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Part 10: 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, Terminals, Transmission and Multiplexing (ATTM).

The present document is part 10 of a multi-part IPCablecom 1.5 deliverable covering the Digital Broadband Cable Access to the Public Telecommunications Network; IP Multimedia Time Critical Services, as identified below:

Part 1: "Overview";

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: "Event Message Specification";

Part 7: "Media Terminal Adapter (MTA Management Information Base (MIB)";

Part 8: "Network Call Signalling (NCS) MIB Requirements";

Part 9: "Security";

Part 10: "Management Information Base (MIB) Framework";

Part 11: "Media terminal adapter (MTA) device provisioning";

Part 12: "Management Event Mechanism";

Part 13: "Trunking Gateway Control Protocol - MGCP option";

Part 14: "Embedded MTA Analog Interface and Powering Specification"

Part 15: "Analog Trunking for PBX Specification";

Part 16: "Signalling for Call Management Server";

Part 17: "CMS Subscriber Provisioning Specification";

Part 18: "Media Terminal Adapter Extension MIB";

Part 19: "IPCablecom Audio Server Protocol Specification - MGCP option";

Part 20: "Management Event MIB Specification";

Part 21: "Signalling Extension MIB Specification".

NOTE 1: Additional parts may be proposed and will be added to the list in future versions.

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

1 Scope

The present document describes the framework in which IPCablecom1.5 MIB (Management Information Base) modules are described. It provides information on the management requirements of IPCablecom compliant devices and functions and how these requirements are supported in the MIB modules. It is intended to support and complement the actual MIB module documents, which are issued separately. There are currently two sets of the MIB modules that describe the Management Information Base for the IPCablecom Multimedia Terminal Adapters (MTAs) as per table 1:

- IPCablecom MIBs ([8], [9], [10], [11], [12])
- IETF MIBs ([16], [17], [18]).

The IPCablecom 1.5 compliant MTAs are to implement the IPCablecom MIBs. The IPCablecom 1.5 compliant MTAs may implement the IETF MIBs.

Table 1: Functional MIB Areas

IPCablecom Specification	Phase	IPCablecom MIB Modules	IETF MIB Modules
NCS Protocol	1.5	Signalling MIB and Signalling Extension MIB	Signalling MIB
MTA Device Provisioning	1.5	MTA MIB and MTA Extension MIB	MTA MIB
Codec	1.5	Signalling MIB	Signalling MIB
Security	1.5	MTA MIB	MTA MIB
Management Event Mechanism	1.5	Management Event MIB	Management Event MIB

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 103 161-11: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 11: Media Terminal Adapter (MTA) device provisioning".

[2] ANSI/SCTE 23-3 2010: "DOCSIS® 1.1 Part 3: Operations Support System Interface".

NOTE: Available at: http://www.scte.org/documents/pdf/Standards/ANSI_SCTE%2023-3%202010.pdf.

[3] IETF RFC 791: "Internet Protocol, J. Postel", September 1981.

[4] IETF RFC 2011: "SNMPv2 Management Information Base for the Internet Protocol using SMIv2", K. McCloghrie, November 1996.

[5] IETF RFC 2863: "The Interfaces Group MIB", K. McCloghrie, F. Kastenholz, June 2000.

[6] ANSI/SCTE 107 2009: "Embedded Cable Modem Devices".

[7] ANSI/SCTE 79-2 2009: "DOCSIS® 2.0 Part 2: Operations Support System Interface".

[8] ETSI TS 103 161-7: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 7: Media Terminal Adapter (MTA) Management Information Base (MIB)".".

[9] ETSI TS 103 161-8: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 8: Network Call Signalling (NCS) MIB Requirements".

[10] ETSI TS 103 161-18: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 18: Media Terminal Adapter Extension MIB".

[11] ETSI TS 103 161-21: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 21: Signalling Extension MIB Specification".

[12] Cable Television Laboratories, Inc. CL-SP-MIB-BB-I04-100608: "CableLabs® Specifications, Battery Backup MIB", June 8, 2010.

[13] IETF RFC 2578/STD0058: "Structure of Management Information Version 2 (SMIv2)".

[14] ETSI TS 103 161-20: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 20: Management Event MIB Specification".

[15] IETF RFC 4293: "Management Information Base for the Internet Protocol (IP)", April 2006.

[16] IETF RFC 4682: "Multimedia Terminal Adapter (MTA) Management Information Base for PacketCable - and IPCablecom-Compliant Devices", December 2006.

[17] IETF RFC 5098: "Signaling MIB for PacketCable and IPCablecom Multimedia Terminal Adapters (MTAs)", February 2008.

[18] IETF RFC 5428: "Management Event Management Information Base (MIB) for PacketCable- and IPCablecom-Compliant Devices", April 2009.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 103 161-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 2: Architectural framework for the delivery of time critical services over Cable Television Networks using Cable Modems".

[i.2] Cable Television Laboratories, Inc. CL-SP-MIB-CLABDEF-I09-110210: "CableLabs® Definition MIB Specification", February 10, 2011.

[i.3] IETF RFC 2013: "SNMPv2 MIB for the User Datagram Protocol Using SMIv2".

