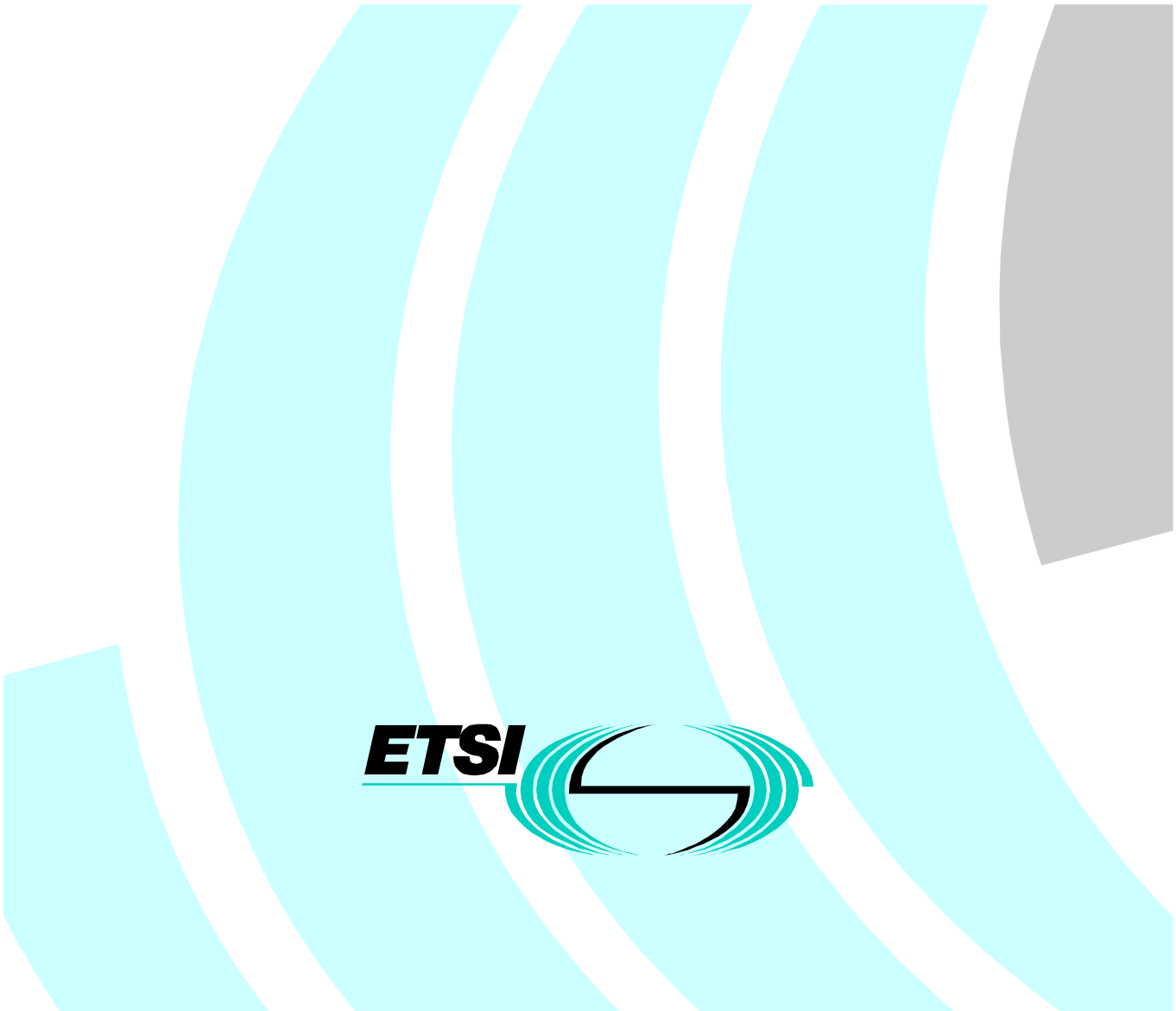
ETSI TS 101 909-7 V1.1.1 (2001-06)

Technical Specification

Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 7: Management Information Base (MIB) Framework



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access and Terminals (AT).

The present document is part 7 of a multi-part deliverable supporting real-time multimedia services, as identified below:

Part 1: "General";

Part 2: "Architectural framework for the delivery of time critical services over cable Television networks using cable modems";

Part 3: "Audio Codec Requirements for the Provision of Bi-Directional Audio Service over Cable Television Networks using Cable Modems";

Part 4: "Network Call signalling Protocol";

Part 5: "Dynamic Quality of Service for the Provision of Real Time Services over Cable Television Networks using Cable Modems";

Part 6: "Media Terminal Adapter (MTA) device provisioning";

Part 7: "Management Information Base (MIB) Framework";

Part 8: "Media Terminal Adapter (MTA) Management Information Base (MIB)";

Part 9: "Network Call Signalling (NCS) MIB Requirements";

Part 10: "Event Message Requirements for the Provision of Real Time Services over Cable Television Networks using Cable Modems";

Part 11: "Security";

Part 12: "Internet Signalling Transport Protocol";

Part 13: "Trunking Gateway Control Protocol";

Part 14: "Operation System Support".

