifies rules on the use of Recommendation H.323 that enable Simple Endpoint Types to be implemented in a simple fashion. The following (non-exhaustive) list of Simple Endpoint Types is envisioned for standardization by the ITU-T:

1) **simple telephone (Simple Audio Endpoint Type)** – defined in this annex;
2) **simple telephone with security capabilities** – for further study;
3) **text conversation terminal** – for further study;
4) **fax device** – for further study.

The simple telephone is defined in this annex. Secure simple telephone, text terminal, and simple fax device are Simple Endpoint Types for further study. The profiles for Simple Endpoint Types can be categorized as follows:

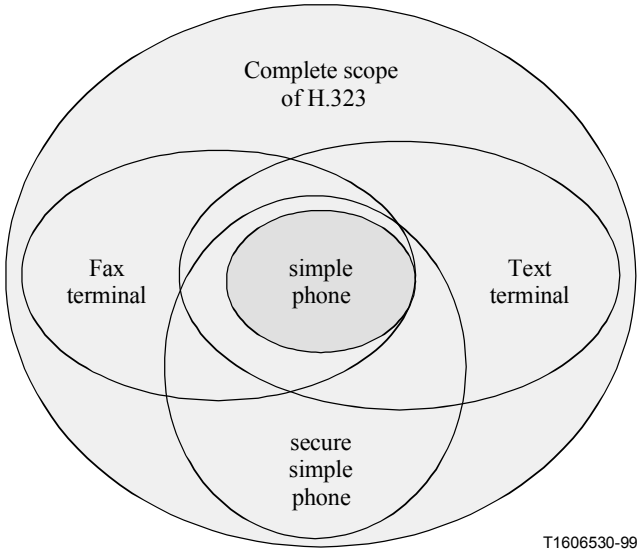


Figure F.1/H.323 – Venn diagram showing functional ranges of the various SET devices

Figure F.1 is a schematic picture of the different Simple Endpoint Types that are being defined in the context of H.323 'profiles', in a so-called Venn diagram. In this diagram, the relation between the SETs is illustrated. The wider ellipsis show the context of a full H.323 compliant system. As an example, the simple telephone is put in the figure. As it is clearly a subset of the full compliant

H.323 system, it lays completely within its scope. A secure simple telephone, containing additionally the security capabilities, comprises the capabilities of the simple telephone (e.g. same audio codecs, same call set-up, etc.). The interoperability between a simple telephone SET implementation and a secure simple telephone will therefore be ensured.

The SET devices are defined in a way that enables them to interoperate seamlessly with one another and with H.323 (1998) devices supporting the FastConnect procedure as well as with all SET-aware H.323 endpoints.

NOTE – Although SET devices are defined with simple devices in mind, it is equally possible to build gateways based upon the respective SET specification. No additional definitions are required for other types of devices.

F.4 Normative References

All the normative references of Recommendation H.323 (1998) and Recommendation H.225.0 (1998) apply.

F.5 Abbreviations

This annex uses the following abbreviations:

SET	Simple Endpoint Type
Audio SET	Simple Audio Endpoint Type
Secure Audio SET	Secure Simple Audio Endpoint Type
Fax SET	Simple Facsimile Endpoint Type
Text SET	Simple Text Telephony Endpoint Type

F.6 Simple (Audio) Endpoint Type – System Functionality Overview

The following characteristics apply to Simple Audio Endpoint Types (Audio SET devices):

Media capabilities

- Voice-capability
  - mandatory: G.711 (A-law and μ-law)
  - suggested options: G.723.1, G.729, GSM.
  - suggested options: audio redundancy encoding with any combinations of the above codecs.
- Audio SET devices shall only support symmetric audio operation.
- No data-capability.
- DTMF capability mandatory; transmission as H.225.0 Information messages mandatory; transmission as RTP payload for further study.
- No video capability.
- No T.120 capability.
- Media distribution: support for unicast mandatory.

The mandatory and optional media capabilities shall be defined separately for other Simple Endpoint Types.

Control capabilities

The following minimum control capabilities shall equally apply to all Simple Endpoint Types.

- FastConnect sequence of Recommendation H.323 (1998) mandatory.

NOTE – Audio SET devices are by default capable of participating in multipoint conferences, where they are obviously limited to audio communications.

Most other control capabilities are optional, in particular:

- UDP-based Faster-Connect Annex E/H.323 optional.
- Supplementary services (solely based upon H.450.x) optional.
- Support for H.245 messages and procedures optional.
- Support of more than a single call/conference at a time is optional.

