INTERNATIONAL TELECOMMUNICATION UNION

ITU-T H.341

(05/99)

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

---

Multimedia management information base

ITU-T Recommendation H.341

(Previously CCITT Recommendation)

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Characteristics of transmission channels used for other than telephone purposes	H.10–H.19
Use of telephone-type circuits for voice-frequency telegraphy	H.20–H.29
Telephone circuits or cables used for various types of telegraph transmission or simultaneous transmission	H.30–H.39
Telephone-type circuits used for facsimile telegraphy	H.40–H.49
Characteristics of data signals	H.50–H.99
CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	**H.300–H.399**
Supplementary services for multimedia	H.450–H.499

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

ITU-T RECOMMENDATION H.341

MULTIMEDIA MANAGEMENT INFORMATION BASE

Summary

This Recommendation defines managed objects for H-series multimedia systems. It follows the IETF Simple Network Management Protocol (SNMP) for defining the managed objects and for managing ITU-T multimedia systems.

This Recommendation includes an electronic attachment containing the formal descriptions of Annexes A, B, C, D and E.

Source

ITU-T Recommendation H.341 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)*.

INTELLECTUAL PROPERTY RIGHTS

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

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

CONTENTS

Page

[1] This annex is available in electronic format only.

Recommendation H.341

MULTIMEDIA MANAGEMENT INFORMATION BASE[2]

1 Scope

This Recommendation describes the Multimedia Management Information Base for H.323 and H.320 Multimedia Systems. The purpose of this Recommendation (MultimediaMIB) is to standardize the management information in multimedia conferencing systems based on one of more of the ITU-T H-series Recommendations.

The goal of Multimedia Management is to provide the appropriate level of management support for the particular Multimedia device. Multimedia management must permit the resources that are being used by individual Multimedia sessions to be identified for the purposes of fault detection, fault isolation, performance monitoring, configuration management and capacity analysis. Multimedia management is applicable to both intermediate-system as well as end-system Multimedia devices such as terminals, multipoint control units (MCUs), gatekeepers and gateways.

The work presented in this Recommendation will be consistent with the conventions in the SNMP Version 2 SMI (Structure of Management Information) [27].

1.1 Management Information Base Overview

A Management Information Base is a specification containing definitions of managed information in a formalism that allows remote monitoring and control of systems over a network. The simplest, incorrect way is to visualize a MIB as a database on a managed system. It is more correct to view a MIB as definitions of the information that can be accessed and the events that can be reported by standard protocols. Standard operations are requested or performed on a system via a management agent by management clients. It is left to this management agent to access the requested information and return it to the requesting client.

1.2 Definition of Managed Objects

The majority of the development of the MediaMIB can be broken down into the following four tasks:

1) Characterization of the managed entity in terms of components, attributes, actions, state and statistics.
2) Organization of information into collections of Object IDs (OID)s.
3) MIB organization – MIB structure and hierarchy tree related to MIB Object Names.
4) Writing and maintaining of the MIB in abstract syntax.

In SNMP, the rules for defining managed information and events are contained in the Structure of Management Information (SMI).

---

[2] This Recommendation includes an electronic attachment containing the formal descriptions of Annexes A, B, C, D and E.

1.3 Operations on Managed Objects

The definition of managed objects may proceed independent of the protocols used to operate on the MIB. The emphasis in this Recommendation is the IETF SNMP. However, operations may be generalized into three categories: information retrieval, information modification, and unsolicited information reporting. It is conceivable that the MIBs defined in the annexes can be reformatted or reused even if SNMP is not the chosen protocol in the future.

1.4 Management Agents

The processing entity responding to management operations is termed an agent. The agent needs access to MIB information and to receive notification of system events. Each managed subsystem must include instrumentation to provide MIB information to the agent. Formal definitions for these interfaces in ISDN systems are described in Recommendation Q.940. In SNMP, the agent is less formalized and generally outside the scope of standardization.

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.