NOTE 1: The above list is complete for the first version of this Technical Specification (TS) (V1.1.1 2001-06). Additional parts are being proposed and these will be added to the list in future versions.

The present part is part 7 of the above mentioned series of ETSI deliverables and describes the framework in which IPCablecom MIBs (Management Information Base) are defined. It provides information on the management requirements of IPCablecom specified devices and functions and how these requirements are supported in the MIB. It is intended to support and complement the actual MIB documents, which are issued separately.

NOTE 2: The choice of a multi-part format for this deliverable is to facilitate maintenance and future enhancements.

NOTE 3: The term **MUST** or **MUST NOT** is used as a convention in the present document part to denote an absolutely mandatory aspect of the specification.

Introduction

The cable industry in Europe and across other Global regions have already deployed broadband cable television Hybrid Fibre Coax (HFC) data networks running the Cable Modem Protocol. The cable industry is in the rapid stages of deploying IP Voice and other time critical multimedia services over these broadband cable television networks.

The cable industry has recognized the urgent need to develop ETSI Technical Specifications aimed at developing interoperable interface specifications and mechanisms for the delivery of end to end advanced real time IP multimedia time critical services over bi-directional broadband cable networks.

IPCablecom is a set of protocols and associated element functional requirements developed to deliver Quality-of-Service (QoS) enhanced secure IP multimedia time critical communications services using packetized data transmission technology to a consumer's home over the broadband cable television Hybrid Fibre/Coaxial (HFC) data network running the Cable Modem protocol. IPCablecom utilizes a network superstructure that overlays the two-way data-ready cable television network. While the initial service offerings in the IPCablecom product line are anticipated to be Packet Voice, the long-term project vision encompasses packet video and a large family of other packet-based services.

The cable industry is a global market and therefore the ETSI standards are developed to align with standards either already developed or under development in other regions. The ETSI Specifications are consistent with the CableLabs/PacketCable set of specifications as published by the SCTE. An agreement has been established between ETSI and SCTE in the US to ensure, where appropriate, that the release of PacketCable and IPCablecom set of specifications are aligned and to avoid unnecessary duplication. The set of IPCablecom ETSI specifications also refers to ITU-SG9 draft and published recommendations relating to IP Cable Communication.

The whole set of multi-part ETSI deliverables to which the present document belongs specify a Cable Communication Service for the delivery of IP Multimedia Time Critical Services over a HFC Broadband Cable Network to the consumers home cable telecom terminal. "IPCablecom" also refers to the ETSI working group program that shall define and develop these ETSI deliverables.

1 Scope

The present set of documents specify IPCablecom, a set of protocols and associated element functional requirements. These have been developed to deliver Quality-of-Service (QoS), enhanced secure IP multimedia time critical communication services, using packetized data transmission technology to a consumer's home over a cable television Hybrid Fibre/Coaxial (HFC) data network.

NOTE 1: IPCablecom set of documents utilize a network superstructure that overlays the two-way data-ready cable television network, e.g. as specified within ES 201 488 and ES 200 800.

While the initial service offerings in the IPCablecom product line are anticipated to be Packet Voice and Packet Video, the long-term project vision encompasses a large family of packet-based services. This may require in the future, not only careful maintenance control, but also an extension of the present set of documents.

NOTE 2: The present set of documents aims for global acceptance and applicability. It is therefore developed in alignment with standards either already existing or under development in other regions and in International Telecommunications Union (ITU).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

ITU-T Recommendation J.83 (1997): "Digital multi-programme systems for television, sound and data services for cable distribution".

ITU-T Recommendation J.112: "Transmission systems for interactive cable television services".

ETSI TS 101 909-2: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 2: Architectural framework for the delivery of time critical services over cable Television networks using cable modems".

ETSI TS 101 909-4: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 4: Network Call signalling Protocol".

ETSI TS 101 909-5: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 5: Dynamic Quality of Service for the Provision of Real Time Services over Cable Television Networks using Cable Modems".

ETSI TS 101 909-6: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 6: Media Terminal Adapter (MTA) device provisioning".

ETSI TS 101 909-9: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 9: Network Call Signalling (NCS) MIB Requirements".

ETSI TS 101 909-11: "Access and Terminals (AT); Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services; Part 11: Security".

ETSI ES 201 488: "Data-Over-Cable Service Interface Specifications Radio Frequency Interface Specification".

ETSI ES 200 800: "Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV)".

RFC 1493 (1993): "Definitions of Managed Objects for Bridges".

RFC 1643 (1994): "Definitions of Managed Objects for the Ethernet-like Interface Types".

RFC 1907 (1996): "Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)".

RFC 2011 (1996): "SNMPv2 Management Information Base for the Internet Protocol using SMIv2".

RFC 2013 (1996): "SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2".

RFC 2233 (1997): "The Interfaces Group MIB using SMIv2".