Some control capabilities are disallowed for Audio SET devices.

- MC functionality prohibited.

F.7 Procedures for Simple Endpoint Types

This clause specifies for all the protocols required by Recommendation H.323, the detailed level of support by SET devices in general, and the specific requirements for Audio SET devices:

- Registration, Admission, and Status (RAS) signalling (H.225.0), see F.7.1;
- Call signalling (H.225.0), see F.7.2;
- Multimedia system control signalling (H.245), see F.7.3;
- Media packetization and transport (H.225.0, RTP), see F.7.4;
- Supplementary Services (H.450.x), see F.7.5 and F.7.6;
- Multipoint conference operation, see F.7.7;
- Loosely-coupled conferences (H.332), see F.7.8;
- Management Information Bases, see F.7.9.

Security services as specified in Recommendation H.235 to create Secure SET devices are considered in clause F.8.

F.7.1 RAS Signalling (H.225.0 RAS)

SET devices shall comply with the RAS procedures as defined in Recommendations H.323 (1998) and H.225.0 (1998) with the following modifications applying.

A SET device shall use the pre-granted ARQ procedures as specified in Recommendation H.225.0 (1998) and shall be able to determine whether an incoming call request is received from its Gatekeeper. A SET-aware Gatekeeper shall support pre-granted ARQ and shall pre-grant for placing and receiving calls with call routing through the Gatekeeper for SET devices (to be indicated in the preGrantedARQ component). If a contacted Gatekeeper does not support pre-granted ARQ or does not provide the aforementioned pre-granting configuration, a SET device shall register with another Gatekeeper.

SET devices shall at a minimum support for the following RAS messages: transmission of GRQ, RRQ, URQ, UCF, and XRS and reception of GCF, GRJ, RCF, RRJ, URQ, UCF, URJ, and XRS. SET devices may support additional RAS messages.

A SET device shall include the "set" component of the H.225.0 EndpointType when communicating with a Gatekeeper and set the bits as follows.

Bit 0: =1 if the device has Audio SET functionality

Bit 1: =0 if the device is not conference-aware

Bit 1: =1 if the device is conference-aware

Use of the other bits will be defined by additional SET specifications.

F.7.2 Call Signalling (H.225.0 Call Control)

SET devices shall comply with the call control procedures defined in Recommendations H.323 (1998) and H.225.0 (1998). SET devices shall not close the call signalling channel after call establishment.

SET devices shall implement the FastConnect procedures as specified in Recommendation H.323 (1998). When originating a call, a SET device shall place a call using FastConnect.

SET devices shall support H.225.0 Information messages in the call signalling channel. Such messages should be used for, but are not restricted to, conveying user input in the Keypad Information Element.

SET devices should use the Status Enquiry and Status messages of Recommendation H.225.0 to estimate round-trip times to its peer.

SET devices may implement UDP-based call setup as outlined in Annex E/H.323. If UDP-based call setup is implemented, a SET device should attempt to call another endpoint via UDP-based call setup first.

Implementation of supplementary services based upon H.450.x is optional for SET devices. SET devices shall be able to safely ignore H.225.0 Facility messages that they do not understand.

A SET device shall include the "set" component of the H.225.0 EndpointType when exchanging call signalling PDUs with its peer. The bits of the "set" components shall be set as defined in F.7.1.

F.7.3 Multimedia System Control Signalling (H.245)

F.7.3.1 H.245 Control Channel

The FastConnect procedure shall be used for connection establishment. Repeated transmission of the fastStart element in H.225.0 call signalling messages shall be used to reconfigure or reroute media streams.

SET devices shall not open a separate H.245 connection:

a) They shall restrict H.245 signalling to the OpenLogicalChannel structure in the FastConnect sequence along with implicit Master Slave Determination.

b) If further H.245 signalling is required, they shall perform tunnelling as defined in Recommendation H.225.0 (1998).

SET devices shall use the syntax of Recommendation H.245 (1998) or later versions.

No specific procedures are defined for H.245 messages. If SET devices implement H.245 functionality, they shall adhere to the procedures defined in Recommendations H.323, H.225.0 and H.245.

F.7.3.2 Master-Slave Determination

SET devices shall implicitly assume the slave role in any communication relationship without an H.245 control channel.