[1] ITU-T Recommendation H.225.0 (1998), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems.*

[2] ITU-T Recommendation H.242 (1993), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s.*

[3] ITU-T Recommendation H.243 (1993), *Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 2 Mbit/s.*

[4] ITU-T Recommendation H.245 (1998), *Control protocol for multimedia communications.*

[5] CCITT Recommendation G.711 (1988), *Pulse Code Modulation (PCM) of voice frequencies.*

[6] CCITT Recommendation G.722 (1988), *7 kHz audio-coding within 64 kbit/s.*

[7] ITU-T Recommendation G.723.1 (1996), *Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s.*

[8] CCITT Recommendation G.728 (1992), *Coding of speech at 16 kbit/s using low-delay code excited linear prediction.*

[9] ITU-T Recommendation G.729 (1996), *Coding of speech at 8 kbit/s using conjugate structure algebraic-code-excited linear-prediction (CS-ACELP).*

[10] ITU-T Recommendation H.261 (1993), *Video codec for audiovisual services at p x 64 kbit/s.*

[11] ITU-T Recommendation H.262 (1995) | ISO/IEC 13818-2:1996, *Information technology – Generic coding of moving pictures and associated audio information: Video.*

[12] ITU-T Recommendation H.263 (1996), *Video coding for low bit rate communication.*

[13] ITU-T Recommendation T.120 (1996), *Data protocols for multimedia conferencing.*

[14] ITU-T Recommendation H.320 (1996), *Narrow-band visual telephone systems and terminal equipment.*

[15] ITU-T Recommendation H.323 (1998), *Packet based multimedia communication systems*.

[17] ITU-T Recommendation H.324 (1996), *Terminal for low bit rate multimedia communication*.

[18] ITU-T Recommendation H.310 (1996), *Broadband audiovisual communication systems and terminals*.

[19] ITU-T Recommendation Q.931 (1993), *Digital Subscriber Signalling System No. 1 (DSS1) – ISDN user-network interface layer 3 specification for basic call control*.

[20] ITU-T Recommendation Q.932 (1993), *Digital Subscriber Signalling System No. 1 (DSS1) – Generic procedures for the control of ISDN supplementary services*.

[21] ITU-T Recommendation Q.950 (1993), *Digital Subscriber Signalling System No. 1 (DSS1) – Supplementary services protocols, structure and general principles*.

[22] ISO/IEC 10646-1:1993, *Information technology – Universal Multiple-Octet Coded Character Set (USC) – Part 1: Architecture and Basic Multilingual Plane*.

[23] CCITT Recommendation E.164 (1991), *Numbering plan for the ISDN era*.

[24] ITU-T Recommendation Q.940 (1988), *ISDN user-network interface protocol for management – General aspects*.

[25] ITU-T Recommendation H.221 (1995), *Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.

[26] ITU-T Recommendation H.230 (1995), *Frame-synchronous control and indication signals for audiovisual systems*.

3 Informative references

[27] RFC 1902, *Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2).*

[28] RFC 1903, *Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2)*.

[29] RFC 1904, *Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2).*

[30] RFC 1905, *Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)*.

[31] RFC 1906, *Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)*.

[32] RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2).*

[33] RFC 1908, *Coexistence between Version 1 and Version 2 of the Internet-standard Network Management Framework.*

[34] RFC 1889, *RTP: A Transport Protocol for Real-Time Applications*.

[35] RFC 1573, *Evolution of the Interfaces Group of MIB-II*.

[36] RFC 2233, *The Interfaces Group MIB using SMIv2*.

4 Definitions

This Recommendation defines the following terms:

4.1 Management Information Base (MIB): The specification of information in a manner that allows standard access through a network management protocol.

4.2 multipoint control unit: The Multipoint Control Unit (MCU) is an endpoint that provides the capability for three or more terminals and Gateways to participate in a multipoint conference. In H.320 it is a defined device. In H.323, an MCU consists of at least an MC and an MP entity.

4.3 multipoint controller: The Multipoint Controller (MC) is an H.323 entity on the local area network that 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 that 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.

4.4 Object Identifier (OID): The permanent assignment of a value to represent a managed object through a process termed registration.

4.5 Structure of Management Information (SMI): The rules used to define objects which can be accessed via a network management protocol.

4.6 Simple Network Management Protocol (SNMP): The network management protocols used in the Internet for TCP/IP systems. There is a body of work termed SNMPV2 and SNMPV3 that are expanded successors to SNMP.

4.7 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.

5 Symbols and abbreviations

This Recommendation uses the following symbols and abbreviations:

CAPS	H.245 or H.242 Capabilities
FFS	For Further Study
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MC	Multipoint Controller
MCU	Multipoint Control Unit
MIB	Management Information Base
MP	Multipoint Processor
OID	Object Identifier
RAS	Registration, Admission and Status
RTCP	Real Time Control Protocol
RTP	Real Time Protocol
SCN	Switched Circuit Network
SNMP	Simple Network Management Protocol

TC Textual Convention

TE Terminal Equipment

UDP User Datagram Protocol

6 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.

7 MIB Applicability by Device Type

The purpose of this clause is to identify how the MIBs of the annexes are to be used in H.320 and H.323 Systems. H.341 (MultimediaMIB) is an optional Recommendation. However, if supported in a system, then there are certain expectations placed on the managed system to be able to support management applications. These are described in 7.1 and 7.2 below.

7.1 H.323 Systems

There are four H.323 system types defined in [15]. The MIBs defined in Annex B are grouped into mandatory and optional by each type and listed in Table 1. In H.323, multiple system types can be combined. For example, a gatekeeper and gateway may be co-resident and need to be managed by a single agent. In cases where multiple types are grouped in a single system, then the mandatory MIBs in each column of the appropriate managed device need to be implemented.

Table 1/H.341 – H.323 MIB Applicability by H.323 System Type

Managed Device	Terminal	Gatekeeper	MCU	Gateway (H.323/H.320) (Note 2)
Mandatory	CallSignalling H.245 Terminal RTP	RAS Gatekeeper	CallSignalling H.245 MC RTP	CallSignalling H.245 Gateway RTP
Conditionally Mandatory (Note 1)	RAS MC MP	CallSignalling H.245 MC MP RTP	RAS MP	RAS MC MP
NOTE 1 – The MIBs in this row are mandatory if the corresponding protocol or entity are present in the managed device. NOTE 2 – For clarity, the H.320 MIBs are not included in this column.				

7.2 H.320 Systems

There are two system types defined for H.320; terminal and MCU. The MIBs defined in Annex B are listed in Table 2. As in H.323, if a terminal and MCU are co-resident, then if this Recommendation is supported, all three MIBs must be implemented.

Table 2/H.341 – H.320 MIB Applicability by H.320 System Type

Managed Device	Terminal	MCU
Mandatory	H.320 Entity Terminal	H.320 Entity MCU

In an H.320/H.323 gateway, the H.320 Entity is required. The MCU MIB is required if the device is also an H.320 MCU.

8 Management Model Overview

8.1 Gateway Model

In [15] an H.323 gateway is defined as a device that provides the appropriate translations between transmission formats and communication procedures in order to facilitate communication between H.323 endpoints and devices and non-H.323 devices. In this Recommendation, gateway is modelled as in Figure 1.

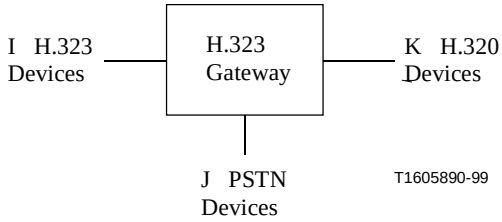


Figure 1/H.341 – Model of an H.323 Gateway

This representation of a gateway can provide connections and the appropriate translations between some number of H.323 devices, H.320 devices, or PSTN devices. The model requires at least one H.323 connection and may connect H.323 devices to H.320, PSTN, or other H.323 devices.

8.2 Multiple Instances

In order to accommodate multiple instances of an H.323 or H.320 device within a managed system, the MIB modules in this Recommendation use ifindex from the Interfaces MIB (RFC 1573, 2233) group to delineate between the instances. One way to employ this technique is for an instance of a device to be viewed as having a one to one correspondence with a physical interface. Figure 2 describes each of these approaches.

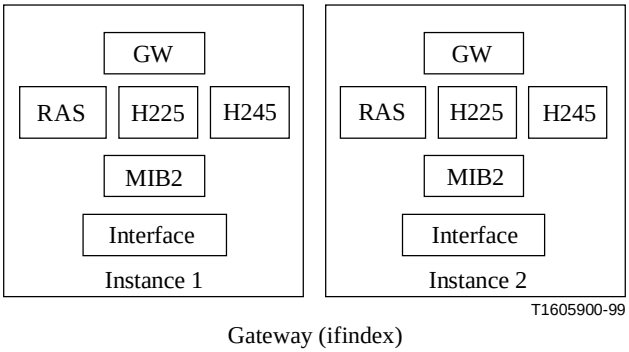


Figure 2/H.341 – Two Gateways, each with a physical interface

In Figure 2, use of ifindex allows the management application to uniquely specify the desired gateway. An example of this might occur in the case of an IP router or H.320 MCU containing two H.323 gateway boards.

9 Management Hierarchy

This clause motivates an approach for Multimedia management based on the hierarchy shown in Table 3. The organization of Multimedia MIBs is based on the hierarchy; each branch and leaf node is explained in detail in this clause immediately following a more general discussion of the communications systems that support multimedia communication.

Multimedia communications systems encompass the entire scope of communication technologies including packet based networks (including Local Area Networks, Enterprise Networks, Metropolitan Networks and IP networks in general), dial-up ISDN and GSTN. These systems and their components such as Terminals, Gateways, Gatekeepers, Multipoint Controllers, Multipoint Processors and Multipoint Control Units are becoming an integral part of an internetwork.

Each object represents some part of a managed resource. The way the objects relate to each other in a MIB tree reflects the functions performed by the managed entity. The representation of MIB hierarchy is based on the fact that H.323 systems consist of one or multiple H.323 entities. There will be some systems containing a Gateway, a Gatekeeper and a Multipoint Controller in one system and other systems containing just a Gatekeeper. The SNMP agent for each system supports all objects that are specified in a MIB for each subsystem, therefore covering the corresponding branches of the overall H.323 MIB tree.

Table 3/H.341 – Hierarchy of H.341 Management Definitions

Subtree	Global Registration and Textual Conventions	H.323	H.320	H.245	H.323 Gateway
Modules		CallSignalling RAS Terminal Gatekeeper MC MP	Entity Terminal MCU		

The Multimedia-TCMIB contains all of the textual conventions used by all of the other MIBs rooted in the Multimedia Tree and defines the OIDs for the major subtrees in the multimedia hierarchy. It is included as Annex A.

9.1 H.323

The H.323 MIB is used to identify objects defined in H.323 standard for multimedia communications systems. It is split into protocols and entities.

9.1.1 CallSignalling

The callSignalling MIB is used by H.323 endpoints to identify managed objects in established connections. It is organized into four functional groups. The callSignalConfig group details configuration parameters used in connection establishment such as maximum number of connections and timer values. The callSignalStats group provides counters used to diagnose connection problems and determine operation of the callSignalling protocol stack.

The connectionsEntityTable group details information pertinent to the connection between H.323 entities. There can be a large amount of information associated with each entity in a call. An H.323 endpoint has a conceptual row entry for each active call.

The callSignalEvents is the fourth group and it is used to identify the reason for call failures.

9.1.2 RAS

The RAS MIB is used by any H.323 endpoint supporting RAS. There are five groups: configuration, registration, admission, statistics and events. The configuration group contains variables describing how a station will operate and which gatekeeper it is trying to register with. When the endpoint is a gatekeeper, the Gatekeeper supplies its own information. The registrationTable contains information registered with a gatekeeper. In an endpoint, the table may have a single row, while in a gatekeeper the table is populated with all registered endpoints. Each registration may have aliases contained in a separate alias table. The admissionTable identifies calls that have been allowed by the gatekeeper. In an endpoint, there will be one or a small number of row entries, but in a gatekeeper the table contains a row for all active calls in the zone. The rasStatistics group tallies counters appropriate for diagnosing registration or admission problems and counters for determining overall RAS transactions. The rasEvents is used to identify the reason for admission rejections.

9.1.3 Terminal

The H323Terminal subtree is used to define the objects that are used in H.323 endpoints. There are three groups: description, capabilities and control. The description group provides system descriptions, such as hardware version, software version, country code and location. The capabilities identify key operating characteristics of the terminal, such as audio/video/data algorithms. The control group supports remote management of H.323 terminal devices.

9.1.4 Gatekeeper

The GK subtree is used to identify objects defined for a H.323 Gatekeeper. There are six groups: zone, system, configuration, statistics, controls and notifications. The system and configuration groups identify key system attributes, such as manufacturer and uptime, and enable/disable of notifications. The zoneTable is used to identify the local and remote zones known to the gatekeeper. Each row represents a zone. The statistics group is used to track potential errors and fault conditions. The controls group supports remote management of H.323 terminal devices. The notifications allow a gatekeeper, if enabled, to inform a remote management client of its operational status.

9.1.5 Multipoint Controller

The MC subtree is used to identify objects defined for a H.323 Multipoint Controller. There are six groups: system, configuration, conference, statistics, controls and notifications. The system, configuration, controls and notifications are used in a manner similar to the equivalent gatekeeper groups. The conference group is used to identify the active conferences in the MC and the participants per conference. The statistics group is used to assess system performance and to assist in fault isolation.

9.1.6 Multipoint Processor

The MP subtree is used to identify objects defined for a H.323 Multipoint Processor. There are two groups: configuration and conference. The configuration group is used to identify audio/video mix configuration counts and the conference group describes the audio and video MP operation.

9.2 H.320

The H.320 MIB is used to identify objects defined in H.320 standard for multimedia communications systems.

9.2.1 Entity

This H.320 Entity subtree is a collection of common objects which can be used in a H.320 terminal, a H.320 MCU and a H.320/H.323 gateway. Objects are grouped as tables. An H.320 terminal will have only one row of the table. An H.320 MCU and an H.320/H.323 gateway may have multiple entries in the table. There are three groups: capability, callstatus and h221Statistics. The capability group describes terminal or MCU capabilities as offered at the start of the call. The callStatus group identifies the characteristics of active calls. The h221Statistics group is used to track performance and to assist in fault isolation.

9.2.2 Terminal

The H.320 Terminal subtree is used to define the objects which are used only in the terminal. There are five groups: system, configuration, callSites and control. The system, configuration and control groups serve the same purpose as those in the H.323 terminal. The callSites group is used to contain terminals and their parameters known to the terminal.

9.2.3 Multipoint Control Unit

The H.320 Multipoint Control Unit subtree is used to identify managed objects for a H.320 Multipoint Control Unit. It consists of four groups: system, conference, terminal and controls. The system group contains the specific characteristics. The conference group consists of the active conferences and parameters known to the H.320 MCU. The terminal group is used to describe terminals in active MCU conferences. The controls group assists remote management of the MCU.

9.3 H.245

The H.245 MIB Proposal is organized into 6 groups.

The configuration group allows remote management of the various state machine timers. The controlChannel group consists of fault isolation and performance counters and the controlChannelMasterSlave Table. The table contains information about the active connections between peer H.245 entities. There is a row in the table for each H.245 connection. The table is indexed by controlChannelSourceTransportAddress and controlChannelDestinationTransportAddress. The capExchange group identifies the potential capabilities exchanged between peer H.245 entities over the open control channel. It contains the capExchangeSignallingTable and the capExchangeCapabilityTable. The logicalChannels group is concerned with monitoring the media streams between peer entities. The logicalChannelGroup consists of the logChannelsTable and fault isolation and performance counters. The conference group contains fault isolation and conference monitoring counters and the conferenceTerminalTable. The table is used to identify the terminals in a particular conference. The misc group contains miscRoundTripDelayTable and the miscMaintenanceLoopTable.

9.4 Gateway

The GW subtree is used to identify objects defined for H.323 Gateway. The MIB is organized into eight groups: systemDescription, capabilities, configuration, statistics, calls, connections, notifications and controls.

The systemDescription group describes the gateway. The capabilities and configuration groups define the H.323, H.320 and PSTN gateway support. Gateway statistics instrument performance, fault isolation, and monitoring information for the media translation/conversion portion of a gateway. The calls group identifies the active gateway calls and the connections group describes those connections that comprise the call. The notifications group identifies important system events. The controls group supports gateway operation.

9.5 Real Time Protocol (RTP)

Terminals, end-systems, and intermediate-systems use Real-time Transport Protocol (RTP) to send and receive synchronous data on packet networks. The version 1 RTP specification is included in its entirety in the H.225.0 standard. RTP contains a sequence number and time stamp in the packet header to detect loss and measure delay variation. RTP has a feedback mechanism called *Real-time Transport Control Protocol* (RTCP) in which senders and receivers send reports to session members. In a multicast environment, RTCP is sent on the odd-numbered port of the destination multicast address when UDP is defined to be the transport protocol. In a unicast environment, there is a pair of destination addresses with control data sent on the odd-numbered port and session data sent on the even-numbered port when UDP is the transport. In addition to RTCP, RTP is complemented by payload type definitions in which the profile of the media-specific packet format and payload structure is specified.

The RTP MIB contains information about RTP Sessions organized by senders and receivers. Information that identifies session participants, session parameters, RTP data transmission and reception characteristics, and RTCP message frequencies are stored in the RTP MIB. Since the RTP MIB is designed to support terminals, the RTP management entity of the terminal stores information about the sessions from which the terminal is receiving or to which the terminal is sending. The RTP MIB definitions support intermediate systems through a table that maps received sessions to transmitted sessions. The session parameters and statistical information can be locally computed as in the case of a terminal or remotely gathered *via* RTCP in the case of an intermediate system. The RTP MIB supports RTP monitors by permitting write operations to the RTP Session table that has the side effect of causing an RTP Monitor to join a particular multicast RTP Session.

The RTP MIB is not included in this Recommendation because it is on the IETF standards track.

9.6 MIB-II

In March 1991, the IETF standardized MIB-II. It defines managed objects for TCP/IP host and internetworking systems. MIB-II includes support for system, interfaces, and the IP, TCP, UDP, ICMP, and SMNP protocols. It is assumed that any device implementing H.341 will also support MIB-II or its successors.

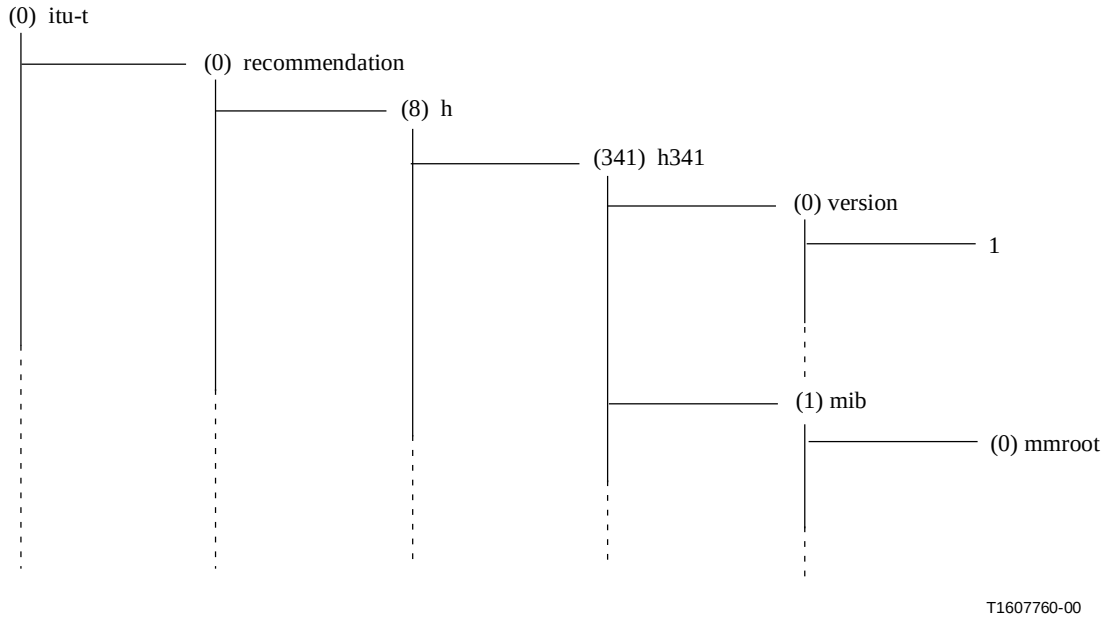
9.7 Interfaces Group

There are two successors to the Interfaces Group in MIB-II, RFC 1573 [35] and RFC 2233 [36]. These two documents define a richer interface model. MIB implementers should examine these two specifications when using H.341 in multi-interface systems.

10 OID Naming

In the IETF, SNMP MIB-II has an OID root of {iso(1) org(3) dod(6) internet(1) mgmt(2) mib(1)}. The convention for adding proprietary modules to obtain an enterprise number from the Internet Assigned Numbers Authority (IANA). Proprietary MIBs use the number received with the root of {iso(1) org(3) dod(6) internet(1) private(4) enterprises(1) vendor (xxx)}. It is up to the vendor to define and manage their private namespace.

H.341 is an ITU-T Recommendation. The proposed root OID for the document version number and these MIB modules is:



The object identifier for version 1.0 of this Recommendation is:

{itu-t(0) recommendation(0) h(8) h341(341) version(0) 1}.

Clause 9 identifies five subtrees:

(0) mmTextualConventions

(1) h323Root

(2) h320Root

(3) h245Root

(4) h323GWRoot

Thus, to refer to the gatekeeper MIB (H.341 Annex B.4), the object identifier root structure is {itu-t(0) recommendation(0) h(8) h341(341) mib(1) mmroot(0) h323Root(1) h323GatekeeperMIBObjects(4)}.

Please note that ccitt and itu-t are synonyms for the OID name. CCITT became ITU-T and itu-t (0) is often seen in texts as ccitt (0).

ANNEX A

Textual Conventions

This formal language description module is available as an attached electronic file.

ANNEX B

H.323

This annex contains 6 formal language description modules:

B.1 H.225 CallSignalling

B.2 RAS

B.3 H.323 Terminal

B.4 H.323 Gatekeeper

B.5 Multipoint Controller

B.6 Multipoint Processor

They are available as attached electronic files.

ANNEX C

H.320

This annex contains 3 formal language description modules:

C.1 H.320 Entity

C.2 H.320 Terminal

C.3 H.320 Multipoint Control Unit

They are available as attached electronic files.

ANNEX D

H.245

This formal language description module is available as an attached electronic file.

ANNEX E

H.323 GATEWAY

This formal language description module is available as an attached electronic file.

ITU-T RECOMMENDATIONS SERIES

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