Network Working Group
Request for Comments: 4546
Obsoletes: 2670
Category: Standards Track

D. Raftus
ATI Technologies, Inc.
E. Cardona
CableLabs

June 2006

Radio Frequency (RF) Interface Management Information Base for Data over Cable Service Interface Specifications (DOCSIS) 2.0 Compliant RF Interfaces

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

This document revises and obsoletes RFC 2670. Please see Section 5.3 for a description of the changes from RFC 2670.

Copyright Notice

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 defines a set of managed objects for Simple Network Management Protocol (SNMP) based management of the Radio Frequency (RF) interfaces for systems compliant with the Data Over Cable Service Interface Specifications (DOCSIS).

Table of Contents

1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] STD 58, RFC 2580 [RFC2580].

2. Glossary

The terms in this document are derived either from normal cable system usage, or from the documents associated with the Data Over Cable Service Interface Specification process.

2.1. Baseline Privacy

Security interface specification, designed for DOCSIS-compliant cable data systems, that ensures device authentication data confidentiality in the CATV plant. See [BPI] and [BPIPLUS].

2.2. CATV

Originally "Community Antenna Television", it now refers to any cable or hybrid fiber and cable system used to deliver video signals to a community.

2.3. Channel

A specific frequency allocation with an RF medium, specified by channel width in Hertz (cycles per second) and by center frequency. Within the US Cable Systems, upstream channels are generally allocated from the 5-42MHz range while downstream channels are generally allocated from the 50-750MHz range, depending on the capabilities of the given system. The typical broadcast channel width in the US is 6MHz. Upstream channel widths for DOCSIS vary.

For European cable systems, upstream channels vary by country. The upper edge of upstream channel allocations varies between 25 MHz to 65 MHz, and the lower edge of downstream channel allocations varies between 47 MHz and 87.5 MHz. The typical broadcast channel width in Europe is 8MHz. The actual parameters are of concern to systems deploying Euro-DOCSIS technology.

The downstream channels conform to the requirements of ITU-T Recommendation J.83 [ITU-T_J.83]

2.4. CM or Cable Modem

A CM acts as a "slave" station in a DOCSIS-compliant cable data system.

2.5. CMTS or Cable Modem Termination System

A generic term covering a cable bridge or cable router in a head-end. A CMTS acts as the master station in a DOCSIS-compliant cable data system. It is the only station that transmits downstream, and it

controls the scheduling of upstream transmissions by its associated CMs.

2.6. Codeword

A characteristic of the Forward Error Correction scheme, used above the RF media layer.

See "Data-Over-Cable Service Interface Specifications: Radio Frequency Interface Specification SP-RFIv2.0-I10-051209".

2.7. Data Packet

The payload portion of the MAC Packet.

2.8. dBmV

A measure of RF signal voltage amplitude, whose power level is determined by the characteristic impedance. A zero dB signal power is equivalent to 48.75 dBmV signal amplitude in a 75 Ohm system.

2.9. DOCSIS

"Data Over Cable Service Interface Specification". A term referring to the ITU-T J112 [ITU-T_J.112] Annex B standard for cable modem systems.

2.9.1. DOCSIS 1.0

Cable modem systems that are CM/CMTS compliant to requirements in [RFI1.0]. A common reference to DOCSIS 1.0 in this document is the upstream channel queuing mechanism, known as Class of Service (COS).

2.9.2. DOCSIS 1.1

Cable modem systems that are CM/CMTS compliant to requirements in [ITU-T_J.112]. DOCSIS 1.1 references in this document are in part associated with the upstream and downstream Quality of Service (QOS). The term DOCSIS 1.x is used in this document to refer to both DOCSIS 1.0 and DOCSIS 1.1.

2.9.3. DOCSIS 2.0

Cable modem systems that are CM/CMTS compliant to requirements in [ITU-T_J.122]. DOCSIS 2.0 corresponds to the second generation of radio-frequency interface specifications of DOCSIS.

2.10. Downstream

The direction from the head-end towards the subscriber.

2.11. Euro-DOCSIS

Cable modem systems CM/CMTS that conform to the European spectrum lineup and are compliant to requirements of Annex F in [ITU-T_J.122].

2.12. Head-end

The origination point in most cable systems of the subscriber video signals. Generally also the location of the CMTS equipment.

2.13. MAC Packet

A DOCSIS PDU.

2.14. MCNS

"Multimedia Cable Network System". Generally replaced in usage by DOCSIS.

2.15. Mini-slot

In general, an interval of time that is allocated by the CMTS to a given CM for that CM to transmit in an upstream direction. See [ITU-T_J.122]

2.16. QPSK (Quadrature Phase Shift Keying)

A particular modulation scheme on an RF medium. See [Proakis00].

2.17. QAM (Quadrature Amplitude Modulation)

A particular modulation scheme on RF medium. Usually expressed with a number indicating the size of the modulation constellation (e.g., 16 QAM). See [Proakis00].

2.18. RF

Radio Frequency.

2.19. Symbol-times

A characteristic of the RF modulation scheme. See [ITU-T_J.122].

2.20. Upstream

The direction from the subscriber towards the head-end.

3. Overview

This MIB module provides a set of objects required for the management of DOCSIS-compliant Cable Modem (CM) and Cable Modem Termination System (CMTS) RF interfaces. The specification is derived in part from the parameters and protocols described in [ITU-T_J.122].

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC2119].

3.1. Textual Conventions

This MIB module defines new textual conventions for CM and CMTS indications of DOCSIS 2.0 RFI capabilities, configuration, usage, and backward compatible modes of operation, as defined in [RFI2.0]. With the same purpose, there are some textual conventions that represent capabilities and modes of operation of [RFI1.1] that are not covered by RFC 2670, and are managed proprietarily in the DOCSIS OSSI 1.1 specification [OSSI1.1].

3.1.1. Textual Conventions in RFC 2670

RFC 2670 defined two textual conventions, TenthdBmV and TenthdB, which are power measurement representations.

3.1.2. Textual Conventions in RFC 4546

This MIB module defines the textual convention DocsisUpstreamType to represent the DOCSIS 1.0 [RFI1.0] and DOCSIS 2.0 [RFI2.0] upstream burst modulation profiles types.

This MIB module defines the textual conventions DocsisVersion and DocsisQosVersion to represent the DOCSIS 1.0 [RFI1.0] and DOCSIS 1.1 [RFI1.1] COS/QOS capabilities and modes of operation.

3.2. Structure of the MIB

This MIB module is structured as three groups:

- Management information pertinent to both Cable Modem (CM) and Cable Modem Termination System (CMTS) (docsIfBaseObjects).

- Management information pertinent to Cable Modem only (docsIfCmObjects).
- Management information pertinent to Cable Modem Termination System only (docsIfCmtsObjects).

Tables within each of these groups cover different functions; e.g., upstream queue services, channel characteristics, MAC layer management, etc. Rows created automatically (e.g., by the device according to the hardware configuration) may and generally will have a mixture of configuration and status objects within them. Rows that are meant to be created by the management station are generally restricted to configuration (read-create) objects.

3.2.1. docsIfBaseObjects

docsIfDownstreamChannelTable - This table describes the existing downstream channels for a CMTS and the received downstream channel for a CM.

docsIfUpstreamChannelTable - This table describes the existing upstream channels for a CMTS and the current upstream transmission channel for a CM.

docsIfQosProfileTable - This table describes the valid Quality of Service profiles for the cable data system.

docsIfSignalQualityTable - This table is used to monitor RF signal quality characteristics of received signals.

docsIfDocsisBaseCapability - This object is used to indicate the highest level of DOCSIS version a cable device can support.

3.2.2. docsIfCmObjects

docsIfCmMacTable - This table is used to monitor the DOCSIS MAC interface and can be considered an extension to the ifEntry.

docsIfCmStatusTable - This table maintains a number of status objects and counters for cable modems. There is a comparable table at the CMTS, docsIfCmtsCmStatusTable, which maintains similar counters from the CMTS point of view.

docsIfCmServiceTable - This table describes the upstream service queues available at this CM. There is a comparable table at the CMTS, docsIfCmtsServiceEntry, which describes the service queues from the point of view of the CMTS.

3.2.3. docsIfCmtsObjects

docsIfCmtsMacTable - Describes the attributes of each CMTS MAC interface.

docsIfCmtsStatusTable - This table provides a set of aggregated counters that roll-up values and events that occur on the underlying sub-interfaces.

docsIfCmtsCmStatusTable - This table is used to hold information about known (i.e., ranging, registered, and/or previously online) cable modems on the system serviced by this CMTS.

docsIfCmtsServiceTable - This table provides access to the information related to upstream service queues.

docsIfCmtsModulationTable - This table allows control over the modulation profiles for RF channels associated with this CMTS.

docsIfCmtsMacToCmTable - This table allows fast access into the docsIfCmtsCmTable via a MAC address (of the CM) interface.

docsIfCmtsChannelUtilizationTable - This table provides statistical load usage data for attached upstream and downstream physical channels.

docsIfCmtsDownChannelCounterTable - This table provides statistical data for attached downstream channels, appropriate as input for load usage calculations.

docsIfCmtsUpChannelCounterTable - This table provides statistical data for attached upstream channels, appropriate as input for load usage calculations.

3.2.4. Relationship to the Interfaces MIB Module

This section clarifies the relationship of this MIB module to the Interfaces MIB [RFC2863]. Several areas of correlation are addressed in the following subsections. The implementer is referred to the Interfaces MIB document in order to understand the general intent of these areas.

3.2.4.1. Layering Model

An instance of ifEntry exists for each RF downstream interface, for each RF upstream interface, for each upstream logical Channel, and for each RF MAC layer.

The ifStackTable [RFC2863] MUST be implemented to identify the relationships among sub-interfaces.

The following example illustrates a CMTS MAC interface with one downstream and two upstream interfaces.

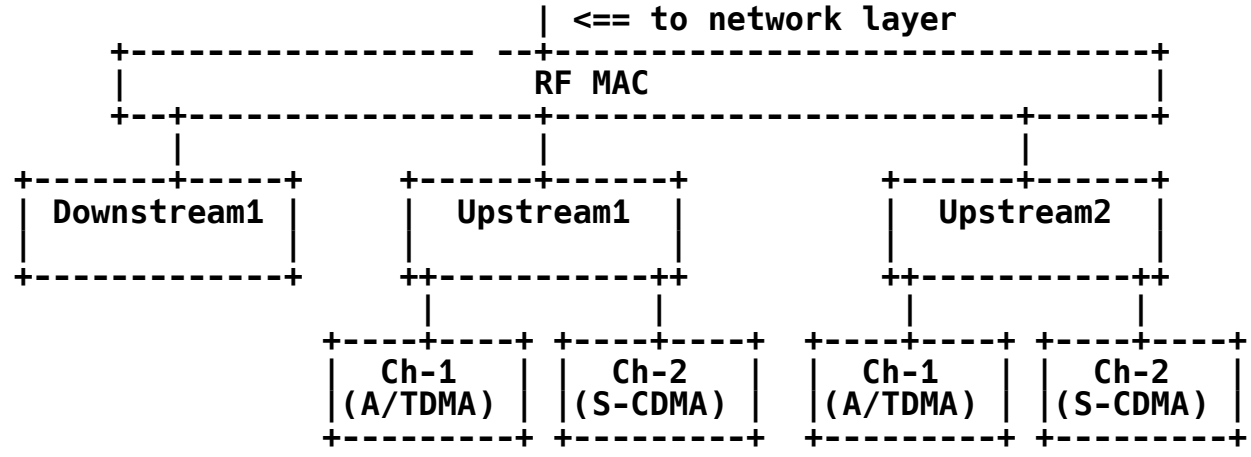

Figure 1

As can be seen from this example, the RF MAC interface is layered on top of the downstream and upstream interfaces, and the RF upstream interface is layered on top of an upstream logical channel.

In this example, the assignment of index values could be as follows:

ifIndex	ifType	Description
2	docsCableMaclayer(127)	CATV MAC Layer
3	docsCableDownstream(128)	CATV Downstream interface
4	docsCableUpstream(129)	CATV Upstream interface
5	docsCableUpstream(129)	CATV Upstream interface
6	docsCableUpstreamChannel(205)	CATV Upstream Channel
7	docsCableUpstreamChannel(205)	CATV Upstream Channel
8	docsCableUpstreamChannel(205)	CATV Upstream Channel
9	docsCableUpstreamChannel(205)	CATV Upstream Channel

Figure 2

The corresponding ifStack entries would then be:

IfStackHigherLayer	ifStackLowerLayer
0	2
2	3
2	4
2	5
4	6
4	7
5	8
5	9
3	0
6	0
7	0
8	0
9	0

Figure 3

The same interface model can also be used in Telephony or Telco Return systems. A pure Telco Return system (Cable Modem, as well as Cable Modem Termination System) would not have upstream cable channels, only downstream cable channels. Systems supporting both Telco Return and cable upstream channels can use the above model without modification.

Telco Return upstream channel(s) management is outside the scope of this document.

3.2.4.2. Virtual Circuits

This medium does not support virtual circuits, and this area is not applicable to this MIB module.

3.2.4.3. ifTestTable

The ifTestTable is optional for DOCSIS CM/CMTS implementations, but is not specifically influenced by the RF MIB.

3.2.4.4. ifRcvAddressTable

The ifRcvAddressTable is optional for DOCSIS CM/CMTS implementations, but is not specifically influenced by the RF MIB.

3.2.4.5. ifEntry

This section documents only the differences from the requirements specified in the Interfaces MIB module. See that MIB module for columns omitted from the descriptions below.

3.2.4.5.1. ifEntry for Downstream Interfaces

The ifEntry for downstream interfaces supports the ifGeneralInformationGroup and the ifPacketGroup of the Interfaces MIB module. This is an output-only interface at the CMTS, and all input status counters -- ifIn* -- will return zero. This is an input-only interface at the CM, and all output status counters -- ifOut* -- will return zero.

3.2.4.5.1.1. ifEntry for Downstream Interfaces in Cable Modem Termination System

ifTable	Comments
ifIndex	Each CATV Downstream interface is represented by an ifEntry.
ifType	The IANA value of docsCableDownstream(128).
ifSpeed	Return the speed of this downstream channel. The returned value is the raw bandwidth in bits/s of this interface. This is the symbol rate multiplied with the number of bits per symbol.
ifHighSpeed	Return the speed of this downstream channel. The returned value is the raw bandwidth in megabits/s of this interface. This is the symbol rate multiplied with the number of bits per symbol.
ifPhysAddress	Return the zero-length OCTET STRING.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of this interface.
ifMtu	The size of the largest frame that can be sent on this interface, specified in octets. The value includes the length of the MAC header.
ifInOctets ifHCInOctets	Return zero.

ifInUcastPkts ifHCInUcastPkts	Return zero.
ifInMulticastPkts ifHCInMulticastPkts	Return zero.
ifInBroadcastPkts ifHCInBroadcastPkts	Return zero.
ifInDiscards	Return zero.
ifInErrors	Return zero.
ifInUnknownProtos	Return zero.
ifOutOctets ifHCOutOctets	The total number of octets transmitted on this interface. This includes MAC packets as well as data packets, and includes the length of the MAC header.
ifOutUcastPkts ifHCOutUcastPkts	The number of unicast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutMulticastPkts ifHCOutMulticastPkts	Return the number of multicast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return the number of broadcast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutDiscards	The total number of outbound packets which were discarded. Possible reasons are: buffer shortage.
ifOutErrors	The number of packets that could not be transmitted due to errors.
ifPromiscuousMode	Return false.

3.2.4.5.1.2. ifEntry for Downstream Interfaces in Cable Modem

ifTable	Comments
ifIndex	Each CATV Downstream interface is represented by an ifEntry.
ifType	The IANA value of docsCableDownstream(128).
ifSpeed	Return the speed of this downstream channel. The returned value the raw bandwidth in bits/s of this interface. This is the symbol rate multiplied with the number of bits per symbol.
ifHighSpeed	Return the speed of this downstream channel. The returned value the raw bandwidth in megabits/s of this interface. This is the symbol rate multiplied with the number of bits per symbol.
ifPhysAddress	Return the zero-length OCTET STRING.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of this interface.
ifMtu	The size of the largest frame that can be received from this interface, specified in octets. The value includes the length of the MAC header.
ifInOctets ifHCInOctets	The total number of octets received on this interface. This includes data packets as well as MAC packets, and includes the length of the MAC header.
ifInUcastPkts ifHCInUcastPkts	The number of unicast packets received on this interface. This includes data packets as well as MAC packets.
ifInMulticastPkts ifHCInMulticastPkts	Return the number of multicast packets received on this interface. This includes data packets as well as MAC packets.

ifInBroadcastPkts ifHCInBroadcastPkts	Return the number of broadcast packets received on this interface. This includes data packets as well as MAC packets.
ifInDiscards	The total number of received packets that have been discarded. The possible reasons are: buffer shortage.
ifInErrors	The number of inbound packets that contained errors preventing them from being deliverable to higher layers. Possible reasons are: MAC FCS error.
ifInUnknownProtos	The number of frames with an unknown packet type. These are MAC frames with an unknown packet type.
ifOutOctets ifHCOutOctets	Return zero.
ifOutUcastPkts ifHCOutUcastPkts	Return zero.
ifOutMulticastPkts ifHCOutMulticastPkts	Return zero.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return zero.
ifOutDiscards	Return zero.
ifOutErrors	Return zero.
ifPromiscuousMode	Refer to the Interfaces MIB.

3.2.4.5.2. ifEntry for Upstream Interfaces

Each supported interface of the type docsCableUpstream(129) must have a corresponding ifEntry. The ifEntry for upstream interfaces supports the ifGeneralInformationGroup and the ifPacketGroup of the Interfaces MIB. This is an input-only interface at the CMTS, and all output status counters -- ifOut* -- will return zero. This is an output only interface at the CM, and all input status counters -- ifIn* -- will return zero.

3.2.4.5.2.1. ifEntry for Upstream Interfaces in Cable Modem Termination System

ifTable	Comments
ifIndex	Each RF Cable Upstream interface is represented by an ifEntry.
ifType	The IANA value of docsCableUpstream (129).
ifSpeed	Return the maximum channel throughput (not payload throughput) supported by the interface. The maximum throughput is calculated for the case where upstream channels are configured to maximize interface throughput.
ifHighSpeed	Return the maximum channel throughput (not payload throughput) supported by the interface. The maximum throughput is calculated for the case where upstream channels are configured to maximize interface throughput. Units for this object are (1/1 000 000) * IfSpeed.
ifPhysAddress	Return the zero-length OCTET STRING.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of this interface. This reflects the total status of all the channels under this interface. So if at least one channel has a physical connection this interface has connection.
ifMtu	The size of the largest frame that can be transmitted on this interface, specified in octets. The value includes the length of the MAC header. This is the maximum of all the ifMtu of all the channels under this interface.
ifInOctets ifHCInOctets	The total (sum) number of octets received on all the upstream channels under this interface. This includes data packets as well as MAC packets, and includes the length of the MAC header.

ifInUcastPkts ifHCInUcastPkts	The total number of unicast packets received on all the upstream channels under this interface. This includes data packets as well as MAC packets.
ifInMulticastPkts ifHCInMulticastPkts	Return the total number of multicast packets received on all the upstream channels under this interface. This includes data packets as well as MAC layer packets.
ifInBroadcastPkts ifHCInBroadcastPkts	Return the total number of broadcast packets received on all the upstream channels under this interface. This includes data packets as well as MAC packets.
ifInDiscards	The total number of received packets that have been discarded on all the upstream channels under this interface. The possible reasons are: buffer shortage.
ifInErrors	The total number of inbound packets that contained errors preventing them from being deliverable to higher layers. Possible reasons are: MAC FCS error.
ifInUnknownProtos	The total number of frames with an unknown packet type. These are MAC frames with an unknown packet type.
ifOutOctets ifHCOutOctets	Return zero.
ifOutUcastPkts ifHCOutOctets	Return zero.
ifOutMulticastPkts ifHCOutMulticastPkts	Return zero.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return zero.

ifOutDiscards	Return zero.
ifOutErrors	Return zero.

3.2.4.5.2.2. ifEntry for Upstream Interfaces in Cable Modem

ifTable	Comments
ifIndex	Each RF Cable Upstream interface is represented by an ifEntry.
ifType	The IANA value of docsCableUpstream (129).
ifSpeed	Return the speed of this upstream interface. The returned value is the raw bandwidth in bits/s of this interface.
ifHighSpeed	Return the speed of this upstream interface. The returned value is the raw bandwidth in megabits/s of this interface.
ifPhysAddress	Return the zero-length OCTET STRING.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of this interface.
ifMtu	The size of the largest frame that can be transmitted on this interface, specified in octets. The value includes the length of the MAC header.
ifInOctets ifHCInOctets	Return zero.
ifInUcastPkts ifHCInUcastPkts	Return zero.
ifInMulticastPkts ifHCInMulticastPkts	Return zero.
ifInBroadcastPkts ifHCInBroadcastPkts	Return zero.
ifInDiscards	Return zero.

ifInErrors	Return zero.
ifInUnknownProtos	Return zero.
ifOutOctets ifHCOutOctets	The total number of octets transmitted on this interface. This includes MAC packets as well as data packets, and includes the length of the MAC header.
ifOutUcastPkts ifHCOutUcastPkts	The number of unicast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutMulticastPkts ifHCOutMulticastPkts	Return the number of multicast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return the number of broadcast packets transmitted on this interface. This includes MAC packets as well as data packets.
ifOutDiscards	The total number of outbound packets that were discarded. Possible reasons are: buffer shortage.
ifOutErrors	The number of packets that could not be transmitted due to errors.
ifPromiscuousMode	Return false.

3.2.4.5.3. ifEntry for Upstream Channels

Each supported channel of the type docsCableUpstreamChannel(205) must have a corresponding ifEntry.

The ifEntry for upstream channels supports the ifGeneralInformationGroup and the ifPacketGroup of the Interfaces MIB. This is an input only interface at the CMTS and all output status counters -- ifOut* -- will return zero. DOCSIS CMs are not required to support logical upstream channels.

3.2.4.5.3.1. ifEntry for Upstream Channels in Cable Modem Termination System

ifTable	Comments
ifIndex	Each RF Cable Upstream channel is represented by an ifEntry.
ifType	The IANA value of docsCableUpstreamChannel (205).
ifSpeed	Return the speed of this upstream channel. The returned value is the raw bandwidth in bits/s of this channel.
ifHighSpeed	Return the speed of this upstream channel. The returned value is the raw bandwidth in megabits/s of this channel.
ifPhysAddress	Return the zero-length OCTET STRING.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of this interface.
ifMtu	The size of the largest frame that can be received on this interface, specified in octets. The value includes the length of the MAC header.
ifInOctets	The total number of octets received on this interface. This includes data packets as well as MAC packets, and includes the length of the MAC header.
ifInUcastPkts ifHCInUcastPkts	The number of unicast packets received on this interface. This includes data packets as well as MAC packets.
ifInMulticastPkts ifHCInMulticastPkts	Return the number of multicast packets received on this interface. This includes data packets as well as MAC layer packets.

ifInBroadcastPkts ifHCInBroadcastPkts	Return the number of broadcast packets received on this interface. This includes data packets as well as MAC packets.
ifInDiscards	The total number of received packets that have been discarded. The possible reasons are: buffer shortage.
ifInErrors	The number of inbound packets that contained errors preventing them from being deliverable to higher layers. Possible reasons are: MAC FCS error.
ifInUnknownProtos	The number of frames with an unknown packet type. These are MAC frames with an unknown packet type.
ifOutOctets ifHCOutOctets	Return zero.
ifOutUcastPkts ifHCOutUcastPkts	Return zero.
ifOutMulticastPkts ifHCOutMulticastPkts	Return zero.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return zero.
ifOutDiscards	Return zero.
ifOutErrors	Return zero.

3.2.4.5.4. ifEntry for the MAC Layer

The ifEntry for the MAC Layer supports the ifGeneralInformationGroup and the ifPacketGroup of the Interfaces MIB. This interface provides an aggregate view of status for the lower level downstream and upstream interfaces.

ifTable	Comments
ifIndex	Each RF Cable MAC layer entity is represented by an ifEntry.

ifType	The IANA value of docsCableMaclayer(127).
ifSpeed	Return zero.
ifPhysAddress	Return the physical address of this interface.
ifAdminStatus	The administrative status of this interface.
ifOperStatus	The current operational status of the MAC layer interface.
ifHighSpeed	Return zero.
ifMtu	Return 1500.
ifInOctets ifHCInOctets	The total number of data octets received on this interface, targeted for upper protocol layers.
ifInUcastPkts ifHCInUcastPkts	The number of unicast packets received on this interface, targeted for upper protocol layers.
ifInMulticastPkts ifHCInMulticastPkts	Return the number of multicast packets received on this interface, targeted for upper protocol layers.
ifInBroadcastPkts ifHCInBroadcastPkts	Return the number of broadcast packets received on this interface, targeted for upper protocol layers.
ifInDiscards	The total number of received packets that have been discarded. The possible reasons are: buffer shortage.
ifInErrors	The number of inbound packets that contained errors preventing them from being deliverable to higher layers. Possible reasons are: data packet FCS error, invalid MAC header.
ifInUnknownProtos	The number of frames with an unknown packet type. This is the number of data packets targeted for upper protocol layers with an unknown packet type.

ifOutOctets ifHCOutOctets	The total number of octets, received from upper protocol layers and transmitted on this interface.
ifOutUcastPkts ifHCOutUcastPkts	The number of unicast packets, received from upper protocol layers and transmitted on this interface.
ifOutMulticastPkts ifHCOutMulticastPkts	Return the number of multicast packets received from upper protocol layers and transmitted on this interface.
ifOutBroadcastPkts ifHCOutBroadcastPkts	Return the number of broadcast packets received from upper protocol layers and transmitted on this interface.
ifOutDiscards	The total number of outbound packets that were discarded. Possible reasons are: buffer shortage.
ifOutErrors	The number of packets that could not be transmitted due to errors.
ifPromiscuousMode	Refer to the Interfaces MIB.

3.2.5. Offline Upstream Parameters Handling

3.2.5.1. Overview

This section describes the offline configuration of the DOCSIS 2.0 upstream logical interface parameters. The purpose of this feature is to guarantee that upstream logical interface parameters (such as modulation profile, channel type, mini-slot size, and SCDMA attributes) are consistent prior to committing changes to an active upstream logical interface. This mechanism can reduce possible downtime of the upstream interface by minimizing SNMP SET operations to in-service upstream interfaces. This mechanism is supported by CMTSs and is not applicable to CMs.

3.2.5.2. Operation

This mechanism uses three upstream channel MIB objects defined for DOCSIS 2.0 CMTS implementations:

docsIfUpChannelStatus - The RowStatus object for the creation of temporary interfaces in the upstream interface table. A temporary entry is used to modify, validate, and commit upstream parameters of a physical interface. In the CMTS, a physical upstream interface refers to an upstream logical channel interface.

docsIfUpChannelCloneFrom - This MIB object associates a physical interface with a temporary interface for the purpose of updating the upstream parameters of the physical interface.

docsIfUpChannelUpdate - This MIB object is the commit object that transfers the validated upstream parameters from the temporary interface to the physical interface.

The offline upstream parameters handling operation is as follows:

- A temporary interface is created in which docsIfUpChannelStatus is set to 'createAndWait', which turns the new create entry status to 'notReady'.
- A SET to docsIfUpChannelCloneFrom in the temporary interface to the physical interface ifIndex value performs two actions:
  - Creates the association of the physical interface to the temporary interface.
  - Copies the original upstream parameters from the physical interface to the temporary interface, which turns its status to 'notInService'.
- The operator modifies the temporary interface parameters to the desired values.
- At this point, a SET to 'active' to the RowStatus of the temporary interface is successful if all parameters in the temporary interface are valid for the associated physical interface; otherwise, the temporary entry remains with status 'notInservice', and the SET returns the error 'commitFailed'.
- When the temporary interface status is 'active', a SET to docsIfUpChannelUpdate to 'true' transfers the temporary interface parameters values to the physical interface.
- After completion of the update operations, the temporary interface is destroyed, setting the docsIfUpChannelStatus to 'destroy'.

3.2.5.3. Relation of docsIfUpChannelStatus and ifMib

The main purpose of docsIfUpChannelStatus is the creation of temporary interfaces for offline handling of the configuration of physical interfaces; it does not manage the creation or control of physical interfaces. To maintain a consistent operation and status report of interfaces, this object does not manage the administrative and operational status of physical interfaces.

4. Definitions

```
DOCS-IF-MIB DEFINITIONS ::= BEGIN

  IMPORTS
     MODULE-IDENTITY,
     OBJECT-TYPE,
     Unsigned32,
     Integer32,
     Counter32,
     Counter64,
     TimeTicks,
     IpAddress,
     transmission
             FROM SNMPv2-SMI        -- [RFC2578]
     TEXTUAL-CONVENTION,
     MacAddress,
     RowStatus,
     TruthValue,
     TimeInterval,
     TimeStamp,
     StorageType
             FROM SNMPv2-TC         -- [RFC2579]
     OBJECT-GROUP,

     MODULE-COMPLIANCE
             FROM SNMPv2-CONF       -- [RFC2580]
     ifIndex, InterfaceIndexOrZero
             FROM IF-MIB            -- [RFC2863]
     InetAddressType,
     InetAddress
             FROM INET-ADDRESS-MIB  -- [RFC4001]
     IANAifType
             FROM IANAifType-MIB;   -- [IANA]

docsIfMib MODULE-IDENTITY
     LAST-UPDATED    "200605240000Z" -- May 24, 2006
     ORGANIZATION    "IETF IPCDN Working Group"
     CONTACT-INFO
```

```
            "        David Raftus
             Postal: ATI Technologies Inc.
                     340 Terry Fox Drive, Suite 202
                     Ottawa Ontario
                     Canada
             Phone:  +1 613 592 1052 ext.222
             E-mail: david.raftus@ati.com

                     Eduardo Cardona
             Postal: Cable Television Laboratories, Inc.
                     858 Coal Creek Circle
                     Louisville, CO 80027-9750
                     U.S.A.
             Phone:  Tel:    +1 303 661 9100
                     Fax:    +1 303 661 9199
             E-mail: e.cardona@cablelabs.com;mibs@cablelabs.com

             IETF IPCDN Working Group
             General Discussion: ipcdn@ietf.org
             Subscribe: http://www.ietf.org/mailman/listinfo/ipcdn
             Archive: ftp://ftp.ietf.org/ietf-mail-archive/ipcdn
             Co-chairs: Richard Woundy, Richard_Woundy@cable.comcast.com
                        Jean-Francois Mule, jf.mule@cablelabs.com"
        DESCRIPTION
            "This is the MIB Module for DOCSIS 2.0-compliant Radio
             Frequency (RF) interfaces in Cable Modems and
             Cable Modem Termination Systems.

             Copyright (C) The Internet Society (2006).  This
             version of this MIB module is part of RFC 4546; see
             the RFC itself for full legal notices."

        REVISION        "200605240000Z"
        DESCRIPTION
            "Revision of the IETF RF MIB module for DOCSIS 2.0.
             This version published as RFC 4546.
             This MIB module revision includes the following
             among others:
             Usage of ifType (205) for upstream logical channels.
             Addition of downstream and upstream utilization
             counters.
             Additional statistics per upstream interface.
             Upstream channel offline configuration mechanism.
             Added MIB support for new DOCSIS 2.0 modulation
             attributes.
             Euro-DOCSIS downstream interleave values.
             Adjustments to RFC 2670 definitions based on
             the MIB review guidelines from the IETF
```

```
            Operations and Management Area (OPS)."

        REVISION "199908190000Z"
        DESCRIPTION
            "Initial version, published as RFC 2670.
             Modified by Mike St. Johns to fix problems identified by
             the first pass of the MIB doctor.  Of special note,
             docsIfRangingResp and docsIfCmtsInsertionInterval were
             obsoleted and replaced by other objects with the same
             functionality, but with more appropriate syntax."
        ::= { transmission 127 }


    -- Textual Conventions

    TenthdBmV ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d-1"
        STATUS       current
        DESCRIPTION
            "This data type represents power levels that are normally
             expressed in dBmV.  Units are in tenths of a dBmV;
             for example, 5.1 dBmV will be represented as 51."
        SYNTAX       Integer32

    TenthdB ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d-1"
        STATUS       current
        DESCRIPTION
            "This data type represents power levels that are normally
             expressed in dB.  Units are in tenths of a dB;
             for example, 5.1 dB will be represented as 51."
        SYNTAX       Integer32

    DocsisVersion ::= TEXTUAL-CONVENTION
        STATUS          current
        DESCRIPTION
            "Indicates the DOCSIS Radio Frequency specification being
             referenced.
             'docsis10' indicates DOCSIS 1.0.
             'docsis11' indicates DOCSIS 1.1.
             'docsis20' indicates DOCSIS 2.0."
        SYNTAX       INTEGER {
            docsis10 (1),
            docsis11 (2),
            docsis20 (3)
        }

    DocsisQosVersion ::= TEXTUAL-CONVENTION
```

```
        STATUS          current
        DESCRIPTION
            "Indicates the referenced quality-of-service
             level.
             'docsis10 refers to DOCSIS 1.0 Class of
             Service queuing services, and 'docsis11' refers
             to DOCSIS 1.1 Quality of Service."
        SYNTAX        INTEGER {
            docsis10 (1),
            docsis11 (2)
        }

    DocsisUpstreamType ::= TEXTUAL-CONVENTION
        STATUS          current
        DESCRIPTION
             "Indicates the DOCSIS Upstream Channel Type.
              'unknown' means information not available.
              'tdma' is related to TDMA, Time Division
              Multiple Access; 'atdma' is related to A-TDMA,
              Advanced Time Division Multiple Access,
              'scdma' is related to S-CDMA, Synchronous
              Code Division Multiple Access.
              'tdmaAndAtdma is related to simultaneous support of
              TDMA and A-TDMA modes."
        SYNTAX          INTEGER {
            unknown(0),
            tdma(1),
            atdma(2),
            scdma(3),
            tdmaAndAtdma(4)
        }

     DocsEqualizerData ::= TEXTUAL-CONVENTION
          STATUS       current
          DESCRIPTION
              "This data type represents the equalizer data
               as measured at the receiver interface.
               The format of the equalizer follows the structure of the
               Transmit Equalization Adjust RNG-RSP TLV of DOCSIS RFI
               v2.0 :
               1 byte Main tap location 1..(n + m)
               1 byte Number of forward taps per symbol
               1 byte Number of forward taps: n
               1 byte Number of reverse taps: m

               Following are the equalizer coefficients:
               First, forward taps coefficients:
               2 bytes F1 (real),  2 bytes  F1 (imag)
```

```
                ...
                2 bytes Fn (real),  2 bytes  Fn (imag)

                Then, reverse taps coefficients:
                2 bytes D1 (real),  2 bytes  D1 (imag)
                ...

                2 bytes Dm (real),  2 bytes  Dm (imag)

                The equalizer coefficients are considered signed 16-bit
                integers in the range from -32768 (0x8000) to 32767
                (0x7FFF).

                DOCSIS specifications require up to a maximum of
                64 equalizer taps (n + m); therefore, this object size
                 can get up 260 bytes (4 + 4x64).
                The minimum object size (other than zero) for a t-spaced
                tap with a minimum of 8 symbols will be 36 (4 + 4x8)."
            REFERENCE
               "Data-Over-Cable Service Interface Specifications: Radio
                Frequency Interface Specification SP-RFIv2.0-I10-051209,
                Figure 8-23."
            SYNTAX       OCTET STRING(SIZE (0 | 36..260))


    docsIfMibObjects  OBJECT IDENTIFIER ::= { docsIfMib 1 }
    docsIfBaseObjects OBJECT IDENTIFIER ::= { docsIfMibObjects 1 }
    docsIfCmObjects   OBJECT IDENTIFIER ::= { docsIfMibObjects 2 }
    docsIfCmtsObjects OBJECT IDENTIFIER ::= { docsIfMibObjects 3 }

    --
    -- BASE GROUP
    --

    --
    -- The following table is implemented on both the Cable Modem
    -- and the Cable Modem Termination System.  This table is
    -- read only for the CM.
    --

    docsIfDownstreamChannelTable OBJECT-TYPE
         SYNTAX      SEQUENCE OF DocsIfDownstreamChannelEntry
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
             "This table describes the attributes of downstream
              channels (frequency bands)."
         REFERENCE
```

```
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-16, and 6-17."
        ::= { docsIfBaseObjects 1 }

    docsIfDownstreamChannelEntry OBJECT-TYPE
        SYNTAX      DocsIfDownstreamChannelEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry provides a list of attributes for a single
             downstream channel.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableDownstream(128)."
        INDEX { ifIndex }
        ::= { docsIfDownstreamChannelTable 1 }

    DocsIfDownstreamChannelEntry ::= SEQUENCE {
            docsIfDownChannelId                Integer32,
            docsIfDownChannelFrequency         Integer32,
            docsIfDownChannelWidth             Integer32,
            docsIfDownChannelModulation        INTEGER,
            docsIfDownChannelInterleave        INTEGER,
            docsIfDownChannelPower             TenthdBmV,
            docsIfDownChannelAnnex             INTEGER,
            docsIfDownChannelStorageType       StorageType
        }

    docsIfDownChannelId OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The Cable Modem Termination System identification of the
             downstream channel within this particular MAC interface.
             if the interface is down, the object returns the most
             current value.  If the downstream channel ID is unknown,
             this object returns a value of 0."
        ::= { docsIfDownstreamChannelEntry 1 }

    docsIfDownChannelFrequency OBJECT-TYPE
        SYNTAX      Integer32 (0..1000000000)
        UNITS       "hertz"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The center of the downstream frequency associated with
             this channel.  This object will return the current tuner
```

```
            frequency.  If a CMTS provides IF output, this object
            will return 0, unless this CMTS is in control of the
            final downstream frequency.  See the associated
            compliance object for a description of valid frequencies
            that may be written to this object."

        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.3.3."
        ::= { docsIfDownstreamChannelEntry 2 }

    docsIfDownChannelWidth OBJECT-TYPE
        SYNTAX      Integer32 (0..16000000)
        UNITS       "hertz"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The bandwidth of this downstream channel.  Most
             implementations are expected to support a channel width
             of 6 MHz (North America) and/or 8 MHz (Europe).  See the
             associated compliance object for a description of the
             valid channel widths for this object."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 6-17."
        ::= { docsIfDownstreamChannelEntry 3 }

    docsIfDownChannelModulation OBJECT-TYPE
        SYNTAX      INTEGER {
            unknown(1),
            other(2),
            qam64(3),
            qam256(4)
        }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The modulation type associated with this downstream
             channel.  If the interface is down, this object either
             returns the configured value (CMTS), the most current
             value (CM), or the value of unknown(1).  See the
             associated conformance object for write conditions and
             limitations.  See the reference for specifics on the
             modulation profiles implied by qam64 and qam256."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
```

```
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Table 6-17."
        ::= { docsIfDownstreamChannelEntry 4 }

    docsIfDownChannelInterleave OBJECT-TYPE
        SYNTAX      INTEGER {
            unknown(1),
            other(2),
            taps8Increment16(3),
            taps16Increment8(4),
            taps32Increment4(5),
            taps64Increment2(6),
            taps128Increment1(7),
            taps12increment17(8)
        }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The Forward Error Correction (FEC) interleaving used
            for this downstream channel.
            Values are defined as follows:
            taps8Increment16(3):   protection 5.9/4.1 usec,
                                   latency .22/.15 msec
            taps16Increment8(4):   protection 12/8.2 usec,
                                   latency .48/.33 msec
            taps32Increment4(5):   protection 24/16 usec,
                                   latency .98/.68 msec
            taps64Increment2(6):   protection 47/33 usec,
                                   latency 2/1.4 msec
            taps128Increment1(7):  protection 95/66 usec,
                                   latency 4/2.8 msec
            taps12increment17(8):  protection 18/14 usec,
                                   latency 0.43/0.32 msec

            The value 'taps12increment17' is supported by EuroDOCSIS
            cable systems only, and the others by DOCSIS cable systems.

            If the interface is down, this object either returns
            the configured value (CMTS), the most current value (CM),
            or the value of unknown(1).
            The value of other(2) is returned if the interleave
            is known but not defined in the above list.
            See the associated conformance object for write
            conditions and limitations.  See the reference for the FEC
            configuration described by the setting of this object."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
```

```
            Table 6-15."
        ::= { docsIfDownstreamChannelEntry 5 }

    docsIfDownChannelPower OBJECT-TYPE
        SYNTAX      TenthdBmV
        UNITS       "dBmV"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "At the CMTS, the operational transmit power.  At the CM,
             the received power level.
             If the interface is down, this object either returns
             the configured value (CMTS), the most current value (CM)
             or the value of 0.  See the associated conformance object
             for write conditions and limitations.  See the reference
             for recommended and required power levels."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-16, 6-17."
        ::= { docsIfDownstreamChannelEntry 6 }

    docsIfDownChannelAnnex OBJECT-TYPE
        SYNTAX      INTEGER {
            unknown(1),
            other(2),
            annexA(3),
            annexB(4),
            annexC(5)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The value of this object indicates the conformance of
             the implementation to important regional cable standards.
             annexA : Annex A from ITU-T J.83 is used.
                      (equivalent to EN 300 429)
             annexB : Annex B from ITU-T J.83 is used.
             annexC : Annex C from ITU-T J.83 is used."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Sections 6.3.1, and H.3.1."
        ::= { docsIfDownstreamChannelEntry 7 }

    docsIfDownChannelStorageType OBJECT-TYPE
        SYNTAX       StorageType
        MAX-ACCESS   read-only
```

```
        STATUS       current
        DESCRIPTION
            "The storage type for this conceptual row.
             Entries with this object set to permanent(4)
             do not require write operations for read-write
             objects."
        ::= { docsIfDownstreamChannelEntry 8 }

    --
    -- The following table is implemented on both the CM and the CMTS.
    -- For the CM, only attached channels appear in the table.  For the
    -- CM, this table is read-only as well.
    --

    docsIfUpstreamChannelTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfUpstreamChannelEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This table describes the attributes of attached upstream
             channels."
        ::= { docsIfBaseObjects 2 }

    docsIfUpstreamChannelEntry OBJECT-TYPE
        SYNTAX      DocsIfUpstreamChannelEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "List of attributes for a single upstream channel.  For
             DOCSIS 2.0 CMTSs, an entry in this table exists for
             each ifEntry with an ifType of docsCableUpstreamChannel
             (205).
             For DOCSIS 1.x CM/CMTSs and DOCSIS 2.0 CMs, an entry in
             this table exists for each ifEntry with an ifType of
             docsCableUpstream (129).

             For DOCSIS 2.0 CMTSs, two classes of interfaces can be
             defined for this table:
              o Upstream Physical Interfaces: The traditional DOCSIS
                1.x CMTS upstream interface ifType 129 and the DOCSIS
                2.0 ifType 205 that are functional.  In other words,
                interfaces that represent upstream receivers within
                an RF MAC interface.
                Entries of physical interfaces are exposed to the
                management interface with their corresponding
                ifStack hierarchy and are not administratively
                created by this table.
```

```
                o Upstream Temporary Interfaces: A fictitious
                  interface created for the purpose of manipulating
                  physical interface parameters offline, then
                  validating prior to updating the target physical
                  interface.

               In case of a reinitialization of the managed system,
               physical interfaces values persist while the temporary
               interfaces are not recreated.

               This mechanism helps to minimize service disruptions
               originating in situations where a group of interface
               parameter values need to be consistent with each other
               in SET operations.  A temporary buffer
               (temporary interface) is provided to allow the CMTS
               to validate the parameters offline."
          INDEX { ifIndex }
          ::= { docsIfUpstreamChannelTable 1 }

      DocsIfUpstreamChannelEntry ::= SEQUENCE {
              docsIfUpChannelId                       Integer32,
              docsIfUpChannelFrequency                Integer32,
              docsIfUpChannelWidth                    Integer32,
              docsIfUpChannelModulationProfile        Unsigned32,
              docsIfUpChannelSlotSize                 Unsigned32,
              docsIfUpChannelTxTimingOffset           Unsigned32,
              docsIfUpChannelRangingBackoffStart      Integer32,
              docsIfUpChannelRangingBackoffEnd        Integer32,
              docsIfUpChannelTxBackoffStart           Integer32,
              docsIfUpChannelTxBackoffEnd             Integer32,
              docsIfUpChannelScdmaActiveCodes         Unsigned32,
              docsIfUpChannelScdmaCodesPerSlot        Integer32,
              docsIfUpChannelScdmaFrameSize           Unsigned32,
              docsIfUpChannelScdmaHoppingSeed         Unsigned32,
              docsIfUpChannelType                     DocsisUpstreamType,
              docsIfUpChannelCloneFrom                InterfaceIndexOrZero,
              docsIfUpChannelUpdate                   TruthValue,
              docsIfUpChannelStatus                   RowStatus,
              docsIfUpChannelPreEqEnable              TruthValue
          }

      docsIfUpChannelId OBJECT-TYPE
          SYNTAX      Integer32 (0..255)
          MAX-ACCESS  read-only
          STATUS      current
          DESCRIPTION
              "The CMTS identification of the upstream channel."
          ::= { docsIfUpstreamChannelEntry 1 }
```

```
   docsIfUpChannelFrequency OBJECT-TYPE
        SYNTAX      Integer32 (0..1000000000)
        UNITS       "hertz"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The center of the frequency band associated with this
             upstream interface.  This object returns 0 if the frequency
             is undefined or unknown.  Minimum permitted upstream
             frequency is 5,000,000 Hz for current technology.  See
             the associated conformance object for write conditions
             and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 4-2."
        ::= { docsIfUpstreamChannelEntry 2 }

   docsIfUpChannelWidth OBJECT-TYPE
        SYNTAX      Integer32 (0..64000000)
        UNITS       "hertz"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The bandwidth of this upstream interface.  This object
             returns 0 if the interface width is undefined or unknown.
             Minimum permitted interface width is currently 200,000 Hz.
             See the associated conformance object for write conditions
             and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 6-5."
        ::= { docsIfUpstreamChannelEntry 3 }

   docsIfUpChannelModulationProfile OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "An entry identical to the docsIfModIndex in the
             docsIfCmtsModulationTable that describes this channel.
             This channel is further instantiated there by a grouping
             of interval usage codes (IUCs) that, together, fully
             describe the channel modulation.  This object returns 0 if
             the docsIfCmtsModulationTable entry does not exist or is
             empty.  See the associated conformance object for write
             conditions and limitations.
```

```
            Setting this object returns an 'inconsistentValue'
            error if the following conditions are not satisfied:
            1. All the IUC entries in the selected modulation profile
            MUST have the same value of docsIfCmtsModChannelType.
            2. All of the Modulation parameters in the selected
            modulation profile MUST be consistent with the other
            parameters in this docsIfUpstreamChannelEntry."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Table 8-19."
        ::= { docsIfUpstreamChannelEntry 4 }

    docsIfUpChannelSlotSize OBJECT-TYPE
        SYNTAX      Unsigned32
        UNITS       "ticks"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Applicable to TDMA and ATDMA channel types only.
            The number of 6.25 microsecond ticks in each upstream
            mini-slot.  Returns zero if the value is undefined or
            unknown or in case of an SCDMA channel.
            See the associated conformance object for write
            conditions and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.1.2.4."
        ::= { docsIfUpstreamChannelEntry 5 }

    docsIfUpChannelTxTimingOffset OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "At the CM, a measure of the current round trip time
            obtained from the ranging offset (initial ranging offset +
            ranging offset adjustments).
            At the CMTS, the maximum of timing offset, among all the
            CMs that are/were present on the channel, taking into
            account all ( initial + periodic ) timing offset
            corrections that were sent for each of the CMs.  Generally,
            these measurements are positive, but if the measurements
            are negative, the value of this object is zero.  Used for
            timing of CM upstream transmissions to ensure synchronized
            arrivals at the CMTS.
            Units are one 64th fraction of 6.25 microseconds."
```

```
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.19."
        ::= { docsIfUpstreamChannelEntry 6 }

    docsIfUpChannelRangingBackoffStart OBJECT-TYPE
        SYNTAX      Integer32 (0..16)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The initial random backoff window to use when retrying
             Ranging Requests.  Expressed as a power of 2.  A value of
             16 at the CMTS indicates that a proprietary adaptive retry
             mechanism is to be used.  See the associated conformance
             object for write conditions and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Sections 8.3.4, and 9.4."
        ::= { docsIfUpstreamChannelEntry 7 }

    docsIfUpChannelRangingBackoffEnd OBJECT-TYPE
        SYNTAX      Integer32 (0..16)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The final random backoff window to use when retrying
             Ranging Requests.  Expressed as a power of 2.  A value of
             16 at the CMTS indicates that a proprietary adaptive retry
             mechanism is to be used.  See the associated conformance
             object for write conditions and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.4, and 9.4."
        ::= { docsIfUpstreamChannelEntry 8 }

    docsIfUpChannelTxBackoffStart OBJECT-TYPE
        SYNTAX      Integer32 (0..16)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The initial random backoff window to use when retrying
             transmissions.  Expressed as a power of 2.  A value of 16
             at the CMTS indicates that a proprietary adaptive retry
             mechanism is to be used.  See the associated conformance
             object for write conditions and limitations."
```

```
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.4, and 9.4."
        ::= { docsIfUpstreamChannelEntry 9 }

    docsIfUpChannelTxBackoffEnd OBJECT-TYPE
        SYNTAX      Integer32 (0..16)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The final random backoff window to use when retrying
             transmissions.  Expressed as a power of 2.  A value of 16
             at the CMTS indicates that a proprietary adaptive retry
             mechanism is to be used.  See the associated conformance
             object for write conditions and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.4, and 9.4."
        ::= { docsIfUpstreamChannelEntry 10 }

    docsIfUpChannelScdmaActiveCodes OBJECT-TYPE
        SYNTAX     Unsigned32 (0|64..66|68..70|72|74..78|80..82|84..88
                               |90..96|98..100|102|104..106|108
                               |110..112|114..126|128)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Applicable for SCDMA channel types only.
             Number of active codes.  Returns zero for
             Non-SCDMA channel types.  Note that legal
             values from 64..128 MUST be non-prime."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.11.2.1."
        ::= { docsIfUpstreamChannelEntry 11 }

    docsIfUpChannelScdmaCodesPerSlot OBJECT-TYPE
        SYNTAX      Integer32(0 | 2..32)
        UNITS       "codesperMinislots"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Applicable for SCDMA channel types only.
             The number of SCDMA codes per mini-slot.
             Returns zero if the value is undefined or unknown or in
```

```
            case of a TDMA or ATDMA channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.11.2.1."
        ::= { docsIfUpstreamChannelEntry 12 }

    docsIfUpChannelScdmaFrameSize OBJECT-TYPE
        SYNTAX      Unsigned32 (0..32)
        UNITS       "spreadIntervals"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Applicable for SCDMA channel types only.
             SCDMA Frame size in units of spreading intervals.
             This value returns zero for non-SCDMA Profiles."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.12."
        ::= { docsIfUpstreamChannelEntry 13 }

    docsIfUpChannelScdmaHoppingSeed OBJECT-TYPE
        SYNTAX     Unsigned32 (0..32767)
        MAX-ACCESS read-create
        STATUS     current
        DESCRIPTION
            "Applicable for SCDMA channel types only.
             15-bit seed used for code hopping sequence initialization.
             Returns zero for non-SCDMA channel types.
             Setting this value to a value different than zero for
             non-SCDMA channel types returns the error 'wrongValue'."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.14.1."
        ::= { docsIfUpstreamChannelEntry 14 }

    docsIfUpChannelType OBJECT-TYPE
        SYNTAX      DocsisUpstreamType
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Reflects the Upstream channel type.
             This object returns the value of docsIfCmtsModChannelType
             for the modulation profile selected in
             docsIfUpChannelModulationProfile for this row."
        REFERENCE
```

```
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.1."
        ::= { docsIfUpstreamChannelEntry 15 }

    docsIfUpChannelCloneFrom OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This object contains the ifIndex value of the physical
             interface row entry whose parameters are to be adjusted.

             Upon setting this object to the ifIndex value of a
             physical interface, the following interface objects values
             are copied to this entry:
             docsIfUpChannelFrequency,
             docsIfUpChannelWidth,
             docsIfUpChannelModulationProfile,
             docsIfUpChannelSlotSize,
             docsIfUpChannelRangingBackoffStart,
             docsIfUpChannelRangingBackoffEnd,
             docsIfUpChannelTxBackoffStart,
             docsIfUpChannelTxBackoffEnd,
             docsIfUpChannelScdmaActiveCodes,
             docsIfUpChannelScdmaCodesPerSlot,
             docsIfUpChannelScdmaFrameSize,
             docsIfUpChannelScdmaHoppingSeed,
             docsIfUpChannelType, and
             docsIfUpChannelPreEqEnable
             Setting this object to the value of a non-existent or
             a temporary upstream interface returns the error
             'wrongValue'.
             This object MUST contain a value of zero for physical
             interfaces entries.
             Setting this object in row entries that correspond to
             physical interfaces returns the error 'wrongValue'."
        ::= { docsIfUpstreamChannelEntry 16 }

    docsIfUpChannelUpdate OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Used to perform the copy of adjusted parameters from the
             temporary interface entry to the physical interface
             indicated by the docsIfUpChannelCloneFrom object.  The
             transfer is initiated through an SNMP SET to 'true' of
```

```
            this object.
            A SET to 'true' fails and returns error 'commitFailed'
            if docsIfUpChannelStatus value is 'notInService', which
            means that the interface parameters values are not
            compatible with each other or have not been validated yet.
            Reading this object always returns 'false'."
        ::= { docsIfUpstreamChannelEntry 17 }

    docsIfUpChannelStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This object is only used for the creation of a temporary
            upstream row with the purpose of updating the parameters
            of a physical upstream channel entry.

            The following restrictions apply to this object:
            1. This object is not writable for physical interfaces.
            2. Temporary interface entries are only created by a SET
               of this object to createandWait(5).
            3. ifAdminStatus from the Interface MIB RFC 2863 is used
               to take a physical upstream channel offline, to be
               consistent with DOCSIS 1.x operation, as indicated in
               RFC 2670.
               In addition,
                o ifAdminStatus 'down' is reflected in this object
                  as 'notInService'.
                o ifOperStatus 'down' while ifAdminStatus 'up' is
                  reflected in this object as 'notInservice'.
            4. Temporary created rows MUST be set to 'active' with
               the purpose of validating upstream parameter
               consistency prior to transferring the parameters to the
               physical interface.

            Below is a mandatory procedure for adjusting the values
            of a physical interface:
            1. Create a temporary interface entry through an SNMP SET
               using 'createAndWait'.  At this point, the RowStatus
               reports 'notReady'.
               The Manager entity uses an ifIndex value outside the
               operational range of the physical interfaces for the
               creation of a temporary interface.
            2. Set the docsIfUpChannelCloneFrom object to the ifIndex
               value of the physical row to update.  Now
               docsIfUpChannelStatus reports 'notInService'.
            3. Change the upstream parameters to the desired values
               in the temporary row.
```

```
            4. Validate that all parameters are consistent by setting
               docsIfUpChannelStatus to 'active'.  A failure to set the
               RowStatus to 'active' returns the error 'commitFailed',
               which means the parameters are not compatible with the
               target physical interface.
            5. With docsIfUpChannelStatus 'active', transfer the
               parameters to the target physical interface by setting
               the object docsIfUpChannelUpdate to 'true'.
            6. Delete the temporary row by setting
               docsIfUpChannelStatus to 'destroy'."
        ::= { docsIfUpstreamChannelEntry 18 }

    docsIfUpChannelPreEqEnable OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "At the CMTS, this object is used to enable or disable
             pre-equalization on the upstream channel represented by
             this table instance.  At the CM, this object is read-only
             and reflects the status of pre-equalization as represented
             in the RNG-RSP.  Pre-equalization is considered enabled at
             the CM if a RNG-RSP with pre-equalization data has been
             received at least once since the last mac
             reinitialization."
        DEFVAL {false}
        ::= { docsIfUpstreamChannelEntry 19 }

    -- The following table describes the attributes of each class of
    -- service.  The entries in this table are referenced from the
    -- docsIfServiceEntries.  They exist as a separate table in order to
    -- reduce redundant information in docsIfServiceTable.
    --
    -- This table is implemented at both the CM and the CMTS.
    -- The CM need only maintain entries for the classes of service
    -- referenced by its docsIfCmServiceTable.
    --

    docsIfQosProfileTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfQosProfileEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes for each class of service."
        ::= { docsIfBaseObjects 3 }

    docsIfQosProfileEntry OBJECT-TYPE
        SYNTAX      DocsIfQosProfileEntry
```

```
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes for a single class of service.
             If implemented as read-create in the Cable Modem
             Termination System, creation of entries in this table is
             controlled by the value of
             docsIfCmtsQosProfilePermissions.

             If implemented as read-only, entries are created based
             on information in REG-REQ MAC messages received from
             cable modems (for Cable Modem Termination System), or
             based on information extracted from the TFTP option file
             (for Cable Modem).
             In the Cable Modem Termination System, read-only entries
             are removed if no longer referenced by
             docsIfCmtsServiceTable.

             An entry in this table MUST not be removed while it is
             referenced by an entry in docsIfCmServiceTable (Cable
             Modem) or docsIfCmtsServiceTable (Cable Modem Termination
             System).

             An entry in this table SHOULD NOT be changeable while
             it is referenced by an entry in docsIfCmtsServiceTable.

             If this table is created automatically, there SHOULD only
             be a single entry for each Class of Service.  Multiple
             entries with the same Class of Service parameters are NOT
             RECOMMENDED."
        INDEX { docsIfQosProfIndex }
        ::= { docsIfQosProfileTable 1 }

    DocsIfQosProfileEntry ::= SEQUENCE {
            docsIfQosProfIndex                Integer32,
            docsIfQosProfPriority             Integer32,
            docsIfQosProfMaxUpBandwidth       Integer32,
            docsIfQosProfGuarUpBandwidth      Integer32,
            docsIfQosProfMaxDownBandwidth     Integer32,
            docsIfQosProfMaxTxBurst           Integer32,  -- deprecated
            docsIfQosProfBaselinePrivacy      TruthValue,
            docsIfQosProfStatus               RowStatus,
            docsIfQosProfMaxTransmitBurst     Integer32,
            docsIfQosProfStorageType          StorageType
        }

    docsIfQosProfIndex OBJECT-TYPE
        SYNTAX      Integer32 (1..16383)
```

```
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The index value that uniquely identifies an entry
             in the docsIfQosProfileTable."
        ::= { docsIfQosProfileEntry 1 }

    docsIfQosProfPriority OBJECT-TYPE
        SYNTAX      Integer32 (0..7)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "A relative priority assigned to this service when
             allocating bandwidth.  Zero indicates lowest priority
             and seven indicates highest priority.
             Interpretation of priority is device-specific.
             MUST NOT be changed while this row is active."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Annex C.1.1.4."
        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 2 }

    docsIfQosProfMaxUpBandwidth OBJECT-TYPE
        SYNTAX      Integer32 (0..100000000)
        UNITS "bits per second"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The maximum upstream bandwidth, in bits per second,
             allowed for a service with this service class.
             Zero if there is no restriction of upstream bandwidth.
             MUST NOT be changed while this row is active."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Annex C.1.1.4."
        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 3 }

    docsIfQosProfGuarUpBandwidth OBJECT-TYPE
        SYNTAX      Integer32 (0..100000000)
        UNITS "bits per second"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Minimum guaranteed upstream bandwidth, in bits per second,
```

```
            allowed for a service with this service class.
            MUST NOT be changed while this row is active."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Annex C.1.1.4."
        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 4 }

    docsIfQosProfMaxDownBandwidth OBJECT-TYPE
        SYNTAX      Integer32 (0..100000000)
        UNITS "bits per second"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The maximum downstream bandwidth, in bits per second,
            allowed for a service with this service class.
            Zero if there is no restriction of downstream bandwidth.
            MUST NOT be changed while this row is active."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Annex C.1.1.4."

        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 5 }

    docsIfQosProfMaxTxBurst OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        UNITS "mini-slots"
        MAX-ACCESS  read-create
        STATUS      deprecated
        DESCRIPTION
            "The maximum number of mini-slots that may be requested
            for a single upstream transmission.
            A value of zero means there is no limit.
            MUST NOT be changed while this row is active.
            This object has been deprecated and replaced by
            docsIfQosProfMaxTransmitBurst, to fix a mismatch
            of the units and value range with respect to the DOCSIS
            Maximum Upstream Channel Transmit Burst Configuration
            Setting."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            C.1.1.4."
        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 6 }
```

```
   docsIfQosProfBaselinePrivacy OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Indicates whether Baseline Privacy is enabled for this
             service class.
             MUST NOT be changed while this row is active."
        DEFVAL { false }
        ::= { docsIfQosProfileEntry 7 }

   docsIfQosProfStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "This is object is used to create or delete rows in
             this table.  This object MUST NOT be changed from active
             while the row is referenced by any entry in either
             docsIfCmServiceTable (on the CM) or
             docsIfCmtsServiceTable (on the CMTS)."
        ::= { docsIfQosProfileEntry 8 }

   docsIfQosProfMaxTransmitBurst OBJECT-TYPE
        SYNTAX      Integer32 (0..65535)
        UNITS       "bytes"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The maximum number of bytes that may be requested for a
             single upstream transmission.  A value of zero means there
             is no limit.  Note: This value does not include any
             physical layer overhead.
             MUST NOT be changed while this row is active."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Annex C.1.1.4."
        DEFVAL { 0 }
        ::= { docsIfQosProfileEntry 9 }

   docsIfQosProfStorageType OBJECT-TYPE
        SYNTAX       StorageType
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The storage type for this conceptual row.
             Entries with this object set to permanent(4)
```

```
            do not require write operations for writable
            objects."
        ::= { docsIfQosProfileEntry 10 }

    docsIfSignalQualityTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfSignalQualityEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "At the CM, describes the PHY signal quality of downstream
            channels.  At the CMTS, this object describes the PHY
            signal quality of upstream channels.  At the CMTS, this
            table MAY exclude contention intervals."
        ::= { docsIfBaseObjects 4 }

    docsIfSignalQualityEntry OBJECT-TYPE
        SYNTAX      DocsIfSignalQualityEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "At the CM, this object describes the PHY characteristics of
            a downstream channel.  At the CMTS, it describes the PHY
            signal quality of an upstream channel.
            An entry in this table exists for each ifEntry with an
            ifType of docsCableDownstream(128) for Cable Modems.
            For DOCSIS 1.1 Cable Modem Termination Systems, an entry
            exists for each ifEntry with an ifType of
            docsCableUpstream (129).
            For DOCSIS 2.0 Cable Modem Termination Systems, an entry
            exists for each ifEntry with an ifType of
            docsCableUpstreamChannel (205)."
        INDEX { ifIndex }
        ::= { docsIfSignalQualityTable 1 }

    DocsIfSignalQualityEntry ::= SEQUENCE {
            docsIfSigQIncludesContention  TruthValue,
            docsIfSigQUnerroreds          Counter32,
            docsIfSigQCorrecteds          Counter32,
            docsIfSigQUncorrectables      Counter32,
            docsIfSigQSignalNoise         TenthdB,
            docsIfSigQMicroreflections    Integer32,
            docsIfSigQEqualizationData    DocsEqualizerData,
            docsIfSigQExtUnerroreds       Counter64,
            docsIfSigQExtCorrecteds       Counter64,
            docsIfSigQExtUncorrectables   Counter64
        }

    docsIfSigQIncludesContention OBJECT-TYPE
```

```
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "true(1) if this CMTS includes contention intervals in
             the counters in this table.  Always false(2) for CMs."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4.1"
        ::= { docsIfSignalQualityEntry 1 }

    docsIfSigQUnerroreds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel without error.
             This includes all codewords, whether or not they
             were part of frames destined for this device.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Sections 6.2.4, and 6.3.6."
        ::= { docsIfSignalQualityEntry 2 }

    docsIfSigQCorrecteds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel with correctable
             errors.  This includes all codewords, whether or not
             they were part of frames destined for this device.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Sections 6.2.4, and 6.3.6."
```

```
        ::= { docsIfSignalQualityEntry 3 }

    docsIfSigQUncorrectables OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel with uncorrectable
             errors.  This includes all codewords, whether or not
             they were part of frames destined for this device.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Sections 6.2.4, and 6.3.6."
        ::= { docsIfSignalQualityEntry 4 }

    docsIfSigQSignalNoise OBJECT-TYPE
        SYNTAX      TenthdB
        UNITS       "TenthdB"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Signal/Noise ratio as perceived for this channel.
             At the CM, this object  describes the Signal/Noise of the
             downstream channel.  At the CMTS, it describes the
             average Signal/Noise of the upstream channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 4-1 and 4-2"
        ::= { docsIfSignalQualityEntry 5 }

    docsIfSigQMicroreflections OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        UNITS       "-dBc"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Microreflections, including in-channel response
             as perceived on this interface, measured in dBc below
             the signal level.
             This object is not assumed to return an absolutely
             accurate value, but it gives a rough indication
```

```
            of microreflections received on this interface.
            It is up to the implementer to provide information
            as accurately as possible."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Tables 4-1 and 4-2"
        ::= { docsIfSignalQualityEntry 6 }

    docsIfSigQEqualizationData OBJECT-TYPE
            SYNTAX      DocsEqualizerData
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                "At the CM, this object returns the equalization data for
                the downstream channel.

                At the CMTS, this object is not applicable and is not
                instantiated.  Note that previous CMTS implementations
                may instantiate this object in two ways:
                - An equalization value indicating an equalization
                  average for the upstream channel.  Those values have
                  vendor-dependent interpretations.
                - Return a zero-length OCTET STRING to indicate that
                  the value is unknown or if there is no equalization
                  data available or defined."
            REFERENCE
                "DOCSIS Radio Frequency Interface Specification,
                Figure 6-23."
            ::= { docsIfSignalQualityEntry 7 }


    docsIfSigQExtUnerroreds OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel without error.
            This includes all codewords, whether or not they
            were part of frames destined for this device.
            This is the 64-bit version of docsIfSigQUnerroreds.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
```

```
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Sections 6.2.4, and 6.3.6."
        ::= { docsIfSignalQualityEntry 8 }

    docsIfSigQExtCorrecteds OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel with correctable
            errors.  This includes all codewords, whether or not
            they were part of frames destined for this device.
            This is the 64-bit version of docsIfSigQCorrecteds.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Sections 6.2.4, and 6.3.6."
        ::= { docsIfSignalQualityEntry 9 }

    docsIfSigQExtUncorrectables OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received on this channel with uncorrectable
            errors.  This includes all codewords, whether or not
            they were part of frames destined for this device.
            This is the 64-bit version of docsIfSigQUncorrectables.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Sections 6.2.4, 6.3.6."
        ::= { docsIfSignalQualityEntry 10 }

    --
    -- DOCSIS Version of the device
    --
```

```
   docsIfDocsisBaseCapability OBJECT-TYPE
           SYNTAX      DocsisVersion
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "Indication of the DOCSIS capability of the device."
           REFERENCE
               "Data-Over-Cable Service Interface Specifications: Radio
                Frequency Interface Specification SP-RFIv2.0-I10-051209,
                Annex G."
           ::= { docsIfBaseObjects 5 }

   --
   -- CABLE MODEM GROUP
   --

   --
   -- The CM MAC Table
   --

   docsIfCmMacTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmMacEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes of each CM MAC interface,
             extending the information available from ifEntry."
        ::= { docsIfCmObjects 1 }

   docsIfCmMacEntry OBJECT-TYPE
        SYNTAX      DocsIfCmMacEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry containing objects describing attributes of
             each MAC entry, extending the information in ifEntry.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableMaclayer(127)."
        INDEX { ifIndex }
        ::= { docsIfCmMacTable 1 }

   DocsIfCmMacEntry ::= SEQUENCE {
            docsIfCmCmtsAddress           MacAddress,
            docsIfCmCapabilities          BITS,
            docsIfCmRangingRespTimeout    TimeTicks,
            docsIfCmRangingTimeout        TimeInterval
         }
```

```
   docsIfCmCmtsAddress OBJECT-TYPE
        SYNTAX      MacAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Identifies the CMTS that is believed to control this MAC
             domain.  At the CM, this will be the source address from
             SYNC, MAP, and other MAC-layer messages.  If the CMTS is
             unknown, returns 00-00-00-00-00-00."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.2.2."
        ::= { docsIfCmMacEntry 1 }

   docsIfCmCapabilities OBJECT-TYPE
        SYNTAX      BITS {
            atmCells(0),
            concatenation(1)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Identifies the capabilities of the MAC implementation
             at this interface.  Note that packet transmission is
             always supported.  Therefore, there is no specific bit
             required to explicitly indicate this capability.
             Note that BITS objects are encoded most significant bit
             first.  For example, if bit 1 is set, the value of this
             object is the octet string '40'H."
        ::= { docsIfCmMacEntry 2 }

   docsIfCmRangingRespTimeout OBJECT-TYPE
        SYNTAX      TimeTicks
        MAX-ACCESS  read-write
        STATUS      obsolete
        DESCRIPTION
            "Waiting time for a Ranging Response packet.
             This object has been obsoleted and replaced by
             docsIfCmRangingTimeout to correct the typing to
             TimeInterval."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.1.6."
        DEFVAL { 20 }
        ::= { docsIfCmMacEntry 3 }
```

```
   docsIfCmRangingTimeout OBJECT-TYPE
        SYNTAX      TimeInterval
        UNITS       "HundredOfSeconds"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "Waiting time for a Ranging Response packet.
             This object MUST NOT persist at reinitialization
             of the managed system."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.1.6, timer T3."
        DEFVAL { 20 }
        ::= { docsIfCmMacEntry 4 }

   --
   -- CM status table.
   -- This table is implemented only at the CM.
   --

   docsIfCmStatusTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmStatusEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This table maintains a number of status objects
             and counters for Cable Modems."
        ::= { docsIfCmObjects 2 }

   docsIfCmStatusEntry OBJECT-TYPE
        SYNTAX      DocsIfCmStatusEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A set of status objects and counters for a single MAC
             layer instance in Cable Modem.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableMaclayer(127)."
        INDEX { ifIndex }
        ::= { docsIfCmStatusTable 1 }

   DocsIfCmStatusEntry ::= SEQUENCE {
            docsIfCmStatusValue               INTEGER,
            docsIfCmStatusCode                OCTET STRING,
            docsIfCmStatusTxPower             TenthdBmV,
            docsIfCmStatusResets              Counter32,
            docsIfCmStatusLostSyncs           Counter32,
```

```
            docsIfCmStatusInvalidMaps         Counter32,
            docsIfCmStatusInvalidUcds         Counter32,
            docsIfCmStatusInvalidRangingResponses   Counter32,
            docsIfCmStatusInvalidRegistrationResponses Counter32,
            docsIfCmStatusT1Timeouts          Counter32,
            docsIfCmStatusT2Timeouts          Counter32,
            docsIfCmStatusT3Timeouts          Counter32,
            docsIfCmStatusT4Timeouts          Counter32,
            docsIfCmStatusRangingAborteds     Counter32,
            docsIfCmStatusDocsisOperMode      DocsisQosVersion,
            docsIfCmStatusModulationType      DocsisUpstreamType,
            docsIfCmStatusEqualizationData    DocsEqualizerData,
            docsIfCmStatusUCCs                Counter32,
            docsIfCmStatusUCCFails            Counter32
        }

    docsIfCmStatusValue OBJECT-TYPE
        SYNTAX      INTEGER {
            other(1),
            notReady(2),
            notSynchronized(3),
            phySynchronized(4),
            usParametersAcquired(5),
            rangingComplete(6),
            ipComplete(7),
            todEstablished(8),
            securityEstablished(9),
            paramTransferComplete(10),
            registrationComplete(11),
            operational(12),
            accessDenied(13)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current Cable Modem connectivity state, as specified
             in the RF Interface Specification.  Interpretations for
             state values 1-12 are clearly outlined in the SP-RFI
             reference given below.
             The state value accessDenied(13) indicates the CMTS has
             sent a Registration Aborted message to the CM.  The same
             state is reported as accessDenied(7) by the CMTS object
             docsIfCmtsCmStatusValue."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 11.2.
             Data-Over-Cable Service Interface Specifications:
```

```
            Operations Support System Interface Specification
            SP-OSSIv2.0-I09-050812, Section 6.3.4.2."
        ::= { docsIfCmStatusEntry 1 }

    docsIfCmStatusCode OBJECT-TYPE
        SYNTAX      OCTET STRING (SIZE( 0 | 5 | 6 ))
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Status code for a Cable Modem as defined in the
            OSSI Specification.  The status code consists
            of a single character indicating error groups, followed
            by a two- or three-digit number indicating the status
            condition, followed by a decimal.
            An example of a returned value could be 'T101.0'.
            The zero-length OCTET STRING indicates no status code yet
            registered."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications:
            Operations Support System Interface Specification
            SP-OSSIv2.0-I09-050812, Annex D."
        ::= { docsIfCmStatusEntry 2 }


    docsIfCmStatusTxPower OBJECT-TYPE
        SYNTAX      TenthdBmV
        UNITS       "TenthdBmV"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The operational transmit power for the attached upstream
            channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 6.2.18."
        ::= { docsIfCmStatusEntry 3 }

    docsIfCmStatusResets OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "resets"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM reset or initialized this
            interface.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
```

```
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmStatusEntry 4 }

    docsIfCmStatusLostSyncs OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM lost synchronization with
            the downstream channel.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.3.2."
        ::= { docsIfCmStatusEntry 5 }

    docsIfCmStatusInvalidMaps OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "maps"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM received invalid MAP messages.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.3.4."
        ::= { docsIfCmStatusEntry 6 }

    docsIfCmStatusInvalidUcds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "messages"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM received invalid UCD messages.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
```

```
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.3."
        ::= { docsIfCmStatusEntry 7 }

    docsIfCmStatusInvalidRangingResponses OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "messages"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM received invalid ranging response
             messages.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.6."
        ::= { docsIfCmStatusEntry 8 }

    docsIfCmStatusInvalidRegistrationResponses OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "messages"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the CM received invalid registration
             response messages.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.8."
        ::= { docsIfCmStatusEntry 9 }

    docsIfCmStatusT1Timeouts OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "timeouts"
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "Number of times counter T1 expired in the CM.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 9-2."
        ::= { docsIfCmStatusEntry 10 }

    docsIfCmStatusT2Timeouts OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "timeouts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times counter T2 expired in the CM.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 9-2."
        ::= { docsIfCmStatusEntry 11 }

    docsIfCmStatusT3Timeouts OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "timeouts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times counter T3 expired in the CM.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 9-2."
        ::= { docsIfCmStatusEntry 12 }

    docsIfCmStatusT4Timeouts OBJECT-TYPE
        SYNTAX      Counter32
```

```
        UNITS       "timeouts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times counter T4 expired in the CM.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 9-2."
        ::= { docsIfCmStatusEntry 13 }

    docsIfCmStatusRangingAborteds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Number of times the ranging process was aborted
             by the CMTS.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.3.3."
        ::= { docsIfCmStatusEntry 14 }

    docsIfCmStatusDocsisOperMode OBJECT-TYPE
        SYNTAX      DocsisQosVersion
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
             "Indication of whether the device has registered using 1.0
              Class of Service or 1.1 Quality of Service.
              An unregistered CM SHOULD indicate 'docsis11' for a
              docsIfDocsisBaseCapability value of DOCSIS 1.1/2.0.  An
              unregistered CM SHOULD indicate 'docsis10'  for a
              docsIfDocsisBaseCapability value of DOCSIS 1.0."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Annex G."
```

```
        ::= { docsIfCmStatusEntry 15 }

   docsIfCmStatusModulationType OBJECT-TYPE
         SYNTAX      DocsisUpstreamType
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
             "Indicates modulation type status currently used by the
              CM.  Since this object specifically identifies PHY mode,
              the shared upstream channel type is not permitted."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.1."

         ::= { docsIfCmStatusEntry 16 }

   docsIfCmStatusEqualizationData OBJECT-TYPE
        SYNTAX      DocsEqualizerData
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Pre-equalization data for this CM after convolution with
             data indicated in the RNG-RSP.  This data is valid when
             docsIfUpChannelPreEqEnable is set to true."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 8-23."
        ::= { docsIfCmStatusEntry 17 }

   docsIfCmStatusUCCs OBJECT-TYPE
        SYNTAX          Counter32
        UNITS           "attempts"
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
            "The number of successful Upstream Channel Change
             transactions.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmStatusEntry 18 }

   docsIfCmStatusUCCFails OBJECT-TYPE
        SYNTAX          Counter32
        UNITS           "attempts"
```

```
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
            "The number of failed Upstream Channel Change
             transactions.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmStatusEntry 19 }

    --
    -- The Cable Modem Service Table
    --

    docsIfCmServiceTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmServiceEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes of each upstream service queue
             on a CM."
        ::= { docsIfCmObjects 3 }

    docsIfCmServiceEntry OBJECT-TYPE
        SYNTAX      DocsIfCmServiceEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes of an upstream bandwidth service
             queue.
             An entry in this table exists for each Service ID.
             The primary index is an ifIndex with an ifType of
             docsCableMaclayer(127)."
        INDEX { ifIndex, docsIfCmServiceId }
        ::= { docsIfCmServiceTable 1 }

    DocsIfCmServiceEntry ::= SEQUENCE {
            docsIfCmServiceId               Integer32,
            docsIfCmServiceQosProfile       Integer32,
            docsIfCmServiceTxSlotsImmed     Counter32,
            docsIfCmServiceTxSlotsDed       Counter32,
            docsIfCmServiceTxRetries        Counter32,
            docsIfCmServiceTxExceededs      Counter32,
            docsIfCmServiceRqRetries        Counter32,
            docsIfCmServiceRqExceededs      Counter32,
            docsIfCmServiceExtTxSlotsImmed  Counter64,
            docsIfCmServiceExtTxSlotsDed    Counter64
```

```
        }

   docsIfCmServiceId OBJECT-TYPE
        SYNTAX      Integer32 (1..16383)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Identifies a service queue for upstream bandwidth.  The
             attributes of this service queue are shared between the
             CM and the CMTS.  The CMTS allocates upstream bandwidth
             to this service queue based on requests from the CM and
             on the class of service associated with this queue."
        ::= { docsIfCmServiceEntry 1 }

   docsIfCmServiceQosProfile OBJECT-TYPE
        SYNTAX      Integer32 (0..16383)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The index in docsIfQosProfileTable describing the quality
             of service attributes associated with this particular
             service.  If no associated entry in docsIfQosProfileTable
             exists, this object returns a value of zero."
        ::= { docsIfCmServiceEntry 2 }

   docsIfCmServiceTxSlotsImmed OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of upstream mini-slots that have been used to
             transmit data PDUs in immediate (contention) mode.  This
             includes only those PDUs that are presumed to have
             arrived at the head-end (i.e., those that were explicitly
             acknowledged).  It does not include retransmission attempts
             or mini-slots used by requests.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 3 }

   docsIfCmServiceTxSlotsDed OBJECT-TYPE
```

```
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of upstream mini-slots that have been used to
             transmit data PDUs in dedicated mode (i.e., as a result
             of a unicast Data Grant).
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 4 }

    docsIfCmServiceTxRetries OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of attempts to transmit data PDUs containing
             requests for acknowledgment that did not result in
             acknowledgment.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 5 }

    docsIfCmServiceTxExceededs OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of data PDU transmission failures due to
             excessive retries without acknowledgment.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
```

```
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 6 }

    docsIfCmServiceRqRetries OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of attempts to transmit bandwidth requests
             that did not result in acknowledgment.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 7 }

    docsIfCmServiceRqExceededs OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of requests for bandwidth that failed due to
             excessive retries without acknowledgment.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 8 }

    docsIfCmServiceExtTxSlotsImmed OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "The number of upstream mini-slots that have been used to
             transmit data PDUs in immediate (contention) mode.  This
             includes only those PDUs that are presumed to have
             arrived at the head-end (i.e., those that were explicitly
             acknowledged).  It does not include retransmission attempts
             or mini-slots used by requests.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 9 }

    docsIfCmServiceExtTxSlotsDed OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of upstream mini-slots that have been used to
             transmit data PDUs in dedicated mode (i.e., as a result
             of a unicast Data Grant).
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.4."
        ::= { docsIfCmServiceEntry 10 }

    --
    -- CMTS GROUP
    --

    --
    -- The CMTS MAC Table
    --

    docsIfCmtsMacTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsMacEntry
        MAX-ACCESS  not-accessible
        STATUS      current
```

```
        DESCRIPTION
            "Describes the attributes of each CMTS MAC interface,
             extending the information available from ifEntry.
             Mandatory for all CMTS devices."
        ::= { docsIfCmtsObjects 1 }

    docsIfCmtsMacEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsMacEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry containing objects describing attributes of each
             MAC entry, extending the information in ifEntry.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableMaclayer(127)."
        INDEX { ifIndex }
        ::= { docsIfCmtsMacTable 1 }

    DocsIfCmtsMacEntry ::= SEQUENCE {
            docsIfCmtsCapabilities            BITS,
            docsIfCmtsSyncInterval            Integer32,
            docsIfCmtsUcdInterval             Integer32,
            docsIfCmtsMaxServiceIds           Integer32,
            docsIfCmtsInsertionInterval       TimeTicks,   -- Obsolete
            docsIfCmtsInvitedRangingAttempts  Integer32,
            docsIfCmtsInsertInterval          TimeInterval,
            docsIfCmtsMacStorageType          StorageType
        }

    docsIfCmtsCapabilities OBJECT-TYPE
        SYNTAX      BITS {
            atmCells(0),
            concatenation(1)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Identifies the capabilities of the CMTS MAC
             implementation at this interface.  Note that packet
             transmission is always supported.  Therefore, there
             is no specific bit required to explicitly indicate
             this capability.
             Note that BITS objects are encoded most significant bit
             first.  For example, if bit 1 is set, the value of this
             object is the octet string '40'H."
        ::= { docsIfCmtsMacEntry 1 }

    docsIfCmtsSyncInterval OBJECT-TYPE
```

```
        SYNTAX      Integer32 (1..200)
        UNITS       "Milliseconds"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The interval between CMTS transmission of successive SYNC
             messages at this interface."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.3."
        ::= { docsIfCmtsMacEntry 2 }

    docsIfCmtsUcdInterval OBJECT-TYPE
        SYNTAX      Integer32 (1..2000)
        UNITS       "Milliseconds"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The interval between CMTS transmission of successive
             Upstream Channel Descriptor messages for each upstream
             channel at this interface."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 9.3"
        ::= { docsIfCmtsMacEntry 3 }

    docsIfCmtsMaxServiceIds OBJECT-TYPE
        SYNTAX     Integer32 (1..16383)
        UNITS      "SIDs"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
            "The maximum number of service IDs that may be
             simultaneously active."
        ::= { docsIfCmtsMacEntry 4 }

    docsIfCmtsInsertionInterval OBJECT-TYPE
        SYNTAX      TimeTicks
        MAX-ACCESS  read-write
        STATUS      obsolete
        DESCRIPTION
            "The amount of time to elapse between each broadcast
             initial maintenance grant.  Broadcast initial maintenance
             grants are used to allow new cable modems to join the
             network.  Zero indicates that a vendor-specific algorithm
             is used instead of a fixed time.  The maximum amount of
```

```
            time permitted by the specification is 2 seconds.
            This object has been obsoleted and replaced by
            docsIfCmtsInsertInterval to fix a SYNTAX typing problem."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Annex B."
        ::= { docsIfCmtsMacEntry 5 }

    docsIfCmtsInvitedRangingAttempts OBJECT-TYPE
        SYNTAX      Integer32 (0..1024)
        UNITS      "attempts"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The maximum number of attempts to make on invitations
            for ranging requests.  A value of zero means the system
            SHOULD attempt to range forever."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 9.3.3 and Annex B."
        ::= { docsIfCmtsMacEntry 6 }

    docsIfCmtsInsertInterval OBJECT-TYPE
        SYNTAX      TimeInterval
        UNITS       "HundredOfSeconds"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The amount of time to elapse between each broadcast
            initial maintenance grant.  Broadcast initial maintenance
            grants are used to allow new cable modems to join the
            network.  Zero indicates that a vendor-specific algorithm
            is used instead of a fixed time.  The maximum amount of
            time permitted by the specification is 2 seconds."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Annex B."
        ::= { docsIfCmtsMacEntry 7 }

    docsIfCmtsMacStorageType OBJECT-TYPE
        SYNTAX       StorageType
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The storage type for this conceptual row.
```

```
            Entries with this object set to permanent(4)
            do not require write operations for read-write
            objects."
        ::= { docsIfCmtsMacEntry 8 }

    --
    --
    -- CMTS status table.
    --

    docsIfCmtsStatusTable OBJECT-TYPE
         SYNTAX      SEQUENCE OF DocsIfCmtsStatusEntry
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
             "For the MAC layer, this group maintains a number of
              status objects and counters."
         ::= { docsIfCmtsObjects 2 }

    docsIfCmtsStatusEntry OBJECT-TYPE
         SYNTAX      DocsIfCmtsStatusEntry
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
            "Status entry for a single MAC layer.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableMaclayer(127)."
         INDEX { ifIndex }
         ::= { docsIfCmtsStatusTable 1 }

    DocsIfCmtsStatusEntry ::= SEQUENCE {
             docsIfCmtsStatusInvalidRangeReqs        Counter32,
             docsIfCmtsStatusRangingAborteds         Counter32,
             docsIfCmtsStatusInvalidRegReqs          Counter32,
             docsIfCmtsStatusFailedRegReqs           Counter32,
             docsIfCmtsStatusInvalidDataReqs         Counter32,
             docsIfCmtsStatusT5Timeouts              Counter32
         }

    docsIfCmtsStatusInvalidRangeReqs OBJECT-TYPE
         SYNTAX      Counter32
         UNITS       "messages"
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
             "This object counts invalid RNG-REQ messages received on
              this interface.
              Discontinuities in the value of this counter can occur
```

```
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.3.5."
        ::= { docsIfCmtsStatusEntry 1 }

    docsIfCmtsStatusRangingAborteds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object counts ranging attempts that were explicitly
            aborted by the CMTS.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.3.6."
        ::= { docsIfCmtsStatusEntry 2 }

    docsIfCmtsStatusInvalidRegReqs OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "messages"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object counts invalid REG-REQ messages received on
            this interface; that is, syntax, out of range parameters,
            or erroneous requests.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 8.3.7."
        ::= { docsIfCmtsStatusEntry 3 }

    docsIfCmtsStatusFailedRegReqs OBJECT-TYPE
        SYNTAX      Counter32
```

```
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object counts failed registration attempts.  Included
             are docsIfCmtsStatusInvalidRegReqs, authentication, and
             class of service failures.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.3.7."
        ::= { docsIfCmtsStatusEntry 4 }

    docsIfCmtsStatusInvalidDataReqs OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "messages"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object counts invalid data request messages
             received on this interface.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsStatusEntry 5 }

    docsIfCmtsStatusT5Timeouts OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "timeouts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "This object counts the number of times counter T5
             expired on this interface.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 9-2."
        ::= { docsIfCmtsStatusEntry 6 }
```

```
   --
   -- CM status table (within CMTS).
   -- This table is implemented only at the CMTS.
   -- It contains per-CM status information available in the CMTS.
   --

   docsIfCmtsCmStatusTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsCmStatusEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A set of objects in the CMTS, maintained for each
             cable modem connected to this CMTS."
        ::= { docsIfCmtsObjects 3 }

   docsIfCmtsCmStatusEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsCmStatusEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Status information for a single cable modem.
             An entry in this table exists for each cable modem
             that is connected to the CMTS implementing this table."
        INDEX { docsIfCmtsCmStatusIndex }
        ::= { docsIfCmtsCmStatusTable 1 }

   DocsIfCmtsCmStatusEntry ::= SEQUENCE {
            docsIfCmtsCmStatusIndex               Integer32,
            docsIfCmtsCmStatusMacAddress          MacAddress,
            docsIfCmtsCmStatusIpAddress        IpAddress, -- deprecated
            docsIfCmtsCmStatusDownChannelIfIndex  InterfaceIndexOrZero,
            docsIfCmtsCmStatusUpChannelIfIndex    InterfaceIndexOrZero,
            docsIfCmtsCmStatusRxPower             TenthdBmV,
            docsIfCmtsCmStatusTimingOffset        Unsigned32,
            docsIfCmtsCmStatusEqualizationData    DocsEqualizerData,
            docsIfCmtsCmStatusValue               INTEGER,
            docsIfCmtsCmStatusUnerroreds          Counter32,
            docsIfCmtsCmStatusCorrecteds          Counter32,
            docsIfCmtsCmStatusUncorrectables      Counter32,
            docsIfCmtsCmStatusSignalNoise         TenthdB,
            docsIfCmtsCmStatusMicroreflections    Integer32,
            docsIfCmtsCmStatusExtUnerroreds       Counter64,
            docsIfCmtsCmStatusExtCorrecteds       Counter64,
            docsIfCmtsCmStatusExtUncorrectables   Counter64,
            docsIfCmtsCmStatusDocsisRegMode       DocsisQosVersion,
            docsIfCmtsCmStatusModulationType      DocsisUpstreamType,
            docsIfCmtsCmStatusInetAddressType     InetAddressType,
            docsIfCmtsCmStatusInetAddress         InetAddress,
```

```
            docsIfCmtsCmStatusValueLastUpdate     TimeStamp,
            docsIfCmtsCmStatusHighResolutionTimingOffset Unsigned32
        }

    docsIfCmtsCmStatusIndex OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Index value to uniquely identify an entry in this table.
             For an individual cable modem, this index value SHOULD
             NOT change during CMTS uptime."
        ::= { docsIfCmtsCmStatusEntry 1 }

    docsIfCmtsCmStatusMacAddress OBJECT-TYPE
        SYNTAX      MacAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "MAC address of the cable modem.  If the cable modem has
             multiple MAC addresses, this is the MAC address associated
             with the Cable interface."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 8.2.2."
        ::= { docsIfCmtsCmStatusEntry 2 }

    docsIfCmtsCmStatusIpAddress OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
            "IP address of this cable modem.  If the cable modem has no
             IP address assigned, or the IP address is unknown, this
             object returns a value of 0.0.0.0.  If the cable modem has
             multiple IP addresses, this object returns the IP address
             associated with the Cable interface.
             This object has been deprecated and replaced by
             docsIfCmtsCmStatusInetAddressType and
             docsIfCmtsCmStatusInetAddress, to enable IPv6 addressing
             in the future."
        ::= { docsIfCmtsCmStatusEntry 3 }

    docsIfCmtsCmStatusDownChannelIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "IfIndex of the downstream channel that this CM is
             connected to.  If the downstream channel is unknown, this
             object returns a value of zero."
        ::= { docsIfCmtsCmStatusEntry 4 }

    docsIfCmtsCmStatusUpChannelIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
           "For DOCSIS 2.0, indicates the ifIndex of the logical
            upstream channel (ifType 205) this CM is connected to.
            For DOCSIS 1.x, indicates the ifIndex of the upstream
             channel (ifType 129) this CM is connected to.
             If the upstream channel is unknown, this object
             returns a value of zero."
        ::= { docsIfCmtsCmStatusEntry 5 }

    docsIfCmtsCmStatusRxPower OBJECT-TYPE
        SYNTAX      TenthdBmV
        UNITS       "ThenthdBmV"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The receive power as perceived for upstream data from
             this cable modem.
             If the receive power is unknown, this object returns
             a value of zero."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.18."
        ::= { docsIfCmtsCmStatusEntry 6 }

    docsIfCmtsCmStatusTimingOffset OBJECT-TYPE
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "A measure of the current round trip time for this CM.
             Used for timing of CM upstream transmissions to ensure
             synchronized arrivals at the CMTS.  Units are in terms
             of (6.25 microseconds/64).  Returns zero if the value
             is unknown.
             For channels requiring finer resolution, please refer to
             object docsIfCmtsCmStatusHighResolutionTimingOffset."
        REFERENCE
```

```
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.17."
        ::= { docsIfCmtsCmStatusEntry 7 }

    docsIfCmtsCmStatusEqualizationData OBJECT-TYPE
        SYNTAX      DocsEqualizerData
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Equalization data for this CM, as measured by the CMTS.
             Returns the zero-length OCTET STRING if the value is
             unknown or if there is no equalization data available
             or defined."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Figure 8-23."
        ::= { docsIfCmtsCmStatusEntry 8 }

    docsIfCmtsCmStatusValue OBJECT-TYPE
        SYNTAX      INTEGER {
            other(1),
            ranging(2),
            rangingAborted(3),
            rangingComplete(4),
            ipComplete(5),
            registrationComplete(6),
            accessDenied(7),
            operational(8),
            -- value 8 should not be used
            registeredBPIInitializing(9)
        }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current cable modem connectivity state, as specified
             in the RF Interface Specification.  Returned status
             information is the CM status, as assumed by the CMTS,
             and indicates the following events:
             other(1)
                Any state other than below.
             ranging(2)
                The CMTS has received an Initial Ranging Request
                message from the CM, and the ranging process is not
                yet complete.
             rangingAborted(3)
                The CMTS has sent a Ranging Abort message to the CM.
```

```
            rangingComplete(4)
               The CMTS has sent a Ranging Complete message to the CM.
            ipComplete(5)
               The CMTS has received a DHCP reply message and
               forwarded it to the CM.
            registrationComplete(6)
               The CMTS has sent a Registration Response message to
               the CM.
            accessDenied(7)
               The CMTS has sent a Registration Aborted message
               to the CM.
            operational(8)
               Value 8 is considered reserved and should not be defined
               in future revisions of this MIB module to avoid conflict
               with documented implementations that support value 8 to
               indicate operational state after completing the BPI
               initialization process.
            registeredBPIInitializing(9)
               Baseline Privacy (BPI) is enabled and the CMTS is in the
               process of completing BPI initialization.  This state
               MAY last for a significant length of time if failures
               occur during the initialization process.  After
               completion of BPI initialization, the CMTS will report
               registrationComplete(6).
            The CMTS only needs to report states it is able to
            detect."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 11.2."
        ::= { docsIfCmtsCmStatusEntry 9 }

    docsIfCmtsCmStatusUnerroreds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received without error from this cable modem.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.4."
        ::= { docsIfCmtsCmStatusEntry 10 }
```

```
   docsIfCmtsCmStatusCorrecteds OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received with correctable errors from this
             cable modem.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.4."
        ::= { docsIfCmtsCmStatusEntry 11 }

   docsIfCmtsCmStatusUncorrectables OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received with uncorrectable errors from this
             cable modem.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.4."
        ::= { docsIfCmtsCmStatusEntry 12 }

   docsIfCmtsCmStatusSignalNoise OBJECT-TYPE
        SYNTAX      TenthdB
        UNITS       "TenthdB"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Signal/Noise ratio as perceived for upstream data from
             this cable modem.
             If the Signal/Noise is unknown, this object returns
             a value of zero."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
```

```
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Tables 4-1 and 4-2."
        ::= { docsIfCmtsCmStatusEntry 13 }

    docsIfCmtsCmStatusMicroreflections OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        UNITS       "-dBc"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Total microreflections, including in-channel response
            as perceived on this interface, measured in dBc below
            the signal level.
            This object is not assumed to return an absolutely
            accurate value, but it gives a rough indication
            of microreflections received on this interface.
            It is up to the implementer to provide information
            as accurately as possible.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Tables 4-1 and 4-2"
        ::= { docsIfCmtsCmStatusEntry 14 }

    docsIfCmtsCmStatusExtUnerroreds OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received without error from this cable modem.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Section 6.2.5."
        ::= { docsIfCmtsCmStatusEntry 15 }

    docsIfCmtsCmStatusExtCorrecteds OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received with correctable errors from this
             cable modem.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.5."
        ::= { docsIfCmtsCmStatusEntry 16 }

    docsIfCmtsCmStatusExtUncorrectables OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "codewords"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Codewords received with uncorrectable errors from this
             cable modem.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.5."
        ::= { docsIfCmtsCmStatusEntry 17 }

    docsIfCmtsCmStatusDocsisRegMode OBJECT-TYPE
           SYNTAX      DocsisQosVersion
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "Indication of whether the CM has registered using 1.0
                Class of Service or 1.1 Quality of Service."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Annex G."
        ::= { docsIfCmtsCmStatusEntry 18 }

    docsIfCmtsCmStatusModulationType OBJECT-TYPE
          SYNTAX      DocsisUpstreamType
```

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Indicates modulation type currently used by the CM.  Since
             this object specifically identifies PHY mode, the shared
             type is not permitted.  If the upstream channel is
             unknown, this object returns a value of zero."
       REFERENCE
           "Data-Over-Cable Service Interface Specifications: Radio
            Frequency Interface Specification SP-RFIv2.0-I10-051209,
            Table 8-19."
        ::= { docsIfCmtsCmStatusEntry 19 }

   docsIfCmtsCmStatusInetAddressType OBJECT-TYPE
           SYNTAX      InetAddressType
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "The type of internet address of
                docsIfCmtsCmStatusInetAddress.  If the cable modem
                internet address is unassigned or unknown, then the
                value of this object is unknown(0)."
           ::= { docsIfCmtsCmStatusEntry 20 }

   docsIfCmtsCmStatusInetAddress OBJECT-TYPE
           SYNTAX      InetAddress
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "Internet address of this cable modem.  If the Cable
                Modem has no Internet address assigned, or the Internet
                address is unknown, the value of this object is the
                zero-length OCTET STRING.  If the cable modem has
                multiple Internet addresses, this object returns the
                Internet address associated with the Cable
                (i.e., RF MAC) interface."
           ::= { docsIfCmtsCmStatusEntry 21 }

   docsIfCmtsCmStatusValueLastUpdate OBJECT-TYPE
           SYNTAX      TimeStamp
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "The value of sysUpTime when docsIfCmtsCmStatusValue
                was last updated."
           ::= { docsIfCmtsCmStatusEntry 22 }

   docsIfCmtsCmStatusHighResolutionTimingOffset OBJECT-TYPE
```

```
        SYNTAX      Unsigned32 (0..4294967295)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "A measure of the current round trip time for this CM.
             Used for timing of CM upstream transmissions to ensure
             synchronized arrivals at the CMTS.  Units are in terms
             of (6.25 microseconds/(64*256)).  Returns zero if the value
             is unknown.
             This is the high resolution version of object
             docsIfCmtsCmStatusTimingOffset, for channels requiring
             finer resolution."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Section 6.2.17."
        ::= { docsIfCmtsCmStatusEntry 23 }

    --
    -- The CMTS Service Table.
    --

    docsIfCmtsServiceTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsServiceEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes of upstream service queues
             in a Cable Modem Termination System."
        ::= { docsIfCmtsObjects 4 }

    docsIfCmtsServiceEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsServiceEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes the attributes of a single upstream bandwidth
             service queue.
             Entries in this table exist for each ifEntry with an
             ifType of docsCableMaclayer(127), and for each service
             queue (Service ID) within this MAC layer.
             Entries in this table are created with the creation of
             individual Service IDs by the MAC layer and removed
             when a Service ID is removed."
        INDEX { ifIndex, docsIfCmtsServiceId }
        ::= { docsIfCmtsServiceTable 1 }

    DocsIfCmtsServiceEntry ::= SEQUENCE {
```

```
            docsIfCmtsServiceId                Integer32,
            docsIfCmtsServiceCmStatusIndex     Integer32,  -- deprecated
            docsIfCmtsServiceAdminStatus       INTEGER,
            docsIfCmtsServiceQosProfile        Integer32,
            docsIfCmtsServiceCreateTime        TimeStamp,
            docsIfCmtsServiceInOctets          Counter32,
            docsIfCmtsServiceInPackets         Counter32,
            docsIfCmtsServiceNewCmStatusIndex Integer32
        }

    docsIfCmtsServiceId OBJECT-TYPE
        SYNTAX      Integer32 (1..16383)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Identifies a service queue for upstream bandwidth.  The
             attributes of this service queue are shared between the
             Cable Modem and the Cable Modem Termination System.
             The CMTS allocates upstream bandwidth to this service
             queue based on requests from the CM and on the class of
             service associated with this queue."
        ::= { docsIfCmtsServiceEntry 1 }

    docsIfCmtsServiceCmStatusIndex OBJECT-TYPE
        SYNTAX      Integer32 (0..65535)
        MAX-ACCESS  read-only
        STATUS      deprecated
        DESCRIPTION
            "Pointer to an entry in docsIfCmtsCmStatusTable identifying
             the cable modem using this Service Queue.  If multiple
             cable modems are using this Service Queue, the value of
             this object is zero.
             This object has been deprecated and replaced by
             docsIfCmtsServiceNewCmStatusIndex, to fix a mismatch
             of the value range with respect to docsIfCmtsCmStatusIndex
             (1..2147483647)."
        ::= { docsIfCmtsServiceEntry 2 }

    docsIfCmtsServiceAdminStatus OBJECT-TYPE
        SYNTAX      INTEGER {
            enabled(1),
            disabled(2),
            destroyed(3) }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "Allows a service class for a particular modem to be
             suppressed, (re-)enabled, or deleted altogether."
```

```
        ::= { docsIfCmtsServiceEntry 3 }

    docsIfCmtsServiceQosProfile OBJECT-TYPE
        SYNTAX      Integer32 (0..16383)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The index in docsIfQosProfileTable describing the quality
             of service attributes associated with this particular
             service.  If no associated docsIfQosProfileTable entry
             exists, this object returns a value of zero."
        ::= { docsIfCmtsServiceEntry 4 }

    docsIfCmtsServiceCreateTime OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The value of sysUpTime when this entry was created."
        ::= { docsIfCmtsServiceEntry 5 }

    docsIfCmtsServiceInOctets OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "Bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The cumulative number of Packet Data octets received
             on this Service ID.  The count does not include the
             size of the Cable MAC header.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsServiceEntry 6 }

    docsIfCmtsServiceInPackets OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "packets"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The cumulative number of Packet Data packets received
             on this Service ID.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
```

```
        ::= { docsIfCmtsServiceEntry 7 }

    docsIfCmtsServiceNewCmStatusIndex OBJECT-TYPE
        SYNTAX      Integer32 (0..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Pointer (via docsIfCmtsCmStatusIndex) to an entry in
             docsIfCmtsCmStatusTable identifying the cable modem
             using this Service Queue.  If multiple cable modems are
             using this Service Queue, the value of this object is
             zero."
        ::= { docsIfCmtsServiceEntry 8 }

    --
    -- The following table provides upstream channel modulation profiles.
    -- Entries in this table can be
    -- re-used by one or more upstream channels.  An upstream channel
    -- will have a modulation profile for each value of
    -- docsIfModIntervalUsageCode.
    --

    docsIfCmtsModulationTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsModulationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes a modulation profile associated with one or more
             upstream channels."
        ::= { docsIfCmtsObjects 5 }

    docsIfCmtsModulationEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsModulationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Describes a modulation profile for an Interval Usage Code
             for one or more upstream channels.
             Entries in this table are created by the operator.

             Initial default entries MAY be created at system
             initialization time, which could report a value of
             'permanent' or 'readOnly' for docsIfCmtsModStorageType.
             A CMTS MAY reject the creation of additional Interval
             Usage Codes for a modulation profile being defined at
             Initialization time.
             No individual objects have to be specified in order
             to create an entry in this table.
```

```
            Note that some objects do not have DEFVAL clauses
            but do have calculated defaults and need not be specified
            during row creation."
         INDEX { docsIfCmtsModIndex, docsIfCmtsModIntervalUsageCode}
        ::= { docsIfCmtsModulationTable 1 }

   DocsIfCmtsModulationEntry ::= SEQUENCE {
           docsIfCmtsModIndex                    Integer32,
           docsIfCmtsModIntervalUsageCode        INTEGER,
           docsIfCmtsModControl                  RowStatus,
           docsIfCmtsModType                     INTEGER,
           docsIfCmtsModPreambleLen              Integer32,
           docsIfCmtsModDifferentialEncoding     TruthValue,
           docsIfCmtsModFECErrorCorrection       Integer32,
           docsIfCmtsModFECCodewordLength        Integer32,
           docsIfCmtsModScramblerSeed            Integer32,
           docsIfCmtsModMaxBurstSize             Integer32,
           docsIfCmtsModGuardTimeSize            Unsigned32,
           docsIfCmtsModLastCodewordShortened    TruthValue,
           docsIfCmtsModScrambler                TruthValue,
           docsIfCmtsModByteInterleaverDepth     Unsigned32,
           docsIfCmtsModByteInterleaverBlockSize Unsigned32,
           docsIfCmtsModPreambleType             INTEGER,
           docsIfCmtsModTcmErrorCorrectionOn     TruthValue,
           docsIfCmtsModScdmaInterleaverStepSize Unsigned32,
           docsIfCmtsModScdmaSpreaderEnable      TruthValue,
           docsIfCmtsModScdmaSubframeCodes       Unsigned32,
           docsIfCmtsModChannelType              DocsisUpstreamType,
           docsIfCmtsModStorageType              StorageType
        }

   docsIfCmtsModIndex OBJECT-TYPE
        SYNTAX       Integer32 (1..2147483647)
        MAX-ACCESS   not-accessible
        STATUS      current
        DESCRIPTION
             "An index into the Channel Modulation table representing
              a group of Interval Usage Codes, all associated with the
              same channel."
        ::= { docsIfCmtsModulationEntry 1 }

   docsIfCmtsModIntervalUsageCode OBJECT-TYPE
        SYNTAX       INTEGER {
            request(1),
            requestData(2),
            initialRanging(3),
            periodicRanging(4),
            shortData(5),
```

```
            longData(6),
            advPhyShortData(9),
            advPhyLongData(10),
            ugs(11)
        }
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An index into the Channel Modulation table that, when
             grouped with other Interval Usage Codes, fully
             instantiates all modulation sets for a given upstream
             channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 8-20."
        ::= { docsIfCmtsModulationEntry 2 }

    docsIfCmtsModControl OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Controls and reflects the status of rows in this table.
             There is no restriction on the changing of values in this
             table while their associated rows are active, with the
             exception of:

             1. If a modulation profile is being referenced by one
                or more upstream channels, an attempt to set the value
                of docsIfCmtsModChannelType returns an
                'inconsistentValue' error.

             2. If a modulation profile is being referenced by one
                or more upstream channels, an attempt to set
                docsIfCmtsModControl to destroy(6) or notInService(2)
                returns an 'inconsistentValue' error."
        ::= { docsIfCmtsModulationEntry 3 }

    docsIfCmtsModType OBJECT-TYPE
        SYNTAX      INTEGER {
            other(1),
            qpsk(2),
            qam16(3),
            qam8(4),
            qam32(5),
            qam64(6),
            qam128(7)
```

```
        }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The modulation type used on this channel.  Returns
             other(1) if the modulation type is not
             qpsk, qam16, qam8, qam32, qam64, or qam128.
             Type qam128 is used for SCDMA channels only.
             See the reference for the modulation profiles
             implied by different modulation types."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { qpsk }
        ::= { docsIfCmtsModulationEntry 4 }

    docsIfCmtsModPreambleLen OBJECT-TYPE
        SYNTAX      Integer32 (0..1536)
        UNITS       "bits"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The preamble length for this modulation profile in bits.
             Default value is the minimum needed by the implementation
             at the CMTS for the given modulation profile."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        ::= { docsIfCmtsModulationEntry 5 }

    docsIfCmtsModDifferentialEncoding OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Specifies whether or not differential encoding is used
             on this channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { false }
        ::= { docsIfCmtsModulationEntry 6 }

    docsIfCmtsModFECErrorCorrection OBJECT-TYPE
        SYNTAX      Integer32 (0..16)
```

```
        UNITS       "Bytes"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The number of correctable errored bytes (t) used in
             forward error correction code.  The value of 0 indicates
             that no correction is employed.  The number of check bytes
             appended will be twice this value."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { 0 }
        ::= { docsIfCmtsModulationEntry 7 }

    docsIfCmtsModFECCodewordLength OBJECT-TYPE
        SYNTAX      Integer32 (1..255)
        UNITS       "Bytes"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The number of data bytes (k) in the forward error
             correction codeword.
             This object is not used if docsIfCmtsModFECErrorCorrection
             is zero."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { 32 }
        ::= { docsIfCmtsModulationEntry 8 }

    docsIfCmtsModScramblerSeed OBJECT-TYPE
        SYNTAX      Integer32 (0..32767)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The 15-bit seed value for the scrambler polynomial."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 8-19."
        DEFVAL { 0 }
        ::= { docsIfCmtsModulationEntry 9 }

    docsIfCmtsModMaxBurstSize OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        UNITS       "mini-slots"
```

```
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The maximum number of mini-slots that can be transmitted
             during this channel's burst time.  Returns zero if the
             burst length is bounded by the allocation MAP rather than
             by this profile.
             Default value is 0, except for shortData, where it is 8."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 8-19."
        ::= { docsIfCmtsModulationEntry 10 }

    docsIfCmtsModGuardTimeSize OBJECT-TYPE
        SYNTAX      Unsigned32
        UNITS       "Symbol-times"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of symbol-times that MUST follow the end of
             this channel's burst.  Default value is the minimum time
             needed by the implementation for this modulation profile."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        ::= { docsIfCmtsModulationEntry 11 }

    docsIfCmtsModLastCodewordShortened OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Indicates whether the last FEC codeword is truncated."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { true }
        ::= { docsIfCmtsModulationEntry 12 }

    docsIfCmtsModScrambler OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Indicates whether the scrambler is employed."
```

```
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { false }
        ::= { docsIfCmtsModulationEntry 13 }

    docsIfCmtsModByteInterleaverDepth OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "ATDMA Byte Interleaver Depth (Ir).  This object returns 1
             for non-ATDMA profiles."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { 1 }
        ::= { docsIfCmtsModulationEntry 14 }

    docsIfCmtsModByteInterleaverBlockSize OBJECT-TYPE
        SYNTAX      Unsigned32
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "ATDMA Byte Interleaver Block size (Br).  This object
             returns zero for non-ATDMA profiles "
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { 18 }
        ::= { docsIfCmtsModulationEntry 15 }

    docsIfCmtsModPreambleType OBJECT-TYPE
        SYNTAX       INTEGER {
            unknown(0),
            qpsk0(1),
            qpsk1(2)
        }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Preamble type for DOCSIS 2.0 bursts.  The value
             'unknown(0)' represents a row entry consisting only of
             DOCSIS 1.x bursts"
        REFERENCE
```

```
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { qpsk0 }
        ::= { docsIfCmtsModulationEntry 16 }

    docsIfCmtsModTcmErrorCorrectionOn OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Trellis Code Modulation (TCM) On/Off.  This value returns
             false for non-S-CDMA profiles."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { false }
        ::= { docsIfCmtsModulationEntry 17 }

    docsIfCmtsModScdmaInterleaverStepSize OBJECT-TYPE
        SYNTAX      Unsigned32 (0 | 1..32)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            " S-CDMA Interleaver step size.  This value returns zero
              for non-S-CDMA profiles."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        DEFVAL { 1 }
        ::= { docsIfCmtsModulationEntry 18 }

    docsIfCmtsModScdmaSpreaderEnable OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            " S-CDMA spreader.  This value returns false for non-S-CDMA
              profiles.  Default value for IUC 3 and 4 is OFF; for
              all other IUCs it is ON."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Tables 6-7, and 8-19."
        ::= { docsIfCmtsModulationEntry 19 }
```

```
   docsIfCmtsModScdmaSubframeCodes OBJECT-TYPE
        SYNTAX      Unsigned32 (0 | 1..128)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            " S-CDMA sub-frame size.  This value returns zero
              for non-S-CDMA profiles."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 6-7, and 8-19."
        DEFVAL { 1 }
        ::= { docsIfCmtsModulationEntry 20 }

   docsIfCmtsModChannelType OBJECT-TYPE
        SYNTAX      DocsisUpstreamType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Describes the modulation channel type for this modulation
             entry.
             All the active entries in a modulation profile (that is all
             active entries that share a common docsIfCmtsModIndex)
             MUST have the same value of docsIfCmtsModChannelType."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I10-051209,
             Table 8-19."
        DEFVAL { tdma }
        ::= { docsIfCmtsModulationEntry 21 }

   docsIfCmtsModStorageType OBJECT-TYPE
        SYNTAX       StorageType
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The storage type for this conceptual row.
             Entries with this object set to permanent(4)
             do not require write operations for read-write
             objects."
        DEFVAL      { nonVolatile }
    ::= { docsIfCmtsModulationEntry 22 }

   docsIfCmtsQosProfilePermissions OBJECT-TYPE
        SYNTAX      BITS {
            createByManagement(0),
            updateByManagement(1),
            createByModems(2)
```

```
        }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "This object specifies permitted methods of creating
             entries in docsIfQosProfileTable.
             createByManagement(0) is set if entries can be created
             using SNMP.  updateByManagement(1) is set if updating
             entries using SNMP is permitted.  createByModems(2)
             is set if entries can be created based on information
             in REG-REQ MAC messages received from cable modems.
             Information in this object is only applicable if
             docsIfQosProfileTable is implemented as read-create.
             Otherwise, this object is implemented as read-only
             and returns createByModems(2).
             Either createByManagement(0) or updateByManagement(1)
             MUST be set when writing to this object.
             Note that BITS objects are encoded most significant bit
             first.  For example, if bit 2 is set, the value of this
             object is the octet string '20'H."
        ::= { docsIfCmtsObjects 6 }

    docsIfCmtsMacToCmTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsMacToCmEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This is a table to provide a quick access index into the
             docsIfCmtsCmStatusTable.  There is exactly one row in this
             table for each row in the docsIfCmtsCmStatusTable.  In
             general, the management station SHOULD use this table only
             to get a pointer into the docsIfCmtsCmStatusTable (which
             corresponds to the CM's RF interface MAC address) and
             SHOULD not iterate (e.g., GetNext through) this table."
        ::= { docsIfCmtsObjects 7 }

    docsIfCmtsMacToCmEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsMacToCmEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A row in the docsIfCmtsMacToCmTable.
             An entry in this table exists for each cable modem
             that is connected to the CMTS implementing this table."
        INDEX   { docsIfCmtsCmMac }
        ::= {docsIfCmtsMacToCmTable 1 }

    DocsIfCmtsMacToCmEntry ::= SEQUENCE {
```

```
                docsIfCmtsCmMac     MacAddress,
                docsIfCmtsCmPtr     Integer32
        }

    docsIfCmtsCmMac OBJECT-TYPE
        SYNTAX      MacAddress
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The RF side MAC address for the referenced CM (e.g., the
             interface on the CM that has docsCableMacLayer(127) as
             its ifType)."
        ::= { docsIfCmtsMacToCmEntry 1 }

    docsIfCmtsCmPtr OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "An row index into docsIfCmtsCmStatusTable.  When queried
             with the correct instance value (e.g., a CM's MAC address),
             returns the index in docsIfCmtsCmStatusTable that
             represents that CM."
        ::= { docsIfCmtsMacToCmEntry 2 }

    -- The following independent object and associated table provide
    -- operators with a mechanism to evaluate the load/utilization of
    -- both upstream and downstream physical channels.  This information
    -- may be used for capacity planning and incident analysis and may
    -- be particularly helpful in provisioning of high value QOS.
    --
    -- Utilization is expressed as an index representing the calculated
    -- percentage utilization of the upstream or downstream channel in
    -- the most recent sampling interval (i.e., utilization interval).
    -- Refer to the DESCRIPTION field of the
    -- docsIfCmtsChannelUtUtilization object for definitions and
    -- calculation details.

    docsIfCmtsChannelUtilizationInterval OBJECT-TYPE
        SYNTAX      Integer32 (0..86400)
        UNITS       "seconds"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
            "The time interval in seconds over which the channel
             utilization index is calculated.  All upstream/downstream
             channels use the same
             docsIfCmtsChannelUtilizationInterval.
```

```
            Setting a value of zero disables utilization reporting.
            A channel utilization index is calculated over a fixed
            window applying to the most recent
            docsIfCmtsChannelUtilizationInterval.  It would therefore
            be prudent to use a relatively short
            docsIfCmtsChannelUtilizationInterval.
            It is a vendor decision whether to reset the timer when
            docsIfCmtsChannelUtilizationInterval is changed during a
            utilization sampling period."
        ::= { docsIfCmtsObjects 8 }

    docsIfCmtsChannelUtilizationTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsChannelUtilizationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Reports utilization statistics for attached upstream and
            downstream physical channels."
        ::= { docsIfCmtsObjects 9 }

    docsIfCmtsChannelUtilizationEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsChannelUtilizationEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "Utilization statistics for a single upstream or downstream
            physical channel.  An entry exists in this table for each
            ifEntry with an ifType equal to
            docsCableDownstream (128)
            or docsCableUpstream (129)."
        INDEX  { ifIndex, docsIfCmtsChannelUtIfType,
            docsIfCmtsChannelUtId }
        ::= { docsIfCmtsChannelUtilizationTable 1 }

    DocsIfCmtsChannelUtilizationEntry ::= SEQUENCE {
            docsIfCmtsChannelUtIfType         IANAifType,
            docsIfCmtsChannelUtId             Integer32,
            docsIfCmtsChannelUtUtilization    Integer32
        }

    docsIfCmtsChannelUtIfType OBJECT-TYPE
        SYNTAX       IANAifType
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
            "The secondary index into this table.  Indicates the IANA
            interface type associated with this physical channel.
            Only docsCableDownstream (128) and
```

```
            docsCableUpstream (129) are valid."
        ::= { docsIfCmtsChannelUtilizationEntry 1 }

    docsIfCmtsChannelUtId OBJECT-TYPE
        SYNTAX       Integer32 (0..255)
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
            "The tertiary index into this table.  Indicates the CMTS
             identifier for this physical channel."
        ::= { docsIfCmtsChannelUtilizationEntry 2 }

    docsIfCmtsChannelUtUtilization OBJECT-TYPE
        SYNTAX       Integer32 (0..100)
        UNITS        "percent"
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The calculated and truncated utilization index for this
             physical upstream or downstream channel, accurate as of
             the most recent docsIfCmtsChannelUtilizationInterval.

             Upstream Channel Utilization Index:

             The upstream channel utilization index is expressed as a
             percentage of mini-slots utilized on the physical channel,
             regardless of burst type.  For an Initial Maintenance
             region, the mini-slots for the complete region are
             considered utilized if the CMTS received an upstream
             burst within the region from any CM on the physical
             channel.  For contention REQ and REQ/DATA regions, the
             mini-slots for a transmission opportunity within the
             region are considered utilized if the CMTS received an
             upstream burst within the opportunity from any CM on the
             physical channel.  For all other regions, utilized
             mini-slots are those in which the CMTS granted
             bandwidth to any unicast SID on the physical channel.

             For an upstream interface that has multiple logical
             upstream channels enabled, the utilization index is a
             weighted sum of utilization indices for the logical
             channels.  The weight for each utilization index is the
             percentage of upstream mini-slots allocated for the
             corresponding logical channel.
             Example:
             If 75% of bandwidth is allocated to the first logical
             channel and 25% to the second, and the utilization
             indices for each are 60 and 40, respectively, the
```

```
            utilization index for the upstream physical channel is
            (60 * 0.75) + (40 * 0.25) = 55.  This figure
            applies to the most recent utilization interval.

            Downstream Channel Utilization Index:

            The downstream channel utilization index is a percentage
            expressing the ratio between bytes used to transmit data
            versus the total number of bytes transmitted in the raw
            bandwidth of the MPEG channel.  As with the upstream
            utilization index, the calculated value represents
            the most recent utilization interval.
            Formula:
            Downstream utilization index =
            (100 * (data bytes / raw bytes))

            Definitions:
            Data bytes:    Number of bytes transmitted as data in the
                           docsIfCmtsChannelUtilizationInterval.
                           Identical to docsIfCmtsDownChannelCtrUsed
                           Bytes measured over the utilization
                           interval.
            Raw bandwidth: Total number of bytes available for
                           transmitting data, not including bytes
                           used for headers and other overhead.
            Raw bytes:     (raw bandwidth *
                           docsIfCmtsChannelUtilizationInterval).
                           Identical to docsIfCmtsDownChannelCtrTotal
                           Bytes measured over the utilization
                           interval."
        ::= { docsIfCmtsChannelUtilizationEntry 3 }

    -- The following table provides operators with input data
    -- appropriate for calculating downstream channel utilization.
    -- Operators may use the docsIfCmtsChannelUtilizationTable or
    -- perform their own polling of the
    -- docsIfCmtsDownChannelCounterTable objects to characterize
    -- their downstream channel usage.  The 32-bit counter objects are
    -- included to provide backward compatibility with SNMPv1 managers,
    -- which cannot access 64-bit counter objects.

    docsIfCmtsDownChannelCounterTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsDownChannelCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This table is implemented at the CMTS to collect
             downstream channel statistics for utilization
```

```
            calculations."
        ::= { docsIfCmtsObjects 10 }

    docsIfCmtsDownChannelCounterEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsDownChannelCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "An entry provides a list of traffic counters for a single
             downstream channel.
             An entry in this table exists for each ifEntry with an
             ifType of docsCableDownstream(128)."
        INDEX { ifIndex }
        ::= { docsIfCmtsDownChannelCounterTable 1 }

    DocsIfCmtsDownChannelCounterEntry ::= SEQUENCE {
            docsIfCmtsDownChnlCtrId              Integer32,
            docsIfCmtsDownChnlCtrTotalBytes      Counter32,
            docsIfCmtsDownChnlCtrUsedBytes       Counter32,
            docsIfCmtsDownChnlCtrExtTotalBytes   Counter64,
            docsIfCmtsDownChnlCtrExtUsedBytes    Counter64
        }

    docsIfCmtsDownChnlCtrId OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The Cable Modem Termination System identification
             of the downstream channel within this particular MAC
             interface.  If the interface is down, the object returns
             the most current value.  If the downstream channel ID is
             unknown, this object returns a value of 0."
        ::= { docsIfCmtsDownChannelCounterEntry 1 }

    docsIfCmtsDownChnlCtrTotalBytes OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "Bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "At the CMTS, the total number of bytes in the Payload
             portion of MPEG Packets (i.e., not including MPEG header
             or pointer_field) transported by this downstream channel.
             This is the 32-bit version of
             docsIfCmtsDownChnlCtrExtTotalBytes, included to provide
             back compatibility with SNMPv1 managers.
             Discontinuities in the value of this counter can occur
```

```
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsDownChannelCounterEntry 2 }

    docsIfCmtsDownChnlCtrUsedBytes OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "Bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "At the CMTS, the total number of DOCSIS data bytes
            transported by this downstream channel.
            The number of data bytes is defined as the total number
            of bytes transported in DOCSIS payloads minus the number
            of stuff bytes transported in DOCSIS payloads.
            This is the 32-bit version of
            docsIfCmtsDownChnlCtrExtUsedBytes, included to provide
            back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsDownChannelCounterEntry 3 }

    docsIfCmtsDownChnlCtrExtTotalBytes OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "Bytes"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "At the CMTS, the total number of bytes in the Payload
            portion of MPEG Packets (i.e., not including MPEG header
            or pointer_field) transported by this downstream
            channel.
            This is the 64-bit version of
            docsIfCmtsDownChnlCtrTotalBytes and will not be
            accessible to SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsDownChannelCounterEntry 4 }

    docsIfCmtsDownChnlCtrExtUsedBytes OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "Bytes"
        MAX-ACCESS  read-only
```

```
        STATUS      current
        DESCRIPTION
            "At the CMTS, the total number of DOCSIS data bytes
             transported by this downstream channel.  The number
             of data bytes is defined as the total number of bytes
             transported in DOCSIS payloads minus the number of
             stuff bytes transported in DOCSIS payloads.
             This is the 64-bit version of
             docsIfCmtsDownChnlCtrUsedBytes and will not be accessible
             to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsDownChannelCounterEntry 5 }

    -- The following table provides operators with input data appropriate
    -- for calculating upstream channel utilization, and for determining
    -- the traffic characteristics of upstream channels.  Operators may
    -- use the docsIfCmtsChannelUtilizationTable or perform their own
    -- polling of the docsIfCmtsUpChannelCounterTable objects for
    -- utilization determination.
    -- The first four 32 and 64 objects in this table are mandatory.
    -- Vendors may choose to implement the remaining optional objects to
    -- provide operators with finer characterization of upstream channel
    -- traffic patterns.  The 32-bit counter objects are included to
    -- provide backward compatibility with SNMPv1 managers, which cannot
    -- access 64-bit counter objects.

    docsIfCmtsUpChannelCounterTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF DocsIfCmtsUpChannelCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "This table is implemented at the CMTS to provide upstream
             channel statistics appropriate for channel utilization
             calculations."
        ::= { docsIfCmtsObjects 11 }

    docsIfCmtsUpChannelCounterEntry OBJECT-TYPE
        SYNTAX      DocsIfCmtsUpChannelCounterEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "List of traffic statistics for a single upstream channel.
             For DOCSIS 2.0 CMTSs, an entry in this table
             exists for each ifEntry with an ifType of
             docsCableUpstreamChannel (205).
```

```
            For DOCSIS 1.x CMTSs, an entry in this table
            exists for each ifEntry with an ifType of
            docsCableUpstream (129)."
        INDEX { ifIndex }
        ::= { docsIfCmtsUpChannelCounterTable 1 }

    DocsIfCmtsUpChannelCounterEntry ::= SEQUENCE {
            docsIfCmtsUpChnlCtrId                          Integer32,
            docsIfCmtsUpChnlCtrTotalMslots                 Counter32,
            docsIfCmtsUpChnlCtrUcastGrantedMslots          Counter32,
            docsIfCmtsUpChnlCtrTotalCntnMslots             Counter32,
            docsIfCmtsUpChnlCtrUsedCntnMslots              Counter32,
            docsIfCmtsUpChnlCtrExtTotalMslots              Counter64,
            docsIfCmtsUpChnlCtrExtUcastGrantedMslots       Counter64,
            docsIfCmtsUpChnlCtrExtTotalCntnMslots          Counter64,
            docsIfCmtsUpChnlCtrExtUsedCntnMslots           Counter64,
            docsIfCmtsUpChnlCtrCollCntnMslots              Counter32,
            docsIfCmtsUpChnlCtrTotalCntnReqMslots          Counter32,
            docsIfCmtsUpChnlCtrUsedCntnReqMslots           Counter32,
            docsIfCmtsUpChnlCtrCollCntnReqMslots           Counter32,
            docsIfCmtsUpChnlCtrTotalCntnReqDataMslots      Counter32,
            docsIfCmtsUpChnlCtrUsedCntnReqDataMslots       Counter32,
            docsIfCmtsUpChnlCtrCollCntnReqDataMslots       Counter32,
            docsIfCmtsUpChnlCtrTotalCntnInitMaintMslots    Counter32,
            docsIfCmtsUpChnlCtrUsedCntnInitMaintMslots     Counter32,
            docsIfCmtsUpChnlCtrCollCntnInitMaintMslots     Counter32,
            docsIfCmtsUpChnlCtrExtCollCntnMslots           Counter64,
            docsIfCmtsUpChnlCtrExtTotalCntnReqMslots       Counter64,
            docsIfCmtsUpChnlCtrExtUsedCntnReqMslots        Counter64,
            docsIfCmtsUpChnlCtrExtCollCntnReqMslots        Counter64,
            docsIfCmtsUpChnlCtrExtTotalCntnReqDataMslots   Counter64,
            docsIfCmtsUpChnlCtrExtUsedCntnReqDataMslots    Counter64,
            docsIfCmtsUpChnlCtrExtCollCntnReqDataMslots    Counter64,
            docsIfCmtsUpChnlCtrExtTotalCntnInitMaintMslots Counter64,
            docsIfCmtsUpChnlCtrExtUsedCntnInitMaintMslots  Counter64,
            docsIfCmtsUpChnlCtrExtCollCntnInitMaintMslots  Counter64
        }

    docsIfCmtsUpChnlCtrId OBJECT-TYPE
        SYNTAX      Integer32 (0..255)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The CMTS identification of the upstream channel."
        ::= { docsIfCmtsUpChannelCounterEntry 1 }

    docsIfCmtsUpChnlCtrTotalMslots OBJECT-TYPE
        SYNTAX      Counter32
```

```
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of all mini-slots
             defined for this upstream logical channel.  This count
             includes all IUCs and SIDs, even those allocated to the
             NULL SID for a 2.0 logical channel that is inactive.  This
             is the 32-bit version of docsIfCmtsUpChnlCtrExtTotalMslots
             and is included for back compatibility with SNMPv1
             managers.  Support for this object is mandatory.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 2 }

    docsIfCmtsUpChnlCtrUcastGrantedMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of unicast
             granted mini-slots on the upstream logical channel,
             regardless of burst type.  Unicast granted mini-slots are
             those in which the CMTS assigned bandwidth to any unicast
             SID on the logical channel.  However, this object does not
             include minis-lots for reserved IUCs, or grants to SIDs
             designated as meaning 'no CM'.  This is the 32-bit version
             of docsIfCmtsUpChnlCtrExtUcastGrantedMslots, and is
             included for back compatibility with SNMPv1 managers.
             Support for this object is mandatory.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 3 }

    docsIfCmtsUpChnlCtrTotalCntnMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             mini-slots defined for this upstream logical channel.  This
             count includes all mini-slots assigned to a broadcast or
```

```
            multicast SID on the logical channel.  This is the 32-bit
            version of docsIfCmtsUpChnlCtrExtTotalCntnMslots, and is
            included for back compatibility with SNMPv1 managers.
            Support for this object is mandatory.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 4 }

    docsIfCmtsUpChnlCtrUsedCntnMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            mini-slots utilized on the upstream logical channel.  For
            contention regions, utilized mini-slots are those in which
            the CMTS correctly received an upstream burst from any CM
            on the upstream logical channel.  This is the 32-bit
            version of docsIfCmtsUpChnlCtrExtUsedCntnMslots and is
            included for back compatibility with SNMPv1 managers.
            Support for this object is mandatory.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 5 }

    docsIfCmtsUpChnlCtrExtTotalMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of all mini-slots
            defined for this upstream logical channel.  This count
            includes all IUCs and SIDs, even those allocated to the
            NULL SID for a 2.0 logical channel that is inactive.  This
            is the 64-bit version of docsIfCmtsUpChnlCtrTotalMslots
            and will not be accessible to SNMPv1 managers.
            Support for this object is mandatory.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 6 }
```

```
   docsIfCmtsUpChnlCtrExtUcastGrantedMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of unicast
             granted mini-slots on the upstream logical channel,
             regardless of burst type.  Unicast granted mini-slots are
             those in which the CMTS assigned bandwidth to any unicast
             SID on the logical channel.  However, this object does not
             include mini-slots for reserved IUCs, or grants to SIDs
             designated as meaning 'no CM'.  This is the 64-bit version
             of docsIfCmtsUpChnlCtrUcastGrantedMslots and will not be
             accessible to SNMPv1 managers.
             Support for this object is mandatory.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 7 }

   docsIfCmtsUpChnlCtrExtTotalCntnMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             mini-slots defined for this upstream logical channel.  This
             count includes all mini-slots assigned to a broadcast or
             multicast SID on the logical channel.  This is the 64-bit
             version of docsIfCmtsUpChnlCtrTotalCntnMslots and will
             not be accessible to SNMPv1 managers.
             Support for this object is mandatory.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 8 }

   docsIfCmtsUpChnlCtrExtUsedCntnMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
```

```
            mini-slots utilized on the upstream logical channel.  For
            contention regions, utilized mini-slots are those in which
            the CMTS correctly received an upstream burst from any CM
            on the upstream logical channel.  This is the 64-bit
            version of docsIfCmtsUpChnlCtrUsedCntnMslots and will not
            be accessible to SNMPv1 managers.
            Support for this object is mandatory.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 9 }

    docsIfCmtsUpChnlCtrCollCntnMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            mini-slots subjected to collisions on the upstream logical
            channel.  For contention regions, these are the mini-slots
            applicable to bursts that the CMTS detected but could not
            correctly receive.  This is the 32-bit version of
            docsIfCmtsUpChnlCtrExtCollCntnMslots and is included for
            back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 10 }

    docsIfCmtsUpChnlCtrTotalCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            request mini-slots defined for this upstream logical
            channel.  This count includes all mini-slots for IUC1
            assigned to a broadcast or multicast SID on the logical
            channel.  This is the 32-bit version of
            docsIfCmtsUpChnlCtrExtTotalCntnReqMslots and is included
            for back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
```

```
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 11 }

    docsIfCmtsUpChnlCtrUsedCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request mini-slots utilized on this upstream logical
             channel.  This count includes all contention mini-slots for
             IUC1 applicable to bursts that the CMTS correctly
             received.  This is the 32-bit version of
             docsIfCmtsUpChnlCtrExtUsedCntnReqMslots and is included
             for back compatibility with SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 12 }

    docsIfCmtsUpChnlCtrCollCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request mini-slots subjected to collisions on this upstream
             logical channel.  This includes all contention mini-slots
             for IUC1 applicable to bursts that the CMTS detected but
             could not correctly receive.  This is the 32-bit version of
             docsIfCmtsUpChnlCtrExtCollCntnReqMslots and is included
             for back compatibility with SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 13 }

    docsIfCmtsUpChnlCtrTotalCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
```

```
            request data mini-slots defined for this upstream logical
            channel.  This count includes all mini-slots for IUC2
            assigned to a broadcast or multicast SID on the logical
            channel.  This is the 32-bit version of
            docsIfCmtsUpChnlCtrExtTotalCntnReqDataMslots and is
            included for back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 14 }

    docsIfCmtsUpChnlCtrUsedCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
    MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            request data mini-slots utilized on this upstream logical
            channel.  This includes all contention mini-slots for IUC2
            applicable to bursts that the CMTS correctly received.
            This is the 32-bit version of
            docsIfCmtsUpChnlCