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Packetcable/IPCablecom MIB Framework
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Abstract
This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it provides information on the management requirements

of PacketCable(TM)/IPCablecom specific devices and defines a framework in which PacketCable MIBs are defined. This document does not precede any previously issued document. It is, however, intended to support and complement the actual Packetcable MIB documents, which are issued separately.

Specification Language

Throughout this document, the words that are used to define the significance of particular requirements are capitalized. These words are:

"MUST - This word or the adjective "REQUIRED" means that the item is an absolute requirement of this specification.

"MUST NOT" - This phrase means that the item is an absolute prohibition of this specification.

"SHOULD" - This word or the adjective "RECOMMENDED" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighed before choosing a different course.

"SHOULD NOT" - This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or event useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.

"MAY" - This word or the adjective "OPTIONAL" means that this item is truly optional. One vendor may choose to include the item

because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

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1. Introduction and scope

This document addresses aspects of the voice communication capabilities
and the related network management requirements of a PacketCable network. It defines a framework for categorizing the capabilities and addressing the requirements and the resulting MIBs to be implemented by
elements of a Packetcable network.

The MIB design itself follows the multi-phase schedule as the rest of the PacketCable specifications. MIBs that are developed for

PacketCable 1.x support embedded and Standalone MTAs and provide definitions for call signaling and MTA provisioning functions. Future PacketCable development phases will include other functional areas as well as requirements for other PacketCable components. Table 1 illustrates the areas covered by Packetcable 1.x and provides a glimpse of the areas that would be considered later. Refer to Section 8 of this document for a brief explanation of some of the areas mentioned.

Packetcable Specification	Phase	Description/MIB reference
Device Provisioning	1.0	MTA Device MIB Telephony Config File.
Security	1.0	MTA Device MIB Telephony config file
NCS Signaling	1.0	MTA SIGNALING MIB Telephony config file
	Future	CMS Signaling.
CODEC	1.0	MTA SIGNALING MIB
Management Event Mechanism	1.1	Management Event MIB
Standalone MTA	1.2	SMTA MIB
QOS	Future	
Primary Line	Future	
DCS Signaling	Future	
Packet Voice Transport	Future	
Performance	Future	Incorporation of RTP MIB Additions to Signaling MIB

Table 1 Packetcable Functional MIB Areas.

However, it is to be noted that the legal/regulatory classification of IP-based voice communications provided over cable networks or otherwise, and the legal/regulatory obligations, if any, borne by providers of such voice communications, are not yet fully defined by appropriate legal and regulatory authorities. Nothing in this specification is addressed to, or intended to affect, those issues. In particular, while this document uses standard terms such as "call," "call signaling," "telephony," etc., it is evident from this document and appropriate references [REFERENCES] that while a Packet-Cable network performs activities analogous to corresponding PSTN functions, the manner by which it does so differs considerably from the manner in which they are performed in the PSTN telecommunications carriers. These differences may be significant for legal/regulatory purposes.

2. TERMS AND DEFINITIONS

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.

Active

A service flow is said to be "active" when it is permitted to forward data packets. A service flow must first be admitted before it is active.

Admitted

A service flow is said to be "admitted" when the CMTS has reserved resources (e.g., bandwidth) for it on the DOCSIS network.

Authentication

The process of verifying the claimed identity of an entity to another entity.

Digital certificate
------- -----------
A binding between an entity's public key and one or more attributes relating to its identity, also known as a public key certificate.

Digital signature
------- ---------
A data value generated by a public-key algorithm based on the contents of a block of data and a private key, yielding an individualized cryptographic checksum.

Downstream

The direction from the head-end toward the subscriber location.

Endpoint

A Terminal, Gateway or Multipoint Conference Unit.

Event Message
----- -------
A message capturing a single portion of a connection.

Flow [DOCSIS Flow]

A unidirectional sequence of packets associated with a Service ID and a QoS. Multiple multimedia streams may be carried in a single DOCSIS Flow. Also known as a DOCSIS-QoS "service flow")

Flow [IP Flow]

A unidirectional sequence of packets identified by OSI Layer 3 and Layer 4
header information. This information includes source/destination IP addresses, source/destination port numbers, protocol ID. Multiple multimedia streams may be carried in a single IP Flow.

Gateway

Devices bridging between the PacketCable IP Voice Communication world and the PSTN. Examples are the Media Gateway, which provides the bearer
circuit interfaces to the PSTN and transcodes the media stream, and the
Signaling Gateway, which sends and receives circuit switched network signaling to the edge of the PacketCable network.

Header

Protocol control information located at the beginning of a protocol data
unit.

Kerberos

A secret-key network authentication protocol that uses a choice of cryptographic algorithms for encryption and a centralized key database for authentication.

Key

A mathematical value input into the selected cryptographic algorithm. Key Exchange The swapping of public keys between entities to be used to
encrypt communication between the entities.

Network Layer
------- -----
Layer 3 in the Open System Interconnection (OSI) architecture that provides network information that is independent from the lower layers.

Network Management
------- ----------
The functions related to the management of data across the network.

Network Management OSS
------- ---------- ----
The functions related to the management of data link layer and physical layer resources and their stations across the data network supported by the hybrid fiber/coax system.

Privacy

A way to ensure that information is not disclosed to any one other then the intended parties. Information is usually encrypted to provide confidentiality. Also known as confidentiality.

Public Key Certificate
------ --- -----------
A binding between an entity's public key and one or more attributes relating to its identity, also known as a digital certificate.

Public Key Cryptography
------ --- ------------
A procedure that uses a pair of keys, a public key and a private key, for encryption and decryption, also known as an asymmetric algorithm. A user's public key is publicly available for others to use to send a message to the owner of the key. A user's private key is kept secret and is the only key that can decrypt messages sent encrypted by the user's public key.