In case an H.245 tunnel is established, following the rules of 6.2.8.4/H.323 (1998), the SET device shall indicate a value of 40 for the **terminalType**. This ensures that in case a SET device connects to a full H.323 (1998) device, the latter will win the Master-Slave-Determination.

F.7.3.3 Terminal Capability Exchange

Although SET devices are by definition restricted in their supported functional range, a capability exchange procedure cannot be circumvented to allow for a minimum of diversity in the devices. However, the range of possible capabilities that may be signalled by a SET endpoint is restricted to what is defined in the following, and the capability exchange procedures shall adhere to the rules set forth in this subclause.

The Capability Exchange procedure for media types and transmission modes shall be carried out following the rules of the FastConnect procedure using multiple Open Logical Channel structures as a selection of possibilities offered by the caller out of which the callee chooses a subset to send and receive.

The following subclause list which capabilities need to be understood on the receiving (called) side and which may be transmitted on the sending (calling) side for Audio SET devices.

F.7.3.3.1 Audio Capability

- G.711 (μ-Law, A-Law, 56 kbit/s, 64 kbit/s)
  The following alternatives shall be supported:

AudioCapability.g711Alaw64k	**≥ 20**	**number of frames**
AudioCapability.g711Alaw56k	**≥ 20**	**number of frames**
AudioCapability.g711Ulaw64k	**≥ 20**	**number of frames**
AudioCapability.g711Ulaw56k	**≥ 20**	**number of frames**

- G.723.1 (silence suppression or not, low and high rate)
  A SET supporting G.723.1 must at a minimum support:

AudioCapability.g7231		
maxAl-sduAudioFrames	**≥ 1**	**number of frames**
silenceSuppression		**True/False as appropriate**

- G.729 (plain or Annex A)
  A SET supporting G.729 must at a minimum support:

AudioCapability.g729	**≥ 1**	**number of frames**
AudioCapability.g729AnnexA	**≥ 1**	**number of frames**

- GSM (full rate, enhanced full rate, half rate).
  A SET supporting GSM must at a minimum support

AudioCapability.gsmFullRate	**GSMAudioCapability,**
AudioCapability.gsmHalfRate	**GSMAudioCapability,**
AudioCapability.gsmEnhancedFullRate	**GSMAudioCapability**

  with GSMAudioCapability defined as appropriate for each of these rates:

GSMAudioCapability.audioUnitSize	**≥ 1**	**number of frames**
GSMAudioCapability.comfortNoise		**True/False as appropriate**
GSMAudioCapability.scrambled		**True/False as appropriate**

F.7.3.3.2 Video Capability

Audio SET devices do not support video.

F.7.3.3.3 Data Capability

Audio SET devices do not support data.

F.7.3.3.4 Conference Capability

SET devices are assumed to be proxied into centralized conferences with centralized data distribution (see F.7.7).

F.7.3.3.5 User Input Capability

SET devices shall support transmission of DTMF as Keypad Information Elements in the H.225.0 call signalling connection (e.g. using Information messages).

F.7.3.3.6 Security Capability

Security for SET devices, i.e. the definition of Secure SET devices, is for further study. Refer also to clause F.8.

F.7.3.3.7 maxPendingReplacementFor

Shall be supported by Audio SET devices. A value equal to '1' shall be implicitly assumed:

maxPendingReplacementFor = 1

Hence, the maxPendingReplacementFor parameter shall not be signalled explicitly.

F.7.3.3.8 nonStandardCapability

Use of non-standard capabilities, on the top level of the capability structure as well as within the aforementioned capability categories, should be avoided as far as possible.

F.7.3.3.9 Additional Rules for the Use of Capabilities

For Audio SET devices, audio capabilities shall only be signalled via the FastConnect procedure and repeated exchange of OpenLogicalChannel structures using the FastConnect.

Video capabilities, data capabilities, conference capabilities, security capabilities, and h233encryption capabilities shall not be used.