[i.4] IETF RFC 3418: "Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)".

[i.5] ETSI TS 103 161-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 4: Network Call Signalling Protocol".

[i.6] ETSI TS 103 161-9: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 9: Security".

[i.7] IETF RFC 3410: "Introduction and Applicability Statements for Internet Standard Management Framework".

[i.8] IETF RFC 3411: "An Architecture for Describing Simple Network Management Protocol (SNMP)".

[i.9] IETF RFC 3412: "Message Processing and Dispatching for the Simple Network Management IETF RFC 3413/STD0062, Simple Network Management Protocol (SNMP) Applications".

[i.10] IETF RFC 3414/STD0062: "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)".

[i.11] IETF RFC 3415/STD0062: "View-based Access Control Model (VACM) for Simple Network Management Protocol (SNMP)".

[i.12] IETF RFC 2959: "Real-Time Transport Protocol Management Information Base". .

[i.13] ETSI TS 103 161-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Integrated Broadband Cable and Television Networks; IPCablecom 1.5; Part 3: Audio Codec Requirements for the Provision of Bi-Directional Audio Service over Cable Television Networks using Cable Modems".

3 Definitions and abbreviations

3.1 Definitions

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

access control: limiting the flow of information from the resources of a system only to authorized persons, programs, processes, or other system resources on a network

authentication: process of verifying the claimed identity of an entity to another entity

embedded MTA: single node that contains both an MTA and a cable modem

endpoint: Terminal, Gateway or Multipoint Conference Unit (MCU)

gateway: devices bridging between the IPCablecom IP Voice Communication world and the PSTN

Multimedia Terminal Adapter (MTA): device that 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

network management: functions related to the management of data across the network

Real-time Transport Protocol (RTP): protocol for encapsulating encoded voice and video streams

3.2 Abbreviations

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

AP	Access Point
CM	DOCSIS® Cable Modem
CMS	Call Management Server
CODEC	COder-DECoder
DOCSIS®	Data-Over-Cable Service Interface Specifications
DSP	Digital Signal Processor
DTMF	Dual Tone Multi Frequency
E-MTA	Embedded MTA
IETF	Internet Engineering Task Force
IFMIB	Interfaces Group Managed Information Block
IP	Internet Protocol
MAC	Message Authentication Code
MGPPI	Multiple Grants Per Interval
MIB	Management Information Base
MTA	Multimedia Terminal Adapter
NCS	Network Call Signalling

PSTN	Public Switched Telephone Network
QoS	Quality of Service
RFC	Request for Comments
RTCP	Real-Time Control Protocol
RTP	Real-time Transport Protocol
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
UPS	Uninterrupted Power Supply
USM	User-based Security Model
VACM	View Access Control Module
VoIP	Voice-over-IP

4 Void

5 Overview

IPCablecom MIB modules are designed to provide necessary functionality defined in IPCablecom 1.5 specifications. The MIB design follows the same multi-phase schedule as the rest of IPCablecom specifications. Table 1 lists IPCablecom functional areas that are in scope of IPCablecom 1.5. Additionally, in the present document, the term "DOCSIS®" is used to refer to DOCSIS® version 1.1 or later, unless explicitly specified otherwise.

5.1 IPCablecom Reference Architecture

The conceptual diagram for the IPCablecom architecture is shown in figure 1.

Please refer to the architecture document [i.1] for more detailed information concerning the IPCablecom architecture.