RFC 2578 (1999): "Structure of Management Information Version 2 (SMIv2)"

RFC 2579 (1999): "Textual Conventions for SMIv2".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Cable Modem: layer two termination device that terminates the customer end of the ITU-T Recommendation J.112 connection

IPCablecom: ETSI working group project that includes an architecture and a series of Specifications that enable the delivery of real time services over the cable television networks using cable modems

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

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CM	Cable Modem
HFC	Hybrid Fibre Coax
MIB	Management Information Base
MTA	Media Terminal Adapter contains the interface to a physical voice device, a network interface, CODECs, and all signalling and encapsulation functions required for VoIP transport, class features signalling, and QoS signalling
NCS	Network Call Signalling
QoS	Quality of Service guarantees network bandwidth and availability for applications

4 Void

5 Overview

IPCablecom MIBs are designed to provide necessary functionality defined in IPCablecom Specifications. MIBs that are developed for IPCablecom support embedded Media Terminal Adapters (MTAs) and provide definitions for NCS call signalling and MTA device provisioning functions. Future IPCablecom development phases will include other functional areas as well as requirements for other IPCablecom components, which will be considered for MIB development. IPCablecom functional areas that are being studied for future IPCablecom MIB definition include Specifications TS 101 909-4, TS 101 909-6, TS 101 909-11 and TS 101 909-5.

5.1 IPCablecom reference architecture

The conceptual diagram for the IPCablecom architecture is shown in figure 1. Please refer to ETSI Specification TS 101 909-2 for more detailed information concerning the IPCablecom architecture.

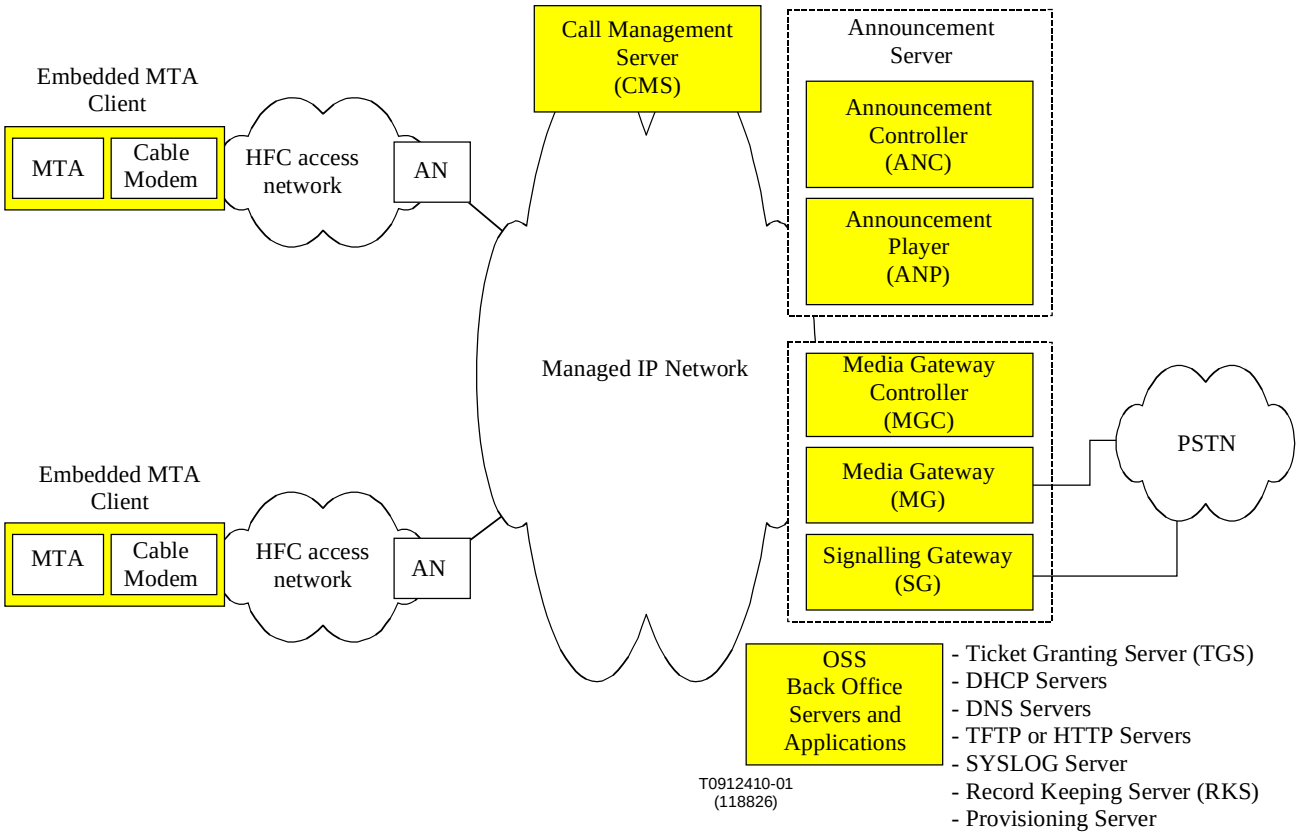

Figure 1: IPCablecom Network Component Reference Model (partial)

5.2 General requirements

The following requirements have been considered in the design of IPCablecom MIBs:

- IPCablecom devices MUST be compliant with ITU-T Recommendations J.83 and J.112;
- Take a minimalist approach for design of the IPCablecom MIB, i.e. if other MIBs define the same functions, then rely on these MIBs rather than create new ones;
- Organize MIBs to support both embedded and stand-alone MTA;
- Organize MIBs so as to allow functional partitioning of ITU-T Recommendation J.112 (high-speed data) and voice features;
- IPCablecom MIBs MUST comply with SMIv2 and SNMPv2 as defined in RFC 2578.