The values of the MultiplexCapability table entry of an Audio SET device shall be assumed as follows:

maximumAudioDelayJitter	**≥ 250 ms**
receiveMultipointCapability,	
transmitMultipointCapability, and	
receiveAndTransmitMultipointCapability	
multicastCapability	**TRUE/FALSE as appropriate, default FALSE[1]**
multiUnicastConference	**TRUE/FALSE as appropriate, default FALSE[1]**
mediaDistributionCapability	
centralizedControl	**TRUE**
distributedControl	**FALSE**
centralizedAudio	**TRUE**
distributedAudio	**TRUE/FALSE as appropriate, default FALSE[1]**
centralizedVideo	**FALSE**
distributedVideo	**FALSE**
centralizedData	**ABSENT**
distributedData	**ABSENT**
mcCapability	
centralizedConferenceMC	**FALSE**
decentralizedConferenceMC	**FALSE**
rtcpVideoControlCapability	**ABSENT**
mediaPacketizationCapability	**ABSENT**
...,	

[1] Multicast, multi-unicast, and distributed audio may be supported by Conference-aware Audio SET devices.

transportCapability	**ABSENT**
redundancyEncodingCapability	**Audio redundancy encoding only (if any)**
logicalChannelSwitchingCapability	**FALSE**
t120DynamicPortCapability	**FALSE**

Capabilities signalled from the remote side that are not understood shall be ignored.

F.7.3.4 Logical Channel Signalling Messages

The opening of logical channels shall adhere to the FastConnect specifications of Recommendation H.323 (1998).

In addition, SET devices shall support reconfiguration of media streams at any time during a call. Open Logical Channel structures shall be tunnelled in H.225.0 call signalling messages following the procedures defined in Recommendation H.225.0 (1998) and H.323 (1998) re-using the fastStart element of the H.225.0 call signalling message. Open Logical Channel structures outside the FastConnect procedure shall be used to alter media stream parameters – to provide a basis for supplementary services. Such Open Logical Channel structures shall be interpreted upon reception as follows.

- If the logical channel number matches a currently open logical channel, the respective channel shall be reconfigured following the principles of the FastConnect procedure if the dataType component is not "null". If the dataType component is "null" – indicating a "NullChannel" – the respective logical channel shall be considered closed and media transmission on this logical channel shall cease.
- If the logical channel number does not match a currently open channel, a new logical channel shall be opened following the princicples of the FastConnect procedure.

In the following, the restrictions on Open Logical Channel request are outlined:

OpenLogicalChannel	
forwardLogicalChannelNumber	**LogicalChannelNumber**
forwardLogicalChannelParameters	
portNumber	**ABSENT**
dataType	**a valid audio data type (see F.7.3.3.1)**
multiplexParameters	**CHOICE: h2250LogicalChannelParameters**
forwardLogicalChannelDependency	**ABSENT,**
replacementFor	**used if another Logical Channel is to be replaced**
reverseLogicalChannelParameters	
dataType	**a valid audio data type (see F.7.3.3.1)**
multiplexParameters	**CHOICE: h2250LogicalChannelParameters**
reverseLogicalChannelDependency	**LogicalChannelNumber OPTIONAL,**
replacementFor	**used if another Logical Channel is to be replaced**
separateStack	**ABSENT**
encryptionSync	**ABSENT for Audio SET devices; FFS.**

To the H2250LogicalChannelParameters structure, the following restrictions apply:

H2250LogicalChannelParameters	
nonStandard	**should be ABSENT**
sessionID	**INTEGER(0..255)**
associatedSessionID	**ABSENT**
mediaChannel	**TransportAddress – should be a unicast address**
mediaGuaranteedDelivery	**ABSENT**
mediaControlChannel	**PRESENT – reverse RTCP channel**
mediaControlGuaranteedDelivery	**FALSE**
silenceSuppression	**as appropriate**
destination	**typically ABSENT**

dynamicRTPPayloadType	**as appropriate,**
mediaPacketization	**as appropriate; may only specify the payload format used**
rtpPayloadType	
payloadDescriptor	**should refer to an rfc-number**
payloadType	**(dynamic) payload type value to be used**
transportCapability	
nonStandard	**should be ABSENT**
qOSCapabilities	**should be ABSENT (may only contain RSVP parameters)**
mediaChannelCapabilities	**should be ABSENT (may indicate "ip-udp")**
redundancyEncoding	**optional; only audio redundancy is allowed**
source	**typically ABSENT**

F.7.4 Media Exchange

For media exchange, SET devices shall follow the H.323 and H.225.0 procedures using RTP/UDP/IP to convey the media streams. The appropriate media packetization formats shall be used.

F.7.5 Supplementary Services (H.450.x)

Support of any of supplementary services according to the H.450-series of Recommendations is optional.

NOTE – If H.450.x functionality is not provided by a SET device, the SET device should implement the message rejection functionality (Interpretation APDU) of H.450.1 to enable its peer to quickly determine non-availability of supplementary services on side of the SET device. If H.450.1 message rejection is not implemented the peer has to rely on a timeout.