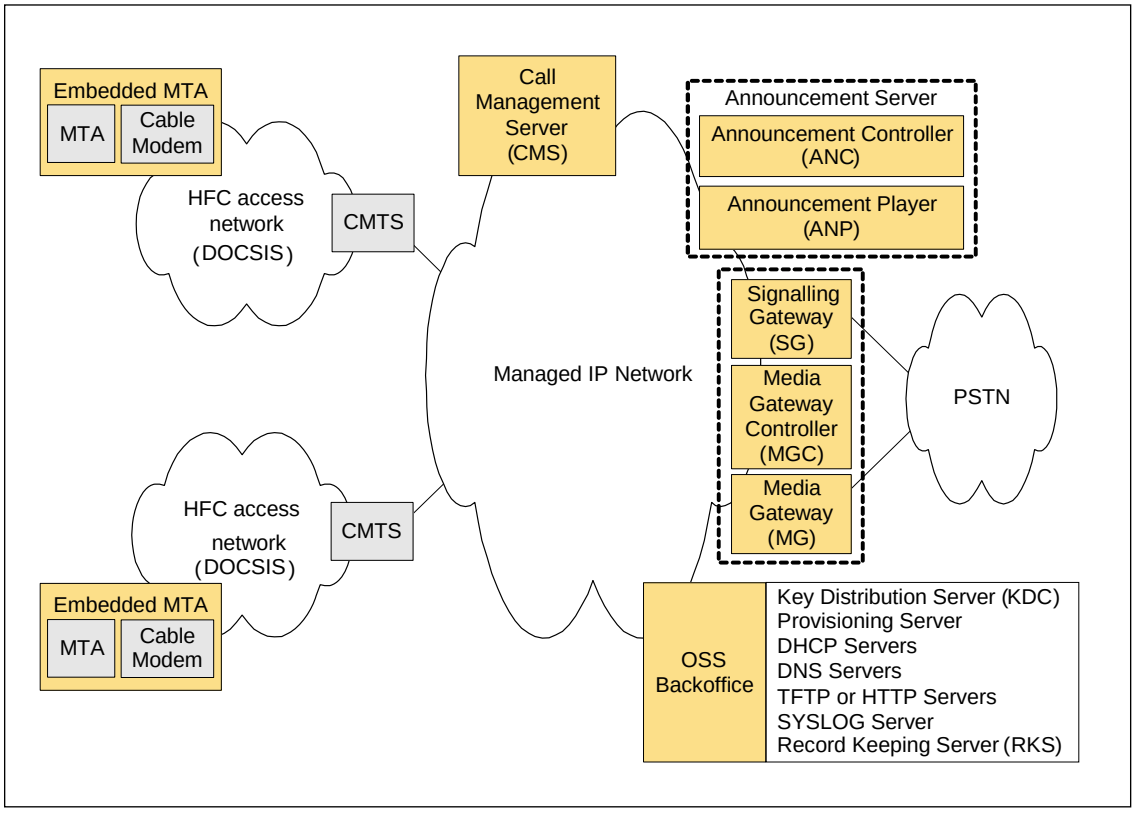

Figure 1: IPCablecom Reference Architecture

5.2 General Requirements

The IPCablecom MIBs Framework Specification follows the Internet Standard Management Framework described in RFC 3410 [i.7]. Additionally, the following requirements have been considered in the design of the IPCablecom MIB modules.

IPCablecom devices must be compliant with DOCSIS®; therefore IPCablecom devices must support DOCSIS® MIBs as defined in clause 6.1 of the present document.

- Take a minimalist approach for design of the IPCablecom MIB modules, i.e. if other MIB modules define the same functions, then rely on these MIB modules rather than create new ones.
- Organize MIB modules to support Embedded MTA (E-MTA).
- Organize MIB modules so as to allow functional partitioning of DOCSIS® (high-speed data) and IPCablecom (voice) features.
- DOCSIS® within IPCablecom applications requires support of SNMPv3 and SNMPv2; therefore IPCablecom MIB agents must comply with SNMPv3 and SNMPv2.
- IPCablecom MIB modules must comply with SMIv2 as defined in IETF STD 58 [13].

In the following clauses we will consider some of these requirements in detail.

5.2.1 Provisioning and Network Management Service Provider

A single physical device (e.g. E-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.

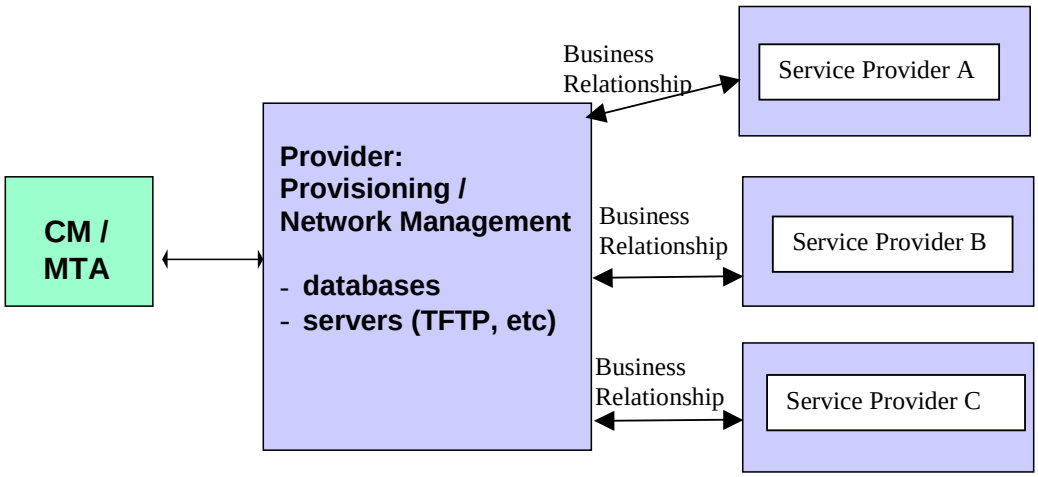

Figure 2: Partitioning of Management Domains

5.2.2 Support for Embedded MTAs

The IPCablecom MIB modules include features for E-MTAs. DOCSIS® Cable Modems with E-MTAs adhere to the DOCSIS® and eDOCSIS® specifications MIBs requirements defined in clause 6.1.

Figure 3 describes the possible MIB module implementation for an E-MTA.

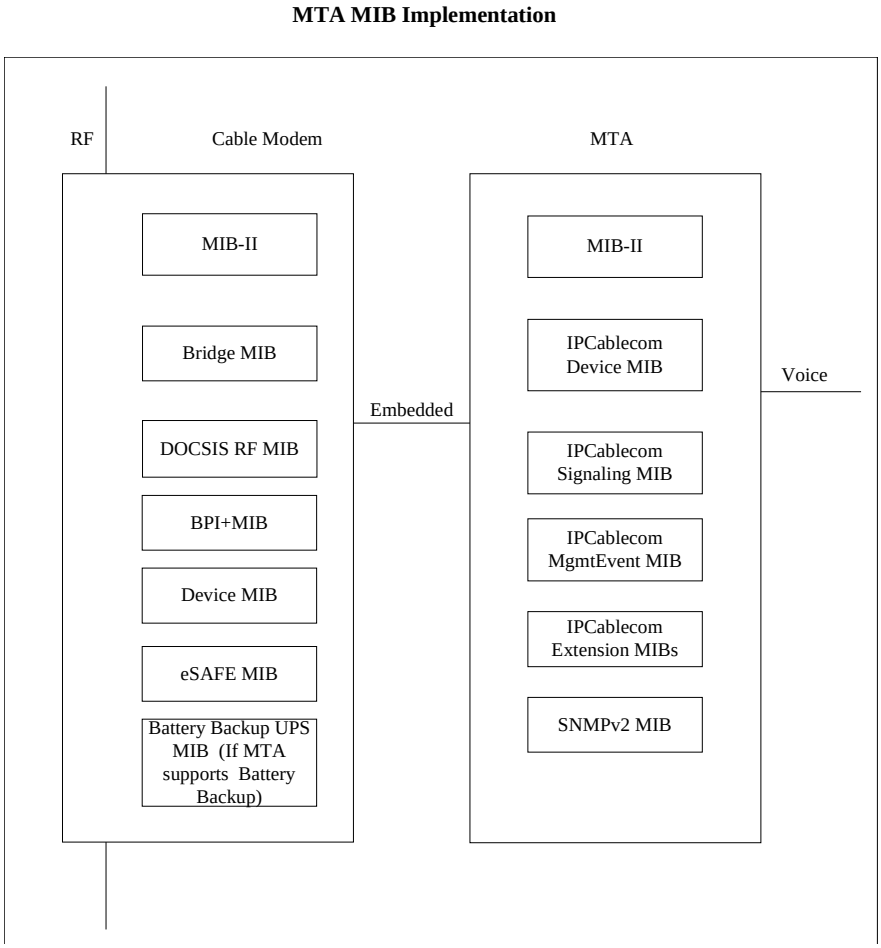

Figure 3: Embedded and Standalone MTA implementations

5.2.3 SNMP Considerations

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

IPCablecom MIB modules must conform to SMIv2 [13].

The following IETF RFCs provide more information on SNMPv3:

- IETF RFC 3410 [i.7],
- IETF RFC 3411 [i.8],
- IETF RFC 3412 [i.9],
- IETF RFC 3413 [i.10],
- IETF RFC 3414 [i.10],
- IETF RFC 3415 [i.11].

5.2.3.1 USM Requirements

The usmUserTable must be configured immediately after the AP Reply received from the Provisioning Server with the following entries:

```
usmUserEngineID  - the SNMP local engine id
usmUserName -  MTA-Prov-xx:xx:xx:xx:xx:xx
```

```
usmUserSecurityName - MTA-Prov-xx:xx:xx:xx:xx:xx
usmUserCloneFrom – 0.0
usmUserAuthProtocol -  usmHMACMD5AuthProtocol or
                       usmHMACSHAAuthProtocol
usmUserAuthKeyChange – ""
usmUserOwnAuthKeyChange – ""
usmUserPrivProtocol – usmDESPrivProtocol if privacy indicated in AP Reply,
usmNoPrivProtocol if no privacy is indicated in the AP Reply.
UsmUserPrivKeyChange – ""
UsmUserOwnPrivKeyChange – ""
usmUserPublic ''"
usmUserStorageType - permanent
usmUserStatus – active
```

The xx:xx:xx:xx:xx:xx in the usmUserName and usmUserSecurityName represents the MAC address of the E-MTA.

Initial authentication and privacy keys for this user are derived from the AP Reply message.

New users may be created by cloning as defined in SNMPv3. This may be done through the config file, or later through SNMP Set operations.

5.2.3.2 VACM Requirements

The following VACM entries must be defined for IPCablecom. Other table entries may be implemented at vendor or operator discretion.

VACM views must be defined for IPCablecom as described below.

5.2.3.2.1 VacmSecurityToGroup Table

The following configuration of the vacmSecurityToGroup table provides a read/write/create view.

```
vacmSecurityModel - USM
vacmSecurityName -  "MTA-Prov-xx:xx:xx:xx:xx:xx'
vacmGroupName - 'PacketCableFullAccess'
vacmSecurityToGroupStorageType - permanent
vacmSecurityToGroupStatus - active
```

5.2.3.2.2 vacmAccessTable

The vacmAccessTable must be configured with the following entries. Other table entries may be implemented at vendor or operator discretion.