5.2.1 Provisioning and network management service provider

A single physical device (e.g. embedded-MTA) will be completely provisioned and managed by a single business entity. In the case of multiple service providers offering different services on the same device [e.g. data by one provider, voice by another provider], a secondary service provider will act as the "contractor" for the primary provider in the areas of device provisioning and management.

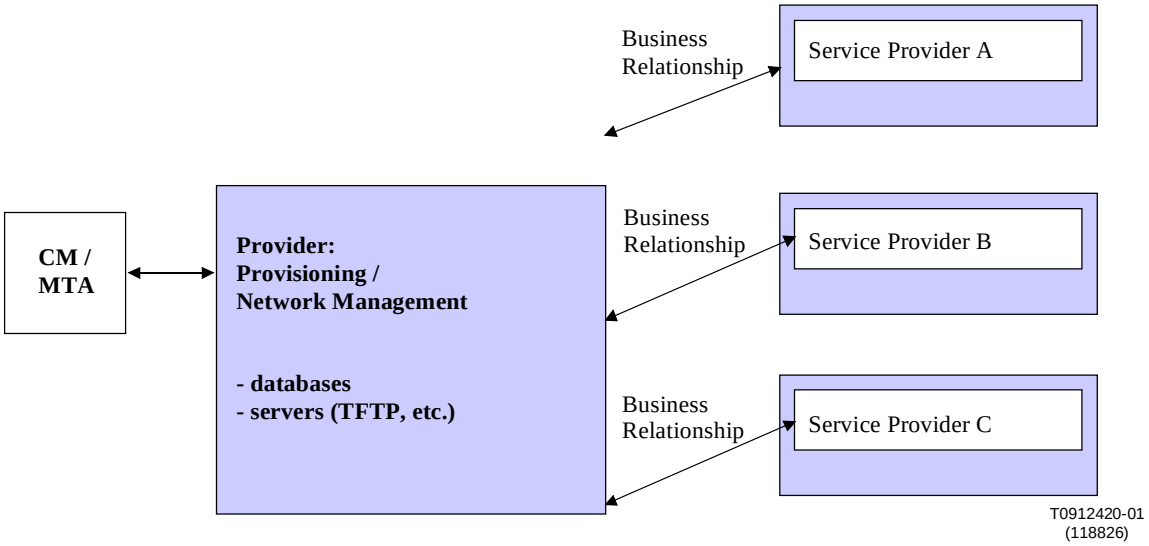

Figure 2: Partitioning of Management Domains

5.2.2 Support for embedded and stand-alone MTAs

The IPCablecom MIBs will provide features for both embedded and stand-alone MTAs. Stand-alone MTAs are not required to include any CM related functions, The IPCablecom MIBs, therefore, should be independent of CM and able to provide management support for voice communications functionalities using a stand-alone MTA device that does not have a CM as a base. Although definitions and design of the stand-alone MTA is not part of the IPCablecom, the MIBs have been designed with the understanding that they will be used in Stand-alone MTA (S-MTA) implementations.

5.2.3 Simple network management protocol (SNMP) considerations

SNMPv3 provides an extended User Security Model which implies changes to the way SNMP packets are exchanged between agents and managers. Since MIBs are used to define the content of the packets, the changes for SNMPv3 do not affect MIB design.

The only requirements imposed are that IPCablecom MIBs MUST conform to SMIv2, which is described in RFC 2578 and 2579.

The following RFCs provide more information on SNMPv3:

- RFC 2571;
- RFC 2572;
- RFC 2573;
- RFC 2574;
- RFC 2575.

5.3 Functional requirements

This clause describes management functions that are supported by the IPCablecom MIB.

5.3.1 IPCablecom device provisioning

The IPCablecom MIB should provide definitions for attributes that are required in the MTA device-provisioning flows. These attributes are specified in the Specification TS 101 909-6 MTA device provisioning specification and include parameters such as CMS identifier, MTA domain name, MTA server addresses, and MTA capabilities. These attributes are defined as configuration file attributes and/or MIB objects as needed.

5.3.2 Security

The IPCablecom MIB provides definitions for attributes that are required for security handshake of the MTA and the provisioning server. These attributes are contained in Specification TS 101 909-11 and include certificates and signatures.

5.3.3 QoS (FFS)

The IPCablecom MIB should provide attributes for support of Quality of Service (QoS) on the MTA, as well as interoperate with QoS definitions of ITU-T Recommendation J.112. Given that CM MIBs are including QoS attribute definitions, the IPCablecom MIB will not be required to repeat these attributes. Examples of these attributes are:

- Type of QoS protocol supported, D-QoS;
- QoS authority;
- QoS assignments;
- Provisioned bandwidth;
- Admitted bandwidth;
- Active bandwidth;
- Service flow identifiers for each connection.