A baseline for supplementary services to be supported by SET devices is for further study.

F.7.6 Third-party initiated pause and rerouting

Support for third-party initiated pause and rerouting is similar to the procedures outlined in 8.4.6/H.323 (1998), with the following modifications applying.

F.7.6.1 Initiating side

To re-route a call connecting to a SET device its peer (typically a Gatekeeper) shall transmit a NullChannel specification in the fastStart element in a message of the call signalling channel.

Subsequently, the initiating entity shall again transmit the (for the new peer) appropriate OpenLogicalChannel structures, similar to the capability negotiation and media stream establishment in the FastConnect procedure, and include the new transport addresses to redirect the media stream sourced by the SET device. The OpenLogicalChannel structures are carried in an H.225.0 call signalling message.

The OpenLogicalChannel structure should offer the same audio encodings that were offered in the initial call.

F.7.6.2 Receiving side (SET device)

Upon reception of a NullChannel specification in a fastStart element, a SET device shall stop transmitting the media stream(s) immediately and shall be prepared to handle interruptions in the received media stream(s). The SET device shall expect a repeated exchange of capability and transport addresses following the principles of the FastConnect procedure.

Upon reception of an OpenLogicalChannel structure carried in an H.225.0 call signalling message, the SET device shall select an acceptable media encoding from the selection offered by the initiating entity, following the rules of the FastConnect procedure. The SET device shall then start transmitting

its media stream(s) to the transport address(es) newly indicated in the OpenLogicalChannel structures.

F.7.7 Conference-Mode Operation

SET devices may participate in multipoint conferences in either of two ways:

- by being proxied into a conference through a dedicated external device, such as a SET-aware MC combined with a suitable MP or a SET-specific proxy as outlined in F.7.7.1 as the default mode of operation for SET devices; or
- by implementing the necessary procedures of the H.225.0 and H.245 protocols as outlined in this subclause. This mode of operation is defined in F.7.7.2.

F.7.7.1 Conference-unaware SET Devices

The default mode of operation for SET devices does not require any awareness of conferencing functionality in a SET device itself. Instead, an external entity is assumed that bridges between a full-featured H.323 device and the SET device. This logical entity may be a stand-alone proxy device or may be part of an MC(U), a Gateway, or a Gatekeeper.

NOTE – The functionality of a logical bridging entity may include the following:

- concealing the existence of conference-related H.245 commands and responding appropriately in the direction of the full-featured H.323 device;
- adapting H.245 capability and logical channel signalling including multipoint mode commands;
- mixing several incoming audio streams and providing a single stream to the SET device;
- translating transport addresses for the audio stream;
- transcoding audio streams; and
- offering access to conference control functions via simple input means (such as DTMF signalling) to the SET device.

F.7.7.2 Conference-aware SET Devices

The specification of conference-aware SET devices is for further study.

Nevertheless, SET devices may follow the full procedures for conference-mode operation defined in the H.323-series of Recommendations.

F.7.8 Support for Loosely-coupled Conferences (Recommendation H.332)

Support for loosely-coupled conferences according to Recommendation H.332 is optional:

- Participation as a member of the panel is optional; it is provided either if conference-mode operation and media distribution via multicast are supported, or if an appropriate MC/MP combination hides all the conference commands from the SET device and only presents a single audio-stream.
- Participation as a member of the audience is optional; it is possible if the SET device supports multicast reception of information and is capable of receiving and interpreting H.332 session announcements.

F.7.9 Management Information Bases (MIBs)

Implementation of Management Information Bases is optional for SET devices. If MIBs are included in the implementation, the following H.323-related MIBs should be implemented:

- Call signalling,
- Terminal entity,

- RAS,
- Real-time Protocol (RTP).

Details are for further study.

F.8 Security Extensions

Plain SET devices are not capable of supporting H.235 security services. Secure SET devices, however, define a simple extension to SET devices covering security functionality using a subset of the mechanisms specified in Recommendation H.235.

The details of Secure SET devices are for further study.

F.9 Interoperability Considerations

This annex specifies a SET device as a well-defined subset of the total H.323 functionality.

SET devices should always be used in conjunction with SET-aware Gatekeepers. The SET-aware Gatekeeper shall perform pre-granted ARQ and shall employ the Gatekeeper-routed call model to ensure full interoperability with other H.323 (1996) and H.323 (1998) devices.

In addition, SET-awareness may be built into MC(U)s or gateways to achieve seamless interoperability.

Table F.1 presents an overview of interoperability achieved between Audio SET devices and other H.323 endpoints.

Table F.1/H.323 – Interoperability of SET devices with other H.323 devices

	H.323 (1996)	**H.323 (1998)**	**H.323 (1998) with Fast Connect**	**SET device**
H.323 (1996)	√	√	√	√ (GK)
H.323 (1998)	√	√	√	√ (GK)
H.323 (1998) with Fast Connect	√	√	√	√ a)
SET device	√ (GK)	√ (GK)	√ a)	√
(GK) Indicates that a SET-aware Gatekeeper is needed for interoperation.				
a) Optional redirection of media channels requires repeated execution of FastConnect in both endpoints				

F.10 Implementation Notes (Informative)

This clause provides informative text on simple encoding most of the necessary H.245 messages without requiring specific ASN.1 encoders/decoders.

NOTE – All these messages are transmitted as tunnelled H.245 messages; i.e. the resulting bit patterns are encoded as a single OCTET STRING of the SEQUENCE in the fastStart component of a H323-UU-PDU. In the tables shown below, the leftmost octet (octet #0) of the first row (word #0) is placed in the first octet of the octet string, followed by octet #1 of the first row, and so on. Octet #3 of word #n is followed by octet #0 of word #(n+1).

If numbers are to be encoded, 2-complement encoding is used for numbers that may be negative. Otherwise, simple binary encoding is used. Encoding of numbers spanning multiple octets is done in a way that the most significant bit of the encoded value is located in the first octet of the value (network byte order).

F.10.1 Open Logical Channel

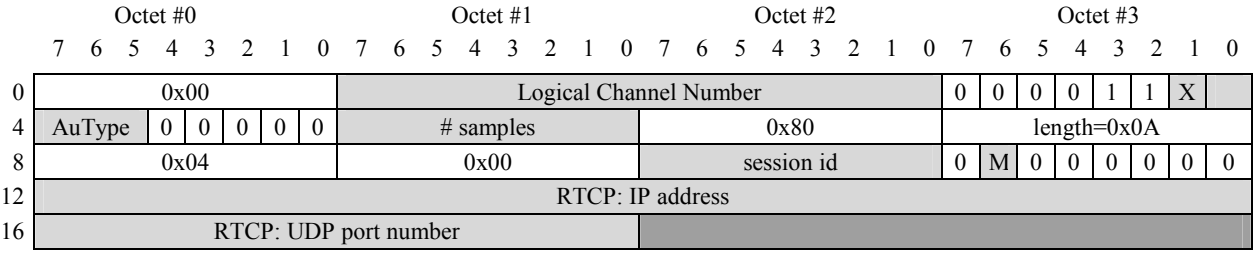
The OpenLogicalChannel structures are used by SET devices during the FastConnect procedure to indicate their capabilities and simultaneously open media channels in both directions and to reconfigure media streams during a conference. By definition, the OpenLogicalChannel structures contain only either forward logical channel parameters or backward logical channel parameters.

F.10.1.1 Forward Logical Channel Parameters

An Open Logical Channel structure containing only ForwardLogicalChannel parameters may be coded in three different ways, depending on the audio type (AuType) and the X bit.

F.10.1.1.1 Recommendations G.711 and G.729

The most common structure is the following (Recommendations G.711, G.729 and Annex A/G.729):



Logical Channel Number: This field contains the number of the H.245 logical channel – 1.

X bit: Used to distinguish between basic and extended audio types. If X=0, AuType (see next field) applies; otherwise (X=1), the extended audio types described below apply (primarily GSM) along with a different packet structure.

AuType: Identifies the audio codec to be used. The following values are acceptable for AuType. The leftmost bit is placed in bit 1 of octet #3 above, the rightmost in bit 5 of octet #4.

No	Codec description	AuType value
1	G.711 A law 64 kbit/s	0001
2	G.711 A law 56 kbit/s	0010
3	G.711 μ law 64 kbit/s	0011
4	G.711 μ law 56 kbit/s	0100
5	G.723.1	1000
6	G.729	1010
7	Annex A/G.729	1011
8	GSM and others (see below)	X=1

samples: For codecs 1, 2, 3, 4, 6, and 7 this component contains the number of samples – 1 per audio packet as defined in Recommendation H.245.