5.2.3.2.2.1 Full Access

This configuration allows for read access of all MIB modules in the E-MTA, write access to IPCablecom MIB modules, and notifications as defined in the IPCablecom MIB modules:

```
vacmGroupName – PacketCableFullAccess
vacmAccessContextPrefix – ""
vacmAccessSecurityModel - USM
vacmAccessSecurityLevel – authPriv or authNoPriv, depending on whether privacy has been specified
vacmAccessContextMatch – exact
vacmAccessReadViewName – ReadOnlyView
vacmAccessWriteViewName – FullAccessView
vacmAccess NotifyViewName – NotifyView
vacmAccessStorageType – permanent
vacmAccessStatus  - active
```

5.2.3.2.3 MIB View Requirements

The FullAccessView must consist of the MIB2 system group, the IFMIB, and all IPCablecom defined MIB modules. It may include vendor defined MIBs, VACM, USM, and Notifications MIB. The following lists the required OIDs:

```
1.3.6.1.2.1.1            /* MIB-II system group MIB tree */
1.3.6.1.2.1.2.2          /* MIB-II IF MIB tree */
1.3.6.1.4.1.4491.2.2     /* PacketCable Project MIB tree */
1.3.6.1.6.3.13           /* NOTIFY MIB tree */
1.3.6.1.6.3.15           /* USM MIB tree */
```

```
1.3.6.1.6.3.16            /* VACM MIB tree */
```

The ReadOnlyView must consist of the entire MIB tree contained in the MTA, including IPCablecom defined MIB modules, and vendor defined MIB modules for IPCablecom.

```
1.3.6.1                  /*  Full Internet MIB Tree*/
```

The NotifyView must consist of the MTA MIB tree, MIB-2 System MIB tree and the snmpTrapOID MIB. It may include vendor defined MIB modules.

```
1.3.6.1.4.1.4491.2.2.1  /*MTA mib tree*/
1.3.6.1.2.1.1           /* MIB-2 system mib tree */
1.3.6.1.6.3.1.1.4.1.0   /* snmpTrapOID mib*/
```

5.3 Functional Requirements

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

5.3.1 IPCablecom Device Provisioning

The IPCablecom MIB modules should provide definitions for attributes that are required in the E-MTA device-provisioning flows. These attributes are documented in the IPCablecom MTA device provisioning specification [1] and include parameters such as CMS identifier, E-MTA domain name, E-MTA server addresses, and E-MTA capabilities. These attributes are defined as configuration file attributes and/or MIB objects as needed.

5.3.2 Security

The IPCablecom MIB modules provide definitions for attributes that are required for security handshake of the E-MTA and the provisioning server. These attributes include certificates and signatures.

5.3.3 Voice interfaces

IPCablecom MIB modules should provide a generic external interface to voice service management attributes. This should be done so as to allow a device to implement proprietary mechanisms for internal control and management of voice interfaces.

5.3.4 IPCablecom Voice Call Signalling

The IPCablecom MIB modules should provide managed objects for the NCS call signalling protocol. Examples of attributes that have to be supported for packet voice call signalling include:

- Dial timeouts
- Distinctive ring patterns
- Codec capabilities
- Signalling configuration for voice communication end points
- Call agent identifier

5.3.5 Media Packet Transport

The IPCablecom MIB modules do not provide any managed objects to monitor and manage media packet transport. The RTP and RTCP protocols are used for media transport in IPCablecom [i.13]. The RTP MIB (RFC 2959 [i.12]) may be used for management of the media transport function of the E-MTA but this is considered out of scope for IPCablecom.

5.3.6 Fault Management

The IPCablecom MIB modules should provide objects for the management of network faults and failures. Some of these managed objects and management functions are defined in the IPCablecom MTA MIB [7], the IPCablecom Signalling MIB [9], and Management Event MIB [14] specifications. In addition, these managed objects and functions can also be managed using the IETF MIB modules indicated by [16], [17], and [18], if implemented by the MTA.

5.3.7 Performance Management

The IPCablecom MIB modules should provide objects for the management of network performance when used for voice communications. Further definition of performance management is out of scope of IPCablecom.

5.3.8 Event Management

The IPCablecom Management Event MIB module provides the means to define and distribute events generated by the E-MTA. This provides the ability for vendors to define their own events as well as support of IPCablecom defined events. These events should support modifiable attributes such as priority level. The IPCablecom MIB should allow the ability to log events by a variety of means like local log, syslog, SNMP Traps and SNMP INFORMs. Refer to [14] and [18] for more details.

6 MIB modules Available in an IPCablecom Network

In designing the IPCablecom MIBs Framework, the managed objects present in the other MIB modules implemented by the E-MTA device were taken into consideration. This clause describes the MIB modules that can be present in the E-MTA, and may be used for IPCablecom management functions.

Table 2 lists the MIB modules supported by eMTAs. The eMTA component of the E-MTAs must implement MIB modules present in table 2.

Table 2: MIB modules implemented by the eMTA component of the E-MTA

IF MIB
MIB II
IPCablecom MTA Device MIB
IPCablecom Signalling MIB
IPCablecom Management Event MIB
SNMPv2 MIB group
IPCablecom Extension MIBs

As mentioned before, partitioning of voice and data services and support of E-MTA has been part of the requirements for design of the IPCablecom MIBs Framework. Figure 3 in the General Requirements clause describes possible organizations of the MIB modules in order to meet these requirements.

6.1 DOCSIS® MIB Modules

As described in clause 5.2, the IPCablecom E-MTA requires support of the DOCSIS® MIB. The eCM component of the E-MTA must adhere to the corresponding DOCSIS® MIBs requirements. Refer to the following documents for the normative DOCSIS® MIB requirements:

- For DOCSIS® 1.1, the MIB module requirements are defined in [2].
- For DOCSIS® 2.0, the MIB module requirements are defined in [7].
- For DOCSIS® 3.0, the MIB module requirements are defined in [15].
- For eDOCSIS®, the MIB module requirements are defined in [6].

6.2 IF MIB

The Interfaces Group MIB (IF MIB) is defined in [5]. The IF MIB is required for the definition of multiple interfaces in the E-MTA.

6.3 MIB II

RFC 3418 [i.4], RFC 2011 [4], and RFC 2013 [i.3] define the second version of the Management Information Base (MIB-II) for use with network management protocols in TCP/IP-based internet. Not all objects in this MIB are deemed necessary for the E-MTA device. The IPCablecom MIB module only requires the **system, interfaces, IP,** and **transmission** objects of MIB II to be present in the E-MTA.

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

6.3.1 sysDescr Requirements

The E-MTA's MIB II sysDescr object must conform to the format specified in DOCSIS® OSSI [2].

6.3.2 sysObjectID Requirements

sysObjectID is defined as follows:

```
sysObjectID OBJECT-TYPE
SYNTAX  OBJECT IDENTIFIER
ACCESS  read-only
STATUS  mandatory
DESCRIPTION
   "The vendor's authoritative identification of the network
    management subsystem contained in the entity. This
    value is allocated within the SMI enterprises subtree
    (1.3.6.1.4.1) and provides an easy and unambiguous
    means for determining `what kind of box' is being
    managed. For example, if vendor `Flintstones, Inc.'
    was assigned the subtree 1.3.6.1.4.1.4242, it could
    assign the identifier 1.3.6.1.4.1.4242.1.1 to its `Fred
    Router'."
::= { system 2 }
```

By using sysObjectID the manager will be able to determine any enterprise specific MIBs which must be used to manage the E-MTA.

6.3.3 "iftable" Requirements

IPCablecom ifTable must contain information about all IPCablecom endpoints. IfIndex must start with value of 9 for telephony endpoints and must be incremented sequentially and match the physical numbering of the telephony endpoints (Indices 2 through 8 are reserved for future use and the usage of index 1 is defined later in this clause.) Each instance of the end-point in an E-MTA must have a corresponding entry ("conceptual row") in the "ifTable" MIB table.

For each "conceptual row" in the "ifTable" table that corresponds to a Telephony Endpoint, the following conceptual columns must be used:

- "ifIndex"
- "ifDescr"
- "ifType"
- "ifAdminStatus"
- "ifOperStatus"

Each conceptual row in "ifTable" must conform to the "IANAifType-MIB" definition for the IPCablecom interface type:

- "ifType" – voiceOverCable (198)
- "ifDescr" – "Voice Over Cable Interface"

IfIndex 1 is used to recognize the DOCSIS® Cable Modem behind which an MTA is connected and the MIB modules involved are indicated in tables 3 and 4. In the case of an E-MTA the tables 3 and 4 must be adhered to.

E-MTAs must implement [2], [3], and [4]. An IPCablecom MTA implementation must conform to the ifTable and ipNetToMediaTable defined in tables 3 and 4, respectively. If an E-MTA is embedded with an eCM that supports IPv6, it must also support the ipNetToPhysicalTable as specified in table 5.

Table 3: RFC 2863 [5] ifTable, MIB-Object Details for E-MTA Device Interfaces

RFC 2863 [5] MIB-Object Details for E-MTA Device Interface	MTA Device
IfIndex	1
ifDescr: must match the text provided in the next column.	"DOCSIS® Embedded Interface "
IfType	other(1)
IfMtu	0
IfSpeed	0
ifPhysAddress	eMTA MAC address
IfAdminStatus : Only up control is required for this interface, down(2) and testing(3) is out of the scope of the present document.	up(1)
ifOperStatus: only up report is required for this object, other options are out of the scope of the present document.	up(1)
IfLastChange	per RFC 2863 [5]
ifInOctets: This object is optional, if not implemented, it must return 0	(n), 0
IfInNUCastPkts	Deprecated
IfInDiscards	0
IfInErrors	0
IfUnknownProtos	0
ifOutOctets: This object is optional, if not implement must return 0	(n), 0
ifOutUCastPkts: This object is optional, if not implemented, it must return 0	(n), 0
IfOutNUCastPkts	Deprecated
IfOutDiscards	0
IfOutErrors	0
IfOutQlen	Deprecated
IfSpecific	Deprecated
ifXTable: entries in ifXtable for this type of interface are not required	NA

Table 4: RFC 2011 [4] ipNetToMedia MIB-Object Details for E-MTA Device Interfaces