5.3.4 Primary line requirements (FFS)

The IPCablecom MIB should provide attributes that are needed to satisfy high availability requirements of the voice communications service as defined in the IPCablecom "primary line" specification. Examples of these attributes are power loss and network element failure.

5.3.5 Voice interfaces (FFS)

The IPCablecom MIB should provide attributes that can be used to manage voice ports on the MTA. Examples of voice port attributes that can be included in the MIB include:

- Physical port description;
- Analogue phone;
- Digital - Integrated Services Digital Network (ISDN);
- Signalling protocols used on this interface;
- Dialtone delay;
- Minimum call setup latency time.

5.3.6 Packet voice call signalling

The IPCablecom MIB should provide attributes that are needed for management of the packet voice call signalling protocol. The only call signalling protocol that is now being specified by IPCablecom is NCS; however, work on DCS is in progress. Examples of attributes that have to be supported for packet voice call signalling include:

- Dial timeouts;
- Distinctive ring patterns;
- COder-DECoder (Codec) capabilities;
- Signalling configuration for voice communication end points;
- Call agent identifier.

5.3.7 Packet voice transport (FFS)

The IPCablecom MIB should provide attributes that can be used to monitor and manage packet voice transport. The Real Time Protocol (RTP) protocol is used for packet voice transport, and therefore the RTP MIB (IETTF draft-ietf-avt-rtp-mib-05.txt) can be used for management of the packet voice transport function of the MTA.

Given that the RTP MIB consists of attributes that relate to fault and performance data, it is not being considered for this release of the IPCablecom MIB.

5.3.8 Fault management (FFS)

The IPCablecom MIB should provide attributes that can be used in management of network faults and failures. Examples of attributes include:

- Standard alerts;
- Common fault messages (software upgrades, resets, link up/down);
- Prioritized alerts (0-7) for throttling and limiting and class;
- Possible "thin RMON" agent;
- Fault isolation.

5.3.9 Performance management (FFS)

The IPCablecom MIB should provide attributes that can be used in monitoring of the performance of the network when used for voice communications. Examples of attributes that should be considered for performance monitoring are:

- Packet counts;
- Call signalling status.

6 MIBs available in a IPCablecom network

In designing the IPCablecom MIBs, it was necessary to consider other MIBs that are also present in the network and which can provide the required attributes and functions. This clause describes the MIBs that can be present in the IPCablecom MTA device, and which can be used for IPCablecom management functions as needed.

6.1 IF MIB

This is the interfaces section of the MIB II (RFC 2233), and is needed for definitions of multiple interfaces in the MTA.

6.2 MIB II

Request for Comments (RFC) 1907, RFC 2011, and RFC 2013 define the second version of the Management Information Base (MIB-II) for use with network management protocols in TCP/IP-based internets. Not all objects in this MIB are deemed necessary for the IPCablecom MTA device. This MIB only requires the **system, interfaces, IP,** and **transmission** objects of MIB II to be present in the MTA.

The system object group contact, administrative, location, and service information regarding the managed node.

The interfaces table provides mechanism for identification and independent management of the interfaces in the device.

The IP object group provides information that is relevant to the IP protocol.

The transmission group provides a mechanism for other MIBs that are related to the underlying media for that interface to be hooked in to the MIB tree.

6.3 IPCablecom Technical Specification TS 101 909-9

Specification TS 101 909-9 contains Network Call Signalling information for provisioning. The data is derived from the IPCablecom NCS specification (Specification TS 101 909-9). No other functionality other than MTA NCS provisioning is defined at this time, although future releases of Specification TS 101 909-9 may enhance the capabilities.

6.3.1 Specification TS 101 909-9 general configuration information

Specification TS 101 909-9 contains general configuration information that applies to network call signalling on a device basis. This information is also contained in Specification TS 101 909-4.

This data only provides the means to provision network call signalling on a device basis.

6.3.2 Specification TS 101 909-9 per endpoint data

Specification TS 101 909-9 contains a per endpoint table. This table contains general configuration information that applies to network call signalling on a per endpoint basis. This information is also found in the configuration file defined in Specification TS 101 909-4. This data only provides the means to provision network call signalling per endpoint.

6.4 IPCablecom Technical Specification TS 101 909-8

Specification TS 101 909-8contains data for provisioning the MTA device and supporting the provisioned functions, specifically syslog. The data is derived from the IPCablecom Specification TS 101 909-6 (MTA device provisioning), and the CM Device MIB. No other functionality other than device provisioning and support of provisioned data is defined at this time, although future releases of the MTA Device MIB may enhance the capabilities.

6.4.1 Specification TS 101 909-8 general configuration information

Specification TS 101 909-8 contains general configuration information to provision the MTA on a device basis. These objects support provisioning required servers, security information, and non-type specific call signalling data.