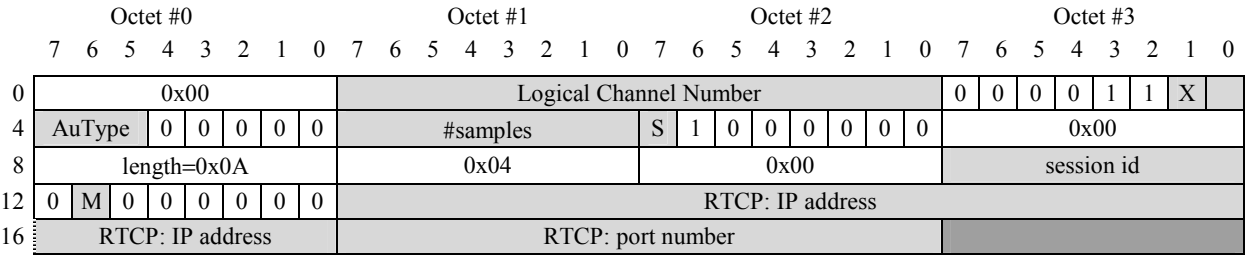
session id: Contains the session id parameter to be used in conjunction with RTP/RTCP.

M bit: Multicast address bit: indicates that the following address is a multicast address. While many address types are defined besides IPv4 (including IPv6 and IPX), the structures shown here are only valid for IPv4 addresses.

RTCP IP address/port: Contains the transport address for the RTCP receiver reports to be sent to.

F.10.1.1.2 G.723.1 Codec

For Recommendation G.723.1, the structure is slightly modified as follows:

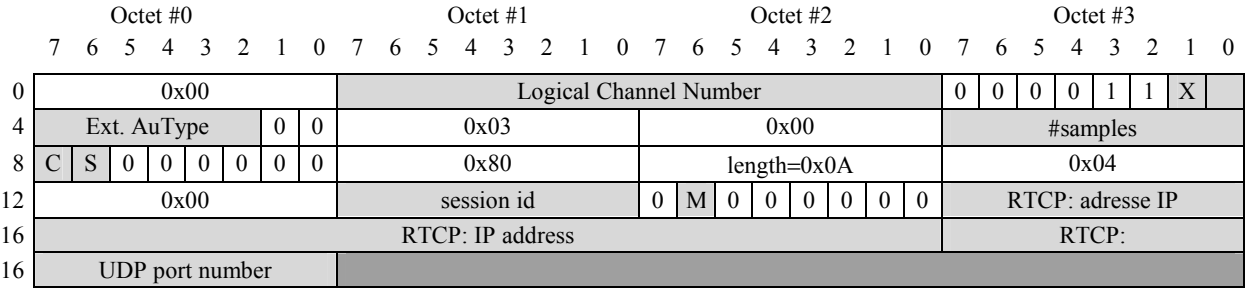


The meaning of the fields is identical to the meaning defined for the above format. In addition, the following fields are relevant:

S bit: Indicates support for silence suppression if S=1.

F.10.1.1.3 GSM

For GSM, identified by bit #1 of octet #3 set to X=1, the structure looks as follows:



The fields have the same meaning as in the above packet formats. In addition, the following fields are defined for GSM:

Ext. Audio Type: Identifies the extended audio codec:

GSM Full Rate = 000 0011

GSM Half Rate = 000 0100

GSM Enhance Full Rate = 000 0101

C bit: C=1 indicates support / use of comfort noise

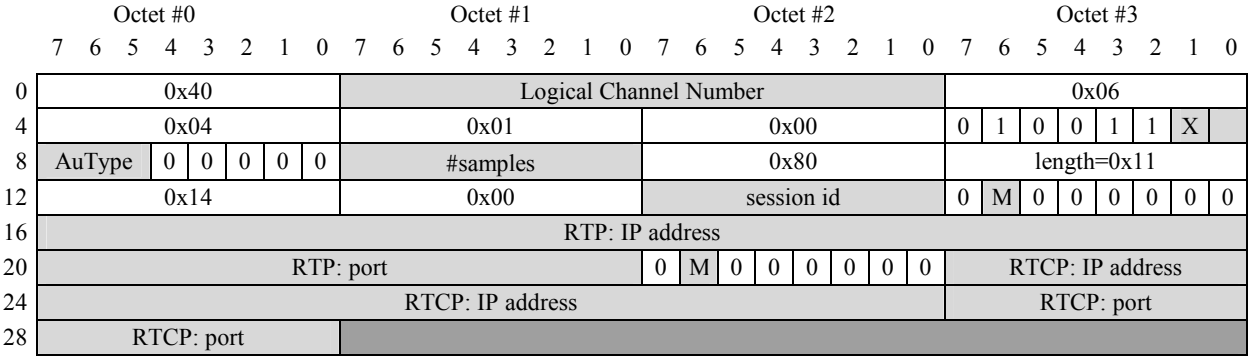
S bit: S=1 indicates support / use of scrambling

F.10.1.2 Reverse Logical Channel Parameters

Open Logical Channel Message containing ReverseLogicalChannel parameters are encoded as described in this subclause.