RFC-2011 MIB-Object details for E-MTA Devices Interfaces	CM device
IpNetToMediaIfIndex	1
IpNetToMediaPhysAddress	CM MAC Address
IpNetToMediaNetAddress	Acquired CM IP address or a value of '0.0.0.0' if the eCM address cannot be represented (e.g. IPv6 eCM)
IpNetToMediaType	Static(4) or invalid(2) if ipNetToMediaNetAddress is set to a value of '0.0.0.0'
IfIndex	1

Table 5: ipNetToPhysicalTable MIB Object Details

MIB Object Name	CM device
ipNetToPhysicalIfIndex	1
ipNetToPhysicalPhysAddress	eCM MAC Address
ipNetToPhysicalNetAddressType	ipv4(1) or ipv6(2)
ipNetToPhysicalNetAddress	eCM IP Address
ipNetToPhysicalLastUpdated	<refer to [15]>
ipNetToPhysicalType	static(4)
ipNetToPhysicalState	<refer to [15]>
ipNetToPhysicalRowStatus	'active'

6.4 IPCablecom SIGNALLING MIB

The IPCablecom Signalling MIB module is defined in [9]. It describes Call Signalling information for the E-MTA device provisioning and configuration. The PacketCable Signalling MIB module is registered under the CableLabs® private enterprise MIB under the PacketCable Project branch (clabProjPacketCable).

The IPCablecom Signalling MIB module contains general configuration information that applies to the Network Call Signalling (NCS) protocol [i.5] on a per MTA device basis. This data only provides the means to provision call signalling parameters on a device basis.

The IPCablecom Signalling MIB module also defines managed objects applicable on a per endpoint basis. The NCS endpoint table (pktcSigEndPntConfigTable) contains specific NCS endpoint configuration information. This data only provides the means to provision network call signalling per endpoint.

6.4.1 MTA SIGNALLING MIB general configuration information

The MTA SIGNALLING MIB contains general configuration information that applies to network call signalling on a device basis.

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

6.4.2 MTA NCS MIB per endpoint data

The MTA NCS MIB 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 the IPCablecom NCS specification [i.5] This data only provides the means to provision network call signalling per endpoint.

6.5 IPCablecom MTA MIB module

The IPCablecom MTA MIB module is defined in [7]. It describes data for provisioning the MTA device. The PacketCable MTA MIB module is registered under the CableLabs® private enterprise MIB under the PacketCable Project branch (clabProjPacketCable).

The IPCablecom MTA MIB module contains general configuration information to provision the MTA device. These objects describe the provisioning data for the required servers, the MTA security information.

6.6 Event Management MIB

The IPCablecom Management Event MIB module is defined in [14]. It provides a common data and format definition for events (informative, alarm, etc.). It also specifies by what means events are transmitted. Use of a common event mechanism facilitates management of the E-MTA in a multi-vendor environment and provides a standard means to implement IPCablecom specified events.

6.7 SNMP MIB

The SNMPv2 MIB module defines the functionality to configure the endpoint in SNMPv2 mode and helps in managing all the MIB objects using SNMPv2 functionality.

6.8 IPCablecom Extension MIB

The IPCablecom Extension MIB is defined in [i.2]. These MIBs are extending the existing IPCablecom1.0 MIB functionality. The extensions are in the areas of MTA MIB and Signalling MIB.

6.8.1 MTA MIB Extension:

The IPCablecom MTA MIB Extension is defined in [10]. This provides the additional functionality for controlling new functionality like Multiple Grants Per Interval (MGPPI) on the endpoint

6.8.2 Signalling MIB Extension

The IPCablecom Signalling MIB Extension is defined in [11]. This provides additional control and reporting functionality for endpoints in the areas of DTMF relay, Quarantine handling, Hookstate etc.

6.9 eDOCSIS® eSAFE MIB

The eDOCSIS® eSAFE MIB is defined in [6]. It describes the various management objects necessary to configure functionality of eSAFE components of a device implementing an eDOCSIS®-compliant cable modem and one or more eSAFE elements. This MIB must be accessible via the eCM interface.

6.10 Battery Backup UPS MIB

The Battery Backup UPS MIB is defined in [12]. It must be implemented by the E-MTAs which support Battery Backup functionality. Battery Backup UPS MIB describes the various management objects necessary to control the Battery Backup UPS functionality implemented by the E-MTA. The MIB must be accessible via the eCM interface.

7 IPCablecom MIB module Implementation

This clause describes a reference implementation of the MIB modules in an IPCablecom device. Only E-MTA is considered in this clause.

7.1 MTA components

Figure 4 shows the components of a typical E-MTA.