6.4.2 Specification TS 101 909-8 syslog information

Specification TS 101 909-8 contains syslog control information such as syslog server, local logging and traps to maintain the syslog capability of the voice communication MTA.

6.5 IPCablecom MIB implementation

This clause describes a reference implementation of the MIBs in an IPCablecom device. Only E-MTA type implementations are considered here.

6.6 MTA components

Figure 3 below shows the components of a typical MTA.

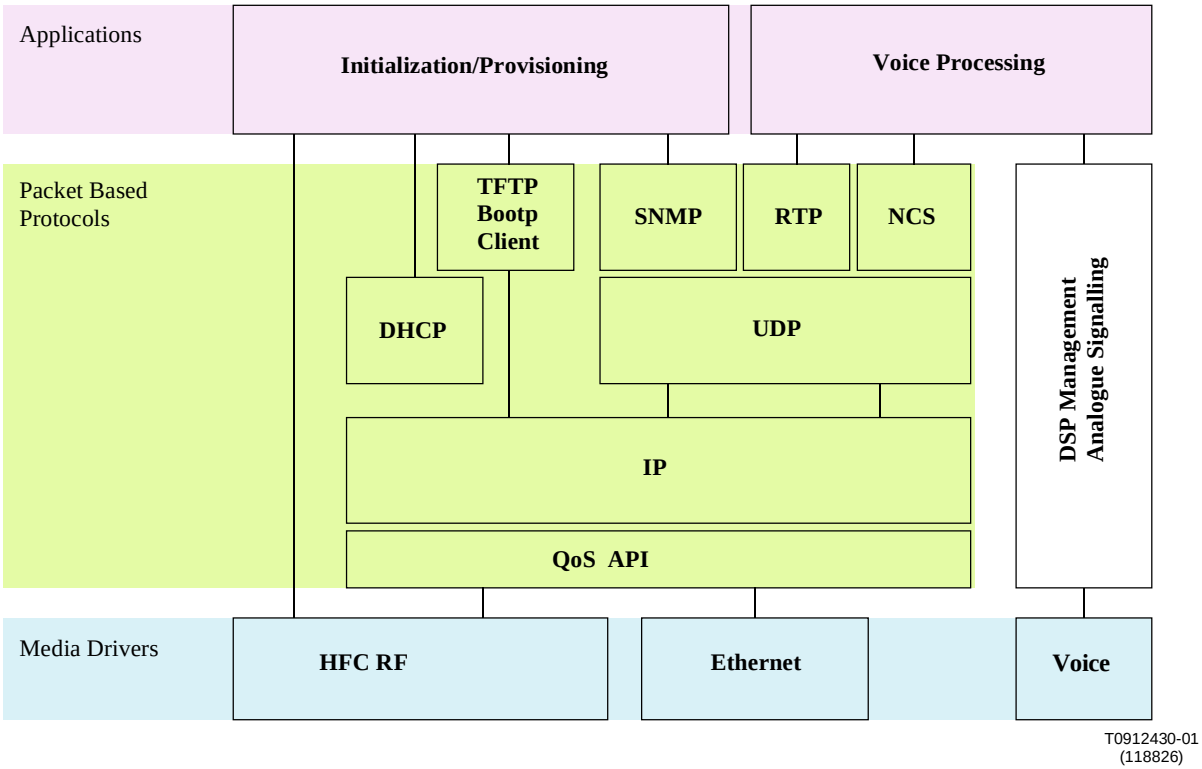

Figure 3: MTA Components

As shown here the MTA components can be organized into separate areas, i.e. packet based protocols, which run on top of IP and the voice subsystem which consists of DSP engines and their associated software. MIBs that are implemented in the MTA have to be organized so as to facilitate this separation. IPCablecom MIB specifies functions for the packet based protocol section of the MTA. No analogue voice MIBs are specified for the MTA.

6.7 MIB Layering

Figure 4 below describes the MIB layering model. The two stacks represent the packet network and analogue voice sections of the MTA. On the packet network side MIB layering follows the same layering model as the protocol stacks.