Subflow

A unidirectional flow of IP packets characterized by a single source and destination IP address and single source and destination UDP/TCP port.

Systems Management
------- ----------
Functions in the application layer related to the management of various
Open Systems Interconnection (OSI) resources and their status across all layers of the OSI architecture.

Upstream

The direction from the subscriber location toward the headend.

X.509 certificate
----- -----------
A public key certificate specification developed as part of the ITU-T **X.500 standards directory.**

3. ABBREVIATIONS

BPI+

Baseline Privacy Plus Interface Specification. The security portion of
the DOCSIS 1.1 standard that runs on the MAC layer.

CA
--
1. Certification Authority. A trusted organization that accepts certificate applications from entities, authenticates applications,
issues certificates and maintains status information about certificates.

2. **Call Agent. The part of the CMS that maintains the communication** state, and controls the line side of the communication.

CM
--
DOCSIS Cable Modem

CMS

Call Management Server. Controls the audio connections. Also called a Call Agent in MGCP/SGCP terminology. This is one example of an Application Server.

CMTS

Cable Modem Termination System. The device at a cable head-end which implements the DOCSIS RFI MAC protocol and connects to CMs over an HFC network.

CMSS

CMS-to-CMS Signaling

Codec

COder-DECoder

DHCP

Dynamic Host Configuration Protocol

DNS

Domain Name Service

DOCSIS

Data-Over-Cable Service Interface Specifications [REFERENCE]

DqoS

Dynamic Quality-of-Service. Assigned on the fly for each communication depending on the QoS requested.

E-MTA

Embedded MTA. A single node that contains both an MTA and a cable modem.

FQDN

Fully Qualified Domain Name. Refer to IETF RFC 821 and RFC 1034 [REFERENCE]for details.

GC
--
Gate Controller

HFC

Hybrid Fiber/Coax coaxial able). An HFC system is a broadband bi-directional shared media transmission system using fiber trunks between
the head-end and the fiber nodes, and coaxial distribution from the fiber nodes to the customer locations.

IANA

Internet Assigned Numbered Authority. See www.ietf.org for details.

IETF

Internet Engineering Task Force. A body responsible, among other things, for developing standards used on the Internet. See www.ietf.org for details

IP
--
Internet Protocol. An Internet network-layer protocol.

KDC

Key Distribution Center

MIB

Management Information Base

MSO

Multi-System Operator. A cable company that operates many head-end locations in several cities.

MTA

Multimedia Terminal Adapter. Contains the interface to a physical voice device, a network interface, CODECs, and all signaling and encapsulation functions required for VoIP transport, class features signaling, and QoS signaling.

NCS

Network Call Signaling

OID

Object Identifier

OSS

Operations Systems Support. The back-office software used for
configuration, performance, fault, accounting, and security
management.

QoS

Quality of Service. Guarantees network bandwidth and availability for
applications.

RFC

Request for Comments. Technical policy documents approved by the IETF
which are available on the World Wide Web at
http://www.ietf.cnri.reston.va.us/rfc.html

RFI

The DOCSIS Radio Frequency Interface specification.

RKS

Record Keeping Server. The device, which collects and correlates the
various Event Messages.

SG
--
Signaling Gateway. An SG is a signaling agent that receives/sends SCN
native signaling at the edge of the IP network. In particular, the SS7
SG function translates variant ISUP and TCAP in an SS7-Internet
Gateway
to a common version of ISUP and TCAP.

S-MTA

Standalone MTA. A single node that contains an MTA and a non-DOCSIS
MAC
(e.g., ethernet).

SNMP

Simple Network Management Protocol

TFTP

Trivial File Transfer Protocol

TLV

Type-Length-Value. A tuple within a DOCSIS or Packetcable configuration
file.

ToD

Time-of-Day Server

UDP

User Datagram Protocol. A connectionless protocol built upon Internet Protocol (IP).

VoIP

Voice over IP

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[17] IETF RFC 2572 Message Processing and Dispatching for SNMP.

[18] IETF RFC 2573 SNMPv3 Applications.

[19] IETF RFC 2574 User Based Security Model for SNMPv3.

[20] IETF RFC 2575 View-Based Access Control Model (VACM) for SNMP.

[21] IETF RFC 2578 Structure of SMIv2.

[22] IETF RFC 2579 Textual Conventions for SMIv2

[23] IETF RFC 2959 Real-Time Transport Protocol Management Information Base.

[24] IETF RFC 2863 The Interfaces Group MIB.

[25] IETF RFC 1907 Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2).

[26] IETF RFC 2011 SNMPv2 Management Information Base for the Internet Protocol using SMIv2.

[27] IETF RFC 2013 SNMPv2 Management Information Base for the User Datagram Protocol using SMIv2.

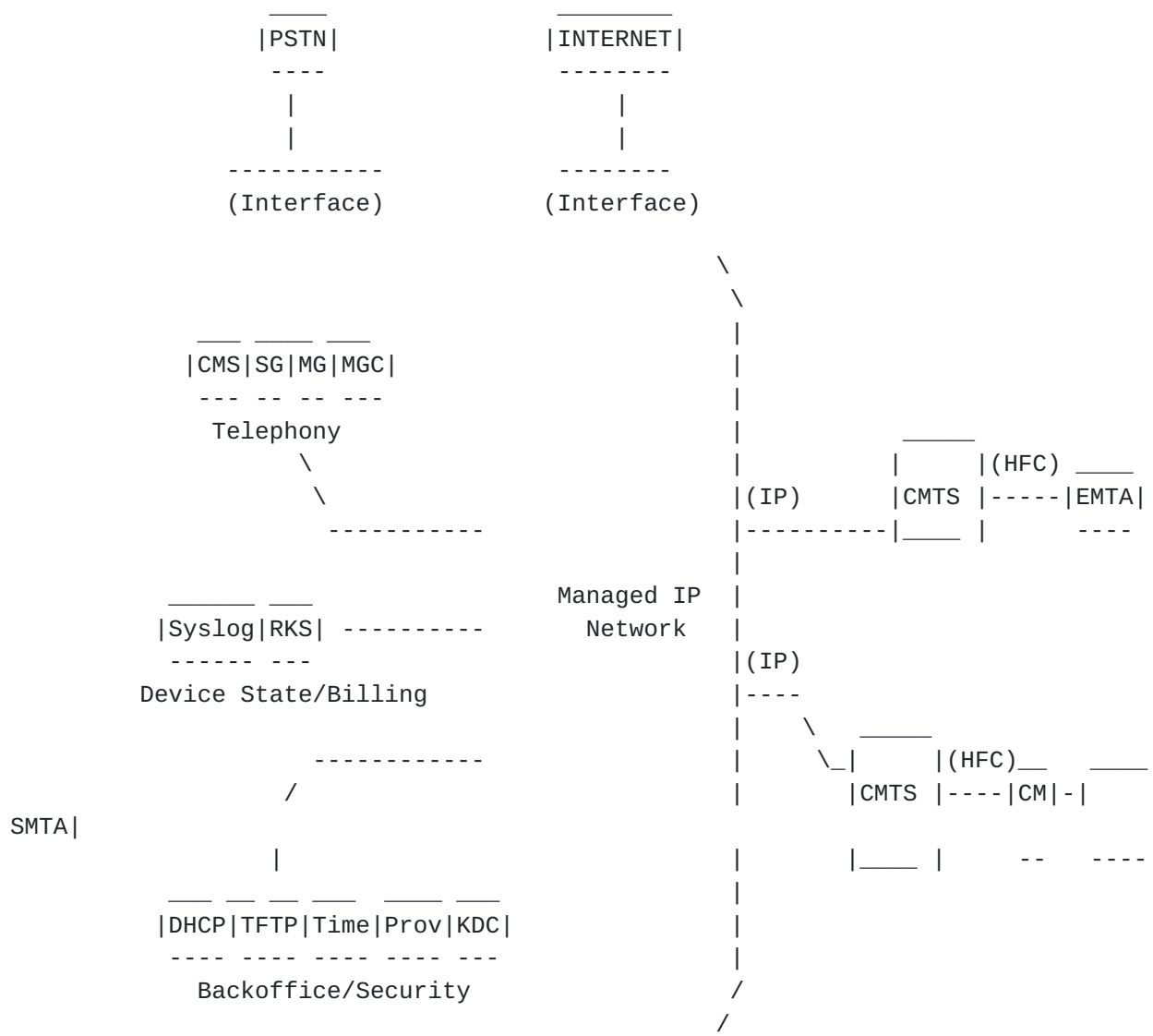
[28] IETF RFC 2665 Definitions of Managed Objects for the Ethernet-like Interface Types.

[29] IETF RFC 1493 Definitions of Managed Objects for Bridges.

5. PacketCable Reference Architecture

A reference PacketCable architecture is as depicted in Figure 1. A detailed explanation of the architecture is out of the scope of this

document and can be obtained from [1].



Legend:

Device components:

CMTS - Cable Modem Termination System
EMTA - Embedded MTA (CM + MTA)

Status/Billing

RKS : Record Keeping Server
Syslog: Sylog Server(Optional)

SMTA - Standalone MTA

Telephony Components:	Backoffice Components:
CMS : Call Management Server	DHCP: Dynamic Host Configuration Protocol
SG : Signaling Gateway	TFTP: Trivial File Transfer Protocol
MG : Media Gateway	Time: Time Server
MGC : Media Gateway Controller	Prov: Provisioning Server
	KDC : Key Distribution Centre

Figure 1. PacketCable Reference Architecture

6. Guidelines and General Management Requirements.

6.1 MIB Framework GuideLines.

The following guidelines were considered in designing the Packetcable MIB framework:

- PacketCable MIBs MUST comply with SMIv2 as specified in [21] and related documents.

- Packetcable MIBs MUST support both embedded and standalone MTAs.

- A minimalist approach MUST be taken while designing the PacketCable MIBs, i.e., if other MIBs define the same functions, then those MIBs should be reused rather than creating new ones.

6.2 Packetcable Device Requirements

The following requirements are imposed by Packetcable on participant devices, specifically:

- The components pertaining to the data part of a PacketCable 1.x network (CM, CMTS) must be compliant with DOCSIS 1.1 and hence MUST support DOCSIS 1.1 MIBs. Refer to [6] and [7] for more information on DOCSIS MIBs.

- DOCSIS 1.1 devices within a PacketCable network require support of SNMPv3 and all end-devices implementing Packetcable MIBs MUST be SNMPv3 compliant as depicted in [19] and related documents.

6.3 Business Management Guidelines

The framework also considered, as a business management guideline, the following:

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.