F.10.1.2.1 Recommendations G.711 and G.729

The most common structure is the following (Recommendations G.711, G.729 and Annex A/G.729):



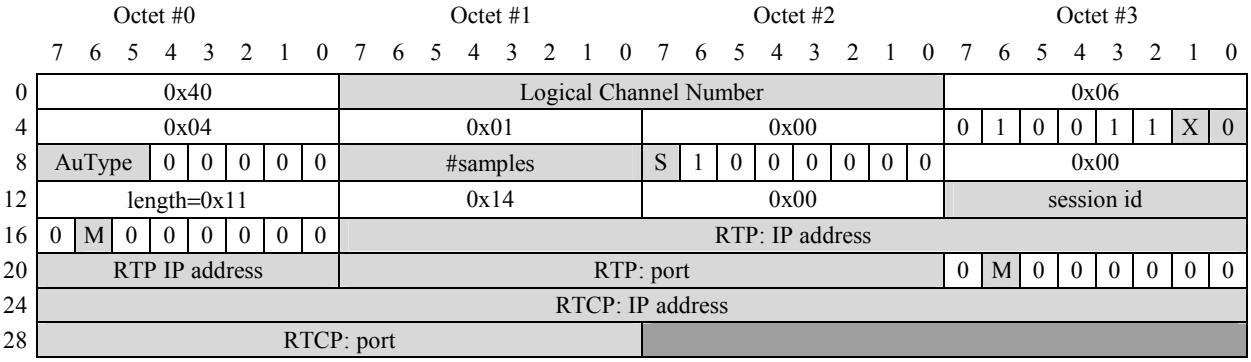
The fields have the same meaning as above. In addition, the following fields are defined:

RTP IP address/port: Target transport address for the RTP audio stream to be sent to.

RTCP IP address/port: Target transport address for RTCP sender reports to be sent to.

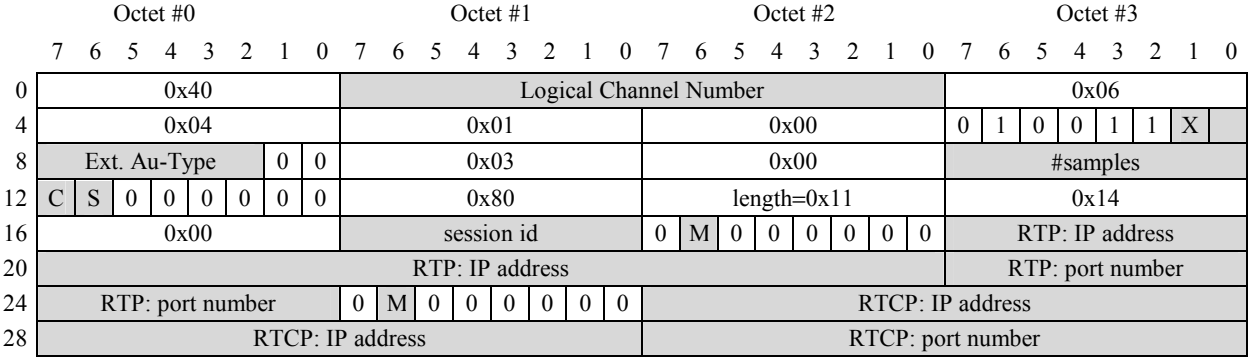
F.10.1.2.2 Recommendation G.723.1

For Recommendation G.723.1, the structure differs slightly from the above as follows:



F.10.1.2.3 GSM

For GSM, identified by bit #1 of octet #7 set to X=1, the structure looks as follows:



Ext. Au Type: Identifies the extended (GSM) audio codec to be used as follows:

GSM Full Rate = 000 0011

GSM Half Rate = 000 0100

GSM Enhance Full Rate = 000 0101

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