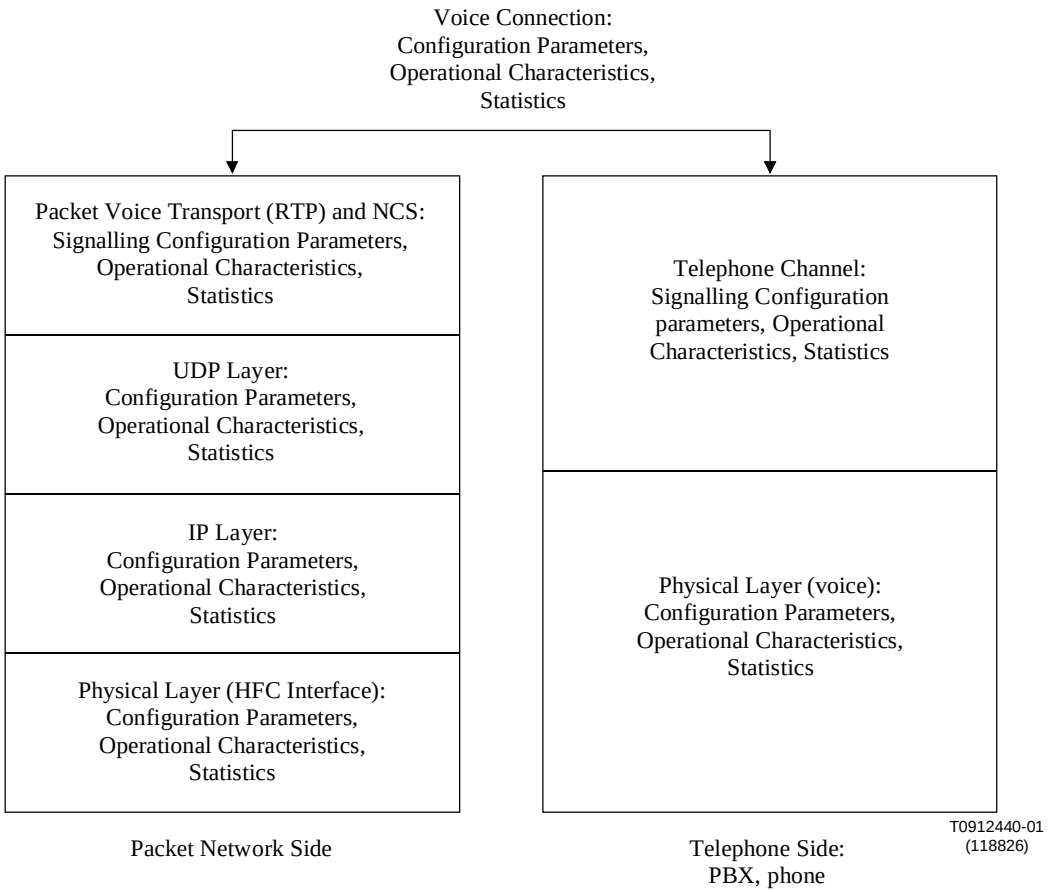

Figure 4: MIB Layering Model

In the context of voice communications, MIBs can be layered into the physical layer attributes which deal with the voice interface and the telephone channel attributes which deal with voice signalling. MIBs for the telephone side of the MTA are for further study.

Annex A (normative): MIB Import Data

The MIB containing import data required for import by IPCablecom NCS MIB and MTA MIB is shown below.

```
CLAB-DEF-MIB DEFINITIONS ::= BEGIN
IMPORTS
  MODULE-IDENTITY,
    enterprises
  FROM SNMPv2-SMI;
    cableLabs MODULE-IDENTITY
  LAST-UPDATED  "9910280000Z" -- October 28, 1999
  ORGANIZATION  "ITU-T SG 9"
  CONTACT-INFO
"Roy Spitzer
      Postal: Telogy Networks, Inc.
      20250 Century Blvd.
      Germantown, MD 20855
      U.S.A.
      Phone: +1 301-515-6531
      Fax:  +1 301-515-7954
      E-mail: rspitzer@telogy.com"


  DESCRIPTION
    "This MIB module supplies the basic management
     object categories for Cable Labs. "
  ::= { enterprises 4491 }

clabFunction     OBJECT IDENTIFIER ::= { cableLabs 1 }
clabFuncMib2     OBJECT IDENTIFIER ::= { clabFunction 1 }
clabFuncProprietary OBJECT IDENTIFIER ::= { clabFunction 2 }
clabProject OBJECT IDENTIFIER ::= { cableLabs 2 }
clabProjDocsis OBJECT IDENTIFIER ::= { clabProject 1 }
clabProjPacketCable OBJECT IDENTIFIER ::= { clabProject 2 }
clabProjOpenCable   OBJECT IDENTIFIER ::= { clabProject 3 }
END
```

Annex B (informative): Additional MIBs Available in ITU-T Recommendation J.112, annex B and annex C

This annex describes possible MIB implementations and additional MIBs that may be available in an ITU-T Recommendation J.112 annex B and annex C implementation of the IPCablecom network.

This annex describes possible MIB implementations for embedded and stand-alone MTAs based on ITU-T Recommendation J.112 annex B and annex C implementations. The S-MTA definitions are for further study.