6.4 Support for Embedded and Standalone MTAs

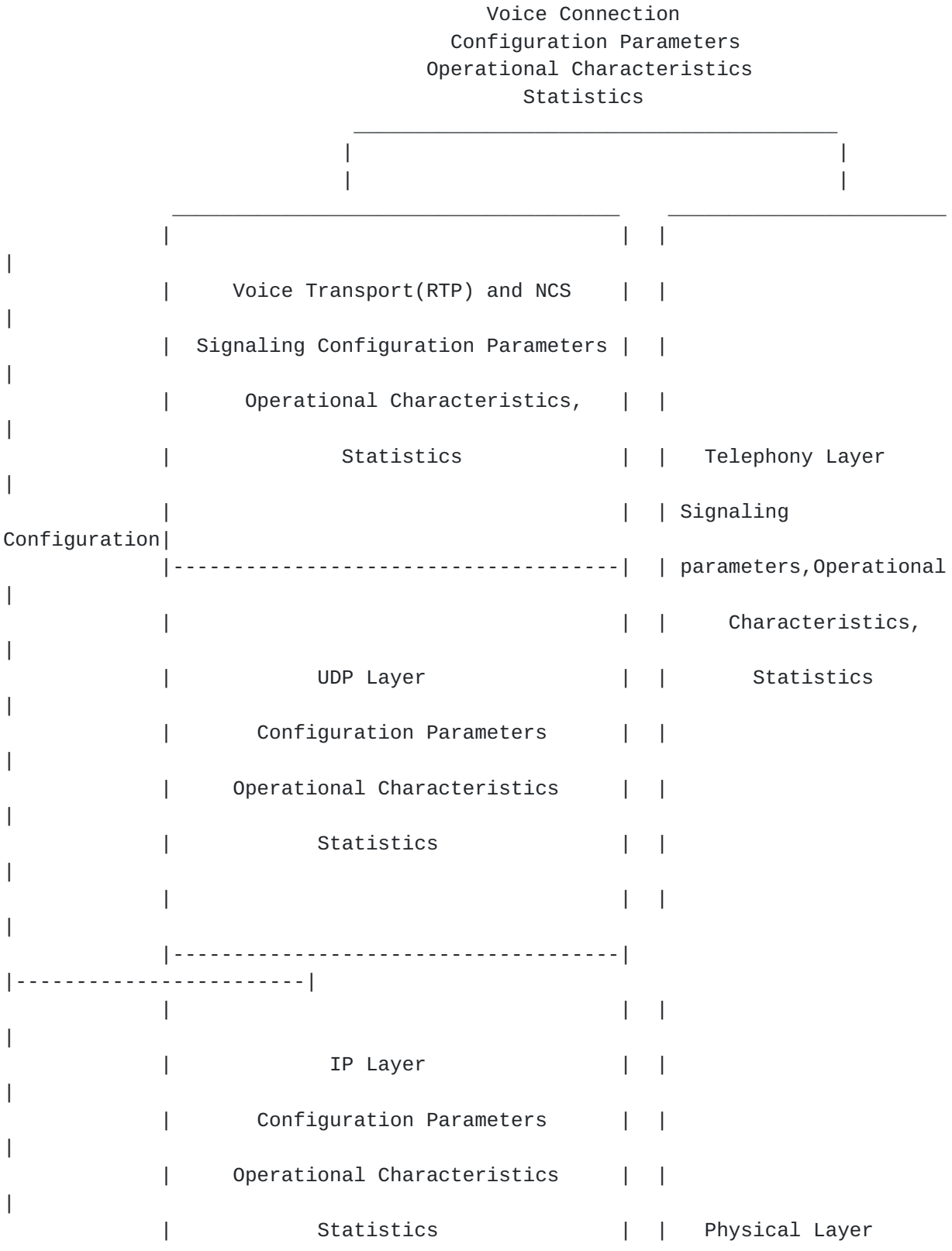
The PacketCable MIBs will provide features for both embedded and standalone MTAs. Standalone MTAs are not required to include any DOCSIS related functions and hence the PacketCable MIBs should be able to provide management support for voice communications functionalities using a standalone MTA device that does not have DOCSIS as a base.

6.5 MIB Layering

Figure 2 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.



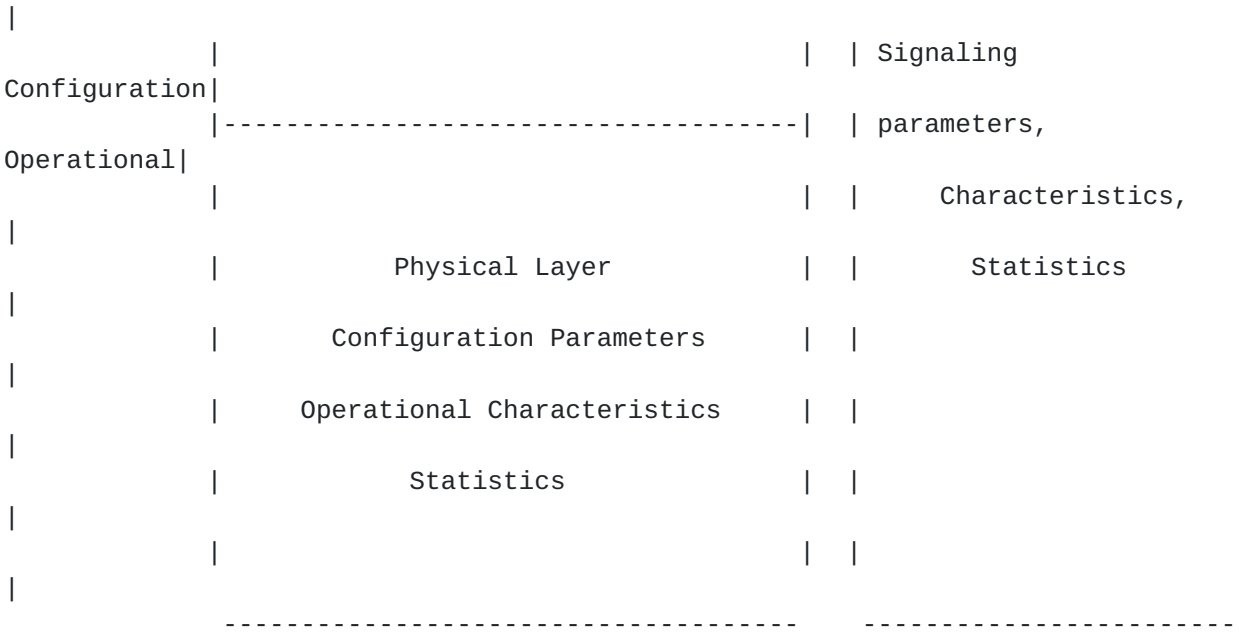


Figure 2. MIB Layering Model

7 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. Refer to [16], [17], [18], [19] and [20] for more information on SNMPv3.

7.1 USM Requirements

For PacketCable 1.0, 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 MTA.

Initial authentication and privacy keys for this user are derived from the AP Reply message. Refer to [3] for more information regarding security in Packetcable and the Key derivation process.

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.

7.2 VACM Requirements

The following VACM entries MUST be defined for PacketCable. Other table entries MAY be implemented at vendor or operator discretion. VACM views MUST be defined for PacketCable as described.

7.2.1 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
```

7.2.2 vacmAccessTable

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

7.2.3 Full Access

This configuration allows for read access of all MIBs in the MTA, write access to PacketCable MIBS, and notifications as defined in the PacketCable MIBs

```
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
```

7.2.4 Notify View

The Notify View configuration provides read only access some MIBs in the MTA. No write access or notifications are defined.

```
vacmGroupName             - PacketCableNotifications
vacmAccessContextPrefix   - ""
vacmAccessSecurityModel   - USM
```

```
                    vacmAccessSecurityLevel   - authPriv or authNoPriv,
depending
                                                on whether privacy has been
                                                specified.
                    vacmAccessContextMatch    - exact
                    vacmAccessReadViewName    - NotifyView
                    vacmAccessWriteViewName   - ""
                    vacmAccess NotifyViewName - ""
                    vacmAccessStorageType     - permanent
                    vacmAccessStatus          - active
```

7.3 MIB View Requirements

The FullAccessView MUST consist of the MIB2 system group, the ifMib, and all PacketCable defined MIBS. It MAY include vendor defined MIBs, VACM, USM, and Notifications MIB. The following lists the required OIDs:

```
                    1.3.6.1                /* Full Internet MIB tree  */
                    1.3.6.1.2.1.1          /* MIB-II system group MIB tree
*/
                    1.3.6.1.2.1.31         /* MIB-II IF MIB tree
*/
                                             1.3.6.1.2.1.TBD        /*
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 PacketCable defined MIBS and vendor defined MIBS.

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

The NotifyView MUST consist of the MTA MIB and Management Event

MIB. It MAY include vendor defined MIBS .

```
1.3.6.1.4.1.4491.2.2.1   /*MTA mib tree*/
1.3.6.1.4.1.4491.2.2.3   /*event mib tree*/
```

8. Functional Requirements

This section describes management functions that are supported by the PacketCable MIB.

8.1 PacketCable Device Provisioning

The PacketCable 1.0 MIB should provide definitions for attributes that are required in the MTA device-provisioning

flows. These attributes are documented in the PacketCable MTA device provisioning specification [3] 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.

8.2 Security

The PacketCable MIB provides definitions for attributes that are required for security handshake of the MTA and the provisioning server. These attributes include certificates and signatures.

8.3 Call Signaling/CODEC

The PacketCable MIB should provide attributes that are needed for management of the call signaling protocol. As of this writing the only call signaling protocol that is being specified by PacketCable is NCS; however, work is also underway

for DCS. Example of attributes that have to be supported for packet voice call signaling include:

* Dial timeouts
* Distinctive ring patterns

* Codec capabilities
* Signaling configuration for voice communication end points
* Call agent identifier

8.4 Management Event mechanism

The PacketCable MIB should provide the means to define and distribute events generated by the MTA. It should provide the ability for vendors to define their own events as well as support PacketCable defined events. These events should support modifiable attributes such as priority level. The PacketCable MIB should allow the ability to log events by a variety of means. These means should include local log, syslog, SNMP traps and SNMP informs. Some means of event thresholding should be supported.

8.5 Standalone MTA

The Packetcable MIB should provide means to define any specific management requirements specific for a Standalone MTA. This would include requirements related to Software Download and others being handled via the undefined DOCSIS interface in the case of Embedded MTAs (Like Network Time).

8.6 QoS (For consideration in future releases of PacketCable)

The PacketCable MIB should provide attributes for support of QoS on the MTA, as well as interoperate with QoS definitions of DOCSIS. Given that DOCSIS MIBs are including QoS attribute definitions, the PacketCable MIB will not be required to repeat these attributes. It might, however, be necessary to define

mechanisms for allocation of specific QoS in the PacketCable MIB in the specific case of voice communications services.

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

8.7 Primary Line Requirements (For consideration in future releases of PacketCable)

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

8.8 Packet Voice Transport (For consideration in future releases of PacketCable)

The PacketCable MIB should provide attributes that can be used to monitor and manage packet voice transport. As of this writing the RTP protocol is used for packet voice transport, and therefore the RTP MIB [23] 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 the 1.x release of the PacketCable MIB as of this writing.

8.9 Fault Management (For consideration in future releases of PacketCable)

The PacketCable MIB should provide attributes that can be used in management of network faults and failures. These attributes and functions related to these attributes are under consideration in the primary line focus group and will be included in the MIB in a later release. These 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.

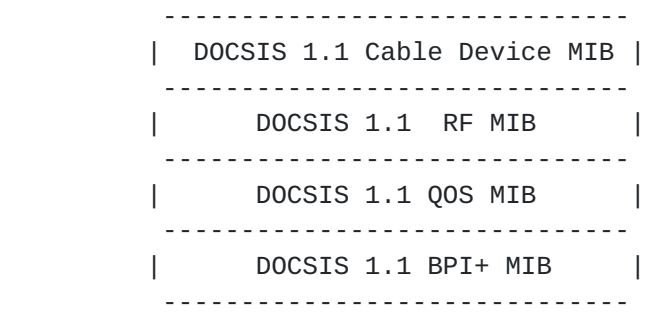
8.10 Performance Management (For consideration in future releases of PacketCable)

The PacketCable MIB should provide attributes that can be used in monitoring of the performance of the network when used for voice communications. As of this writing no focus group is considering performance monitoring aspects of the PacketCable network. Examples of attributes that should be considered for performance monitoring are:
* Packet counts
* Call signaling status

9 MIBS available in a Packetcable Network.

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

The following table lists MIBs that are present in the PacketCable device. Note that the device can be a cable modem or an E-MTA or an S-MTA.



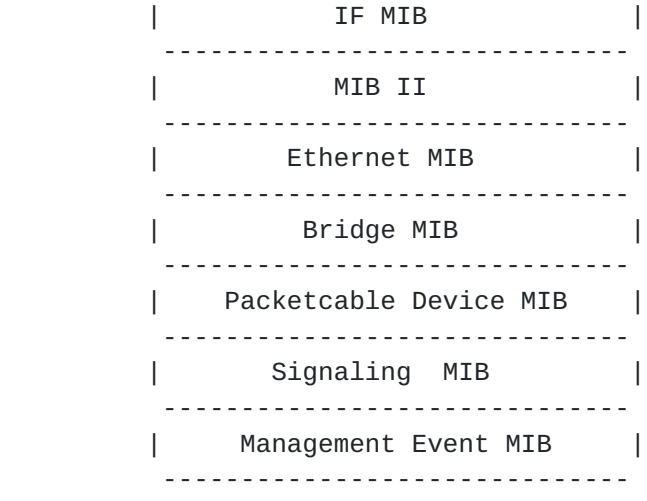


Table 2: Additional MIBs

9.1 DOCSIS 1.1 MIBs

The data-handling part of the PacketCable network is dependent on DOCSIS 1.1 MIBs as defined in [6], [7] and [8].

9.2 IF MIB

This is the interfaces section of MIB II [24], and is needed

for
definitions of multiple interfaces in the MTA.

9.3 MIB II

The second version of the Management Information Base (MIB-II) is defined in [25], [26] and [27] for use with network management protocols in TCP/IP-based internet. Not all objects in this MIB are deemed necessary for the PacketCable MTA device. PacketCable 1.x requires only the system, interfaces, IP, and transmission objects of MIB II to be present in the MTA.

By using sysObjectID the manager will be able to determine any enterprise specific MIBs which must be used to manage the MTAs

```
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 }
```

9.3.1 "iftable" Requirements

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, the following conceptual columns MUST be used:

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

Each conceptual row in "ifTable" MUST conform to the "IANA ifType-MIB" definition for the PacketCable interface type:

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

Each interface of the E-MTA MUST be numbered sequentially according to the DOCSIS 1.1 "Operations Support System Interface Specification[15]"

9.4 Ethernet MIB

Definitions of Managed Objects for Ethernet Like Interfaces as defined in [28].

9.5 Bridge MIB

Definitions of Managed Objects for Bridges as defined in [29].

9.6 PacketCable MTA Signaling MIB

The MTA SIGNALING MIB contains Call Signaling information for provisioning. The MTA SIGNALING MIB is derived as part of the PacketCable enterprise branch of MIB tree. Application for standard acceptance is being discussed. No other functionality other than MTA SIGNALING provisioning is defined at this time,

although future releases of the MTA SIGNALING MIB may enhance the capabilities.

9.6.1 MTA Signaling MIB general configuration information

The MTA SIGNALING MIB contains general configuration information that applies to network call signaling on a device basis. This data only provides the means to provision call signaling on a device basis.

9.6.2 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 signaling on a per endpoint basis. This information is also found in the configuration file defined in the PacketCable NCS specification [4]. This data only provides the means to provision network call signaling per endpoint.

9.7 PacketCable MTA Device MIB

The MTA Device MIB contains data for provisioning the MTA device and supporting the provisioned functions. The data is derived from the PacketCable device provisioning specification [2], and the DOCSIS Cable Device MIB[6]. 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.

9.7.1 MTA Device MIB general configuration information

The MTA Device MIB 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 signaling data.

9.7.2 MTA Device MIB Syslog Information

The MTA Device MIB contains syslog control information similar to DOCSIS. This is to maintain the syslog capability of the voice communication MTA separate from the DOCSIS CM syslog. As in DOCSIS, it supports a syslog

server, local logging, and traps.

9.8 Management Event MIB

The Management Event MIB 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 MTA in a multi-vendor environment and provides a standard means to implement PacketCable specified events.

As mentioned before partitioning of voice and data services and support of both S-MTA and E-MTA has been requirements for design of the MIB. Figures 4 and 5 depict possible organizations of the MIB within an MTA in order to meet these requirements. The common MIB category is basically a collection of MIBs, which can be present on both the cable modem as well as the MTA device.

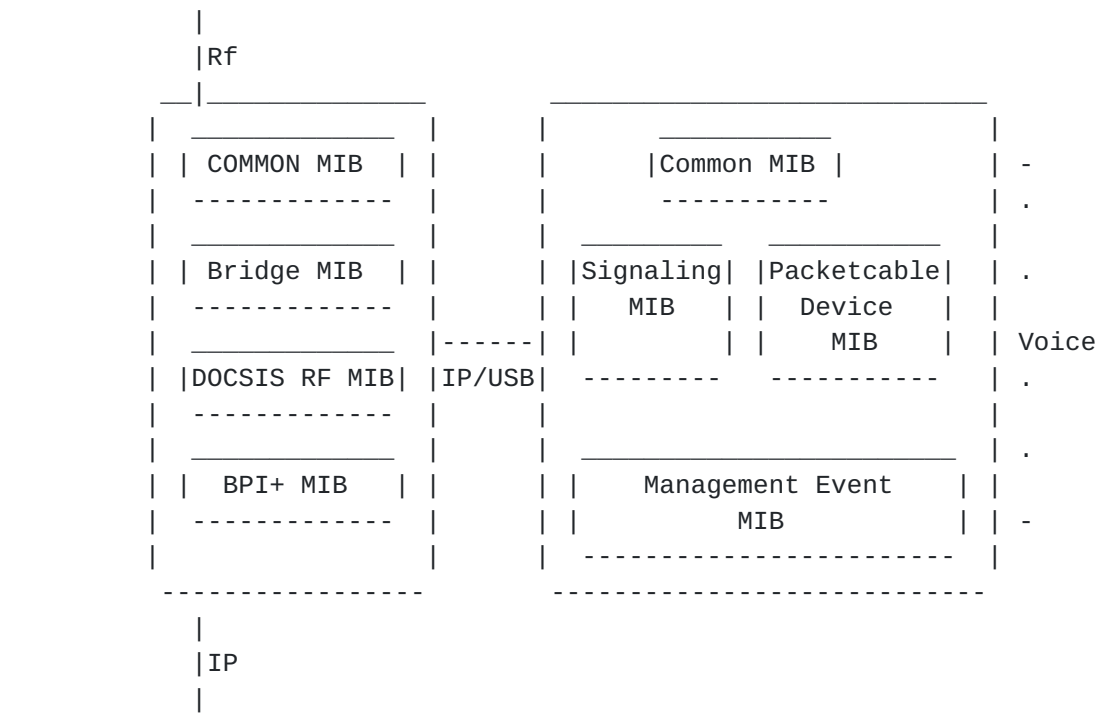
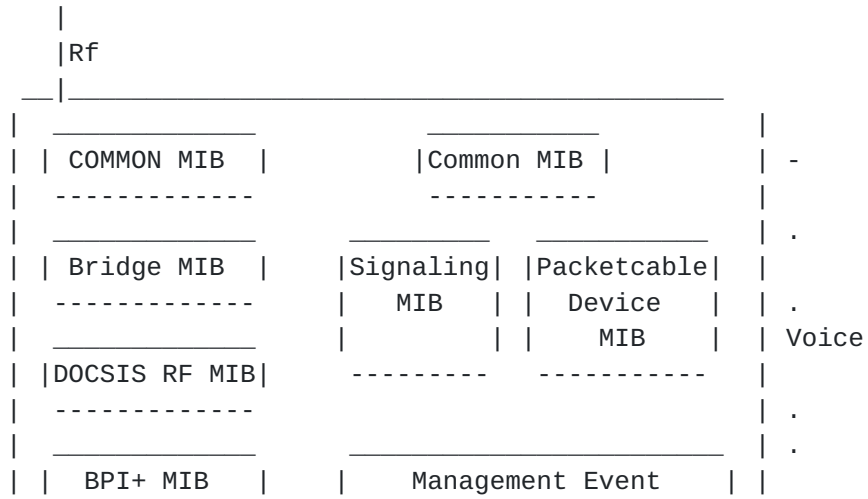


Figure 4 Possible MIB Implementation in an SMTA



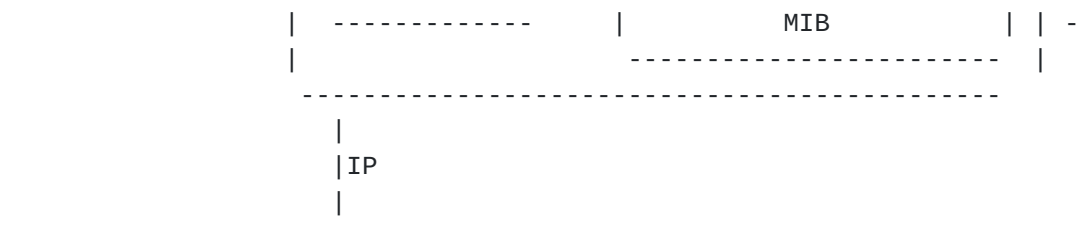
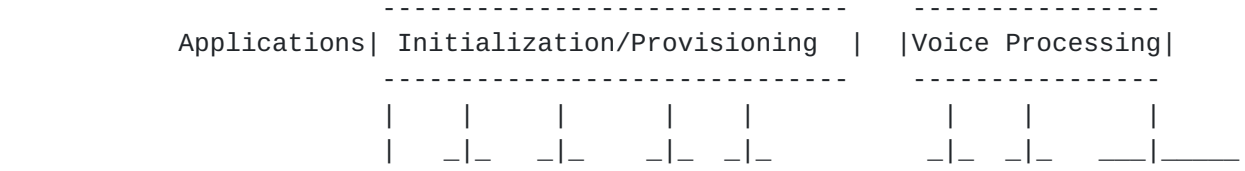


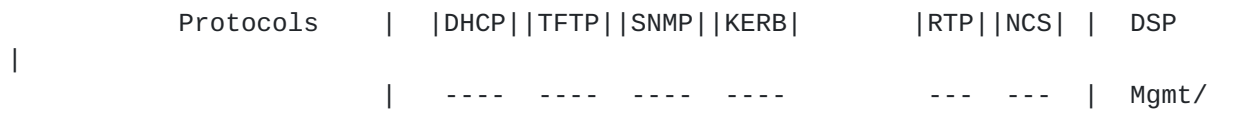
Figure 5 Possible MIB Implementation in an SMTA

10. Functional components of an MTA.

This section identifies the functional areas within an MTA device as per the requirements imposed by Packetcable. As shown in Figure 3, the functional components of the MTA can be organized into two distinct 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. PacketCable 1.0 MIB specifies functions for the packet based protocol section of the MTA. As of this writing there are no analog voice MIBs specified for the MTA.





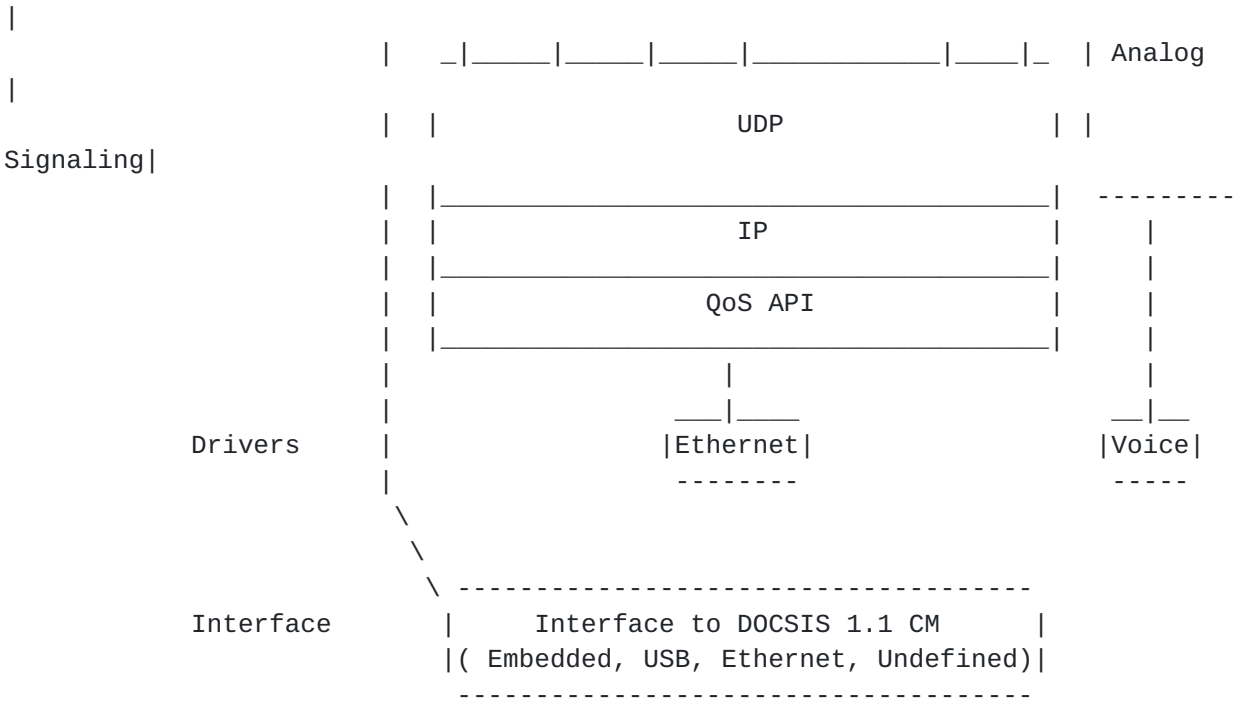


Figure 3. Functional components of an MTA

The actual details are beyond the scope of this document. For further details on the requirements please refer to [1],[2],[3], [4] and [5].

11. CableLabs MIB Import Data

```
CLAB-DEF-MIB DEFINITIONS ::= BEGIN
IMPORTS
     MODULE-IDENTITY,
     enterprises
                              FROM SNMPv2-SMI;

cableLabs MODULE-IDENTITY
     LAST-UPDATED    "0201160000Z" - January 16, 2002
    ORGANIZATION    "Packet Cable OSS Group"
    CONTACT-INFO
            "Matt Osman
            Postal: Cable Television Laboratories, Inc.
               400 Centennial Parkway
               Louisville, Colorado 80027-1266
```

U.S.A.
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Fax : +1 303-661-9199
E-mail: sumanth@alopa.com"

```
    DESCRIPTION
            "This MIB module supplies the basic management
               object categories for Cable Labs. "
    ::= { mib-2 70 }

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 }
clabprojCableHome      OBJECT IDENTIFIER ::= { calbProject 4 }
--================================================================
--        Packet Cable branch definitions
--================================================================

pktcMtaMib      OBJECT IDENTIFIER ::= { clabProjPacketCable 1 }
pktcSigMib      OBJECT IDENTIFIER ::= { clabProjPacketCable 2 }
pktcEventMib     OBJECT IDENTIFIER ::= { clabProjPacketCable 3 }
pktcSmtaMib      OBJECT IDENTIFIER ::= { clabProjPacketCable 4 }
--pktcSecurity   OBJECT IDENTIFIER ::= { clabProjPacketCable 5 }
--  See PacketCable Security Specification PKT-SP-SEC_I02-001229
--  for details.

END
```

Appendix C. Acknowledgements

The PacketCable project would like to acknowledge the members of the PacketCable OSS focus group whose efforts have been invaluable for creation of this document. In particular we wish to recognize and thank the following for their contribution to this document:

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Satish Kumar (TI)
Wim De Ketelaere (tComLabs)

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