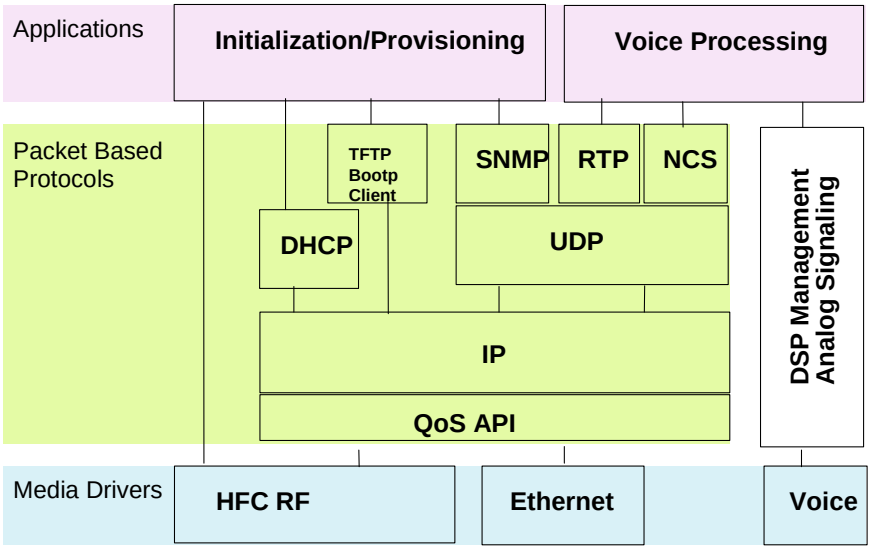

Figure 4: E-MTA Components

As shown here the E-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. MIB modules that are implemented in the MTA have to be organized so as to facilitate this separation. IPCablecom MIB modules specify functions for the packet based protocol clause of the E-MTA. As of this writing there are no analog voice MIB modules specified for the E-MTA.

NOTE: Please refer to the IPCablecom Security Specification [i.6] for the security protocols.

7.2 MIB Layering

Figure 5 below describes the MIB layering model. The two stacks represent the packet network and analog voice sections of the MTA. On the packet network side MIB layering follows the same layering model as the protocol stacks.

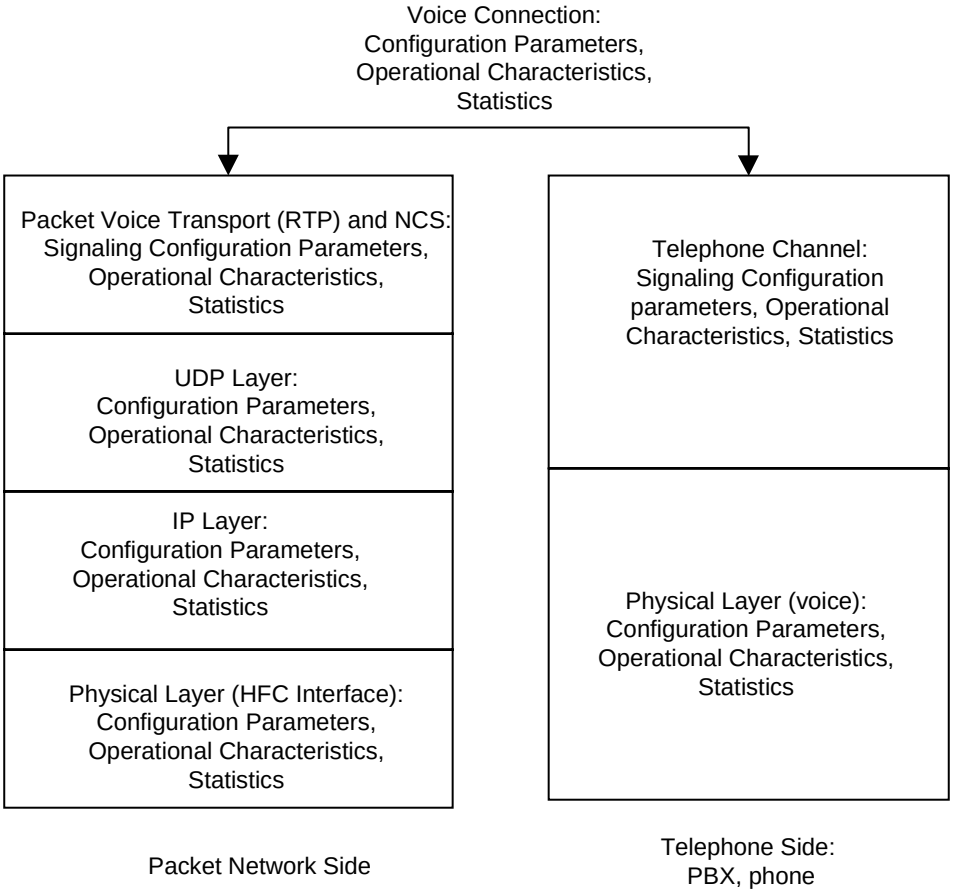

Figure 5: MIB Layering Model

In the context of voice communications, MIB modules can be layered into the physical layer attributes, which deal with the voice interface, and the telephone channel attributes which deal with voice signalling.

Annex A (informative): Bibliography

- IETF STD0062: "Simple Network Management Protocol Version 3 (SNMPv3)", December 2002.
- Cable Television Laboratories, Inc. SP-CMCI-C01-081104: "Data-Over-Cable Service Interface Specifications, Cable Modem to Customer Premise Equipment Interface Specification (CMCI)", November 4, 2008.
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- IETF RFC 1493: "Definitions of Managed Objects for Bridges".
- IETF RFC 3665: "Definitions of Managed Objects for the Ethernet-like Interface Types", September 2003.
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History

Document history		
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