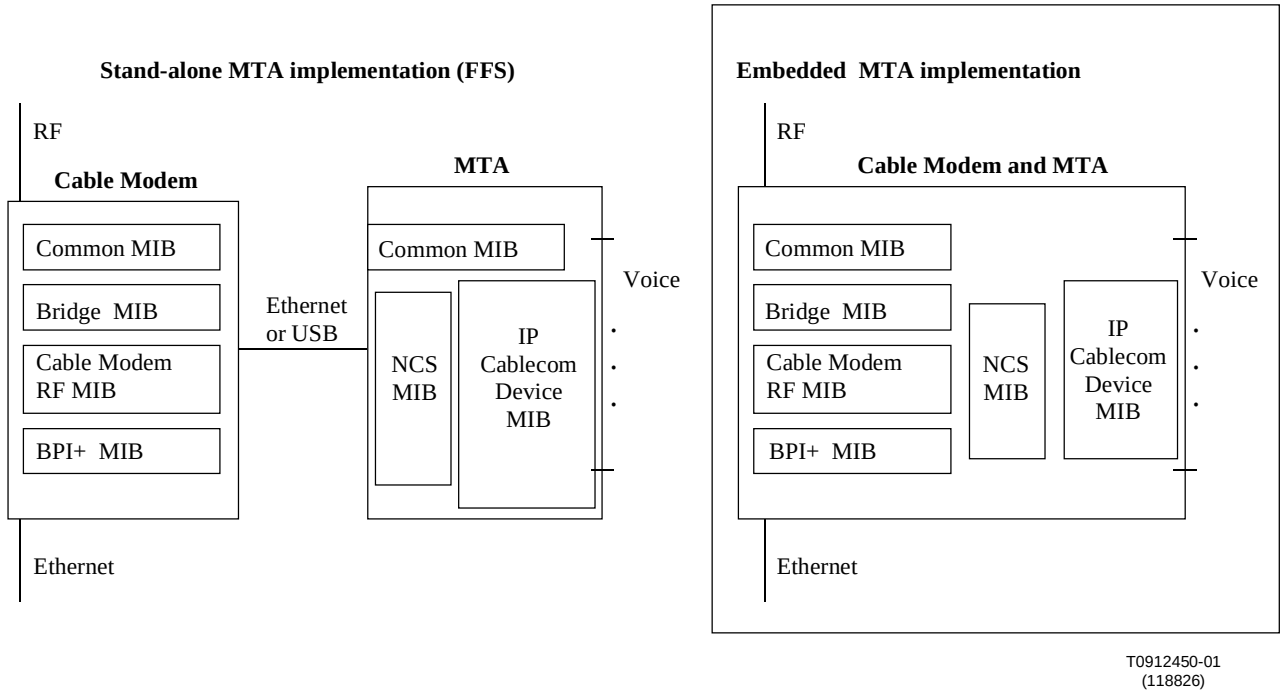

Figure 5: Embedded and Stand-alone MTA implementations

In this figure, the MIBs are divided into categories that can be placed into both Embedded MTA (E-MTA) and S-MTA. The box that is labelled as "common MIB" represents a set of MIBs that has to be present on any device. An example of a common MIB is the interfaces group of MIB II.

The following table lists MIBs that may be present in the ITU-T Recommendation J.112 annex B and annex C implementation of an IPCablecom device. Note that the device can be a CM or an E-MTA or an S-MTA.

Table 1: Additional MIBs

Possible MIBs present in IPCablecom Device
CM Device MIB
CM RF MIB
CM QoS MIB
CM BPI+ MIB
IF MIB
MIB II
Ethernet MIB
Bridge MIB
IPCablecom Device MIB
NCS MIB

Partitioning of voice and data services and support of both S-MTA and E-MTA, have been requirements for design of the MIB. This clause describes possible organizations of the MIB in order to meet these requirements. In doing so, the common MIB category was introduced which is basically a collection of MIBs which can be present on both the CM as the MTA device.

B.1 CM MIBs

The embedded MTA may take advantage of the MIBs that are available in the CM as appropriate.

B.2 Ethernet MIB

Contains definitions of Managed Objects for the Ethernet Like Interfaces. See RFC 1643.

B.3 Bridge MIB

Contains definitions of Managed Objects for Bridges. See RFC 1493.

Annex C (informative): Bibliography

RFC 2571 (1999): "An Architecture for Describing SNMP Management Frameworks".

RFC 2572 (1999): "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)".

RFC 2573 (1999): "SNMP Applications".

RFC 2574 (1999): "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)".

RFC 2575 (1999): "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)".

List of ITU-T Recommendations referring to IP Cablecom:

ITU-T Recommendation J.160: "Architectural framework for the delivery of time critical services over cable television networks using cable modems".

ITU-T Recommendation J.161: "Audio codec requirements for the provision of bidirectional audio service over cable television networks using cable modems".

ITU-T Recommendation J.162: "Network call signalling (NCS) MIB requirements".

ITU-T Recommendation J.163: "Dynamic quality of service for the provision of real time services over cable television networks using cable modems".

ITU-T Recommendation J.164: "Event Message requirements for the support of real-time services over cable television networks using cable modems".

ITU-T Recommendation J.165: "IPCablecom Internet Signalling Transport Protocol".

ITU-T Recommendation J.166: "IPCablecom Management information base (MIB) framework".

ITU-T Recommendation J.167: "Media terminal adapter (MTA) device provisioning requirements for the delivery of real-time services over cable television networks using cable modems".

ITU-T Recommendation J.168: "IPCablecom media terminal adapter (MTA) MIB requirements".

ITU-T Recommendation J.169: "IPCablecom network call signalling (NCS) MIB requirements".

ITU-T Recommendation J.170: "IPCablecom Security specification".

ITU-T Recommendation J.171: "IPCablecom Trunking Gateway Control Protocol (TGCP)".

History

Document history		
V1.1.1	June 2001	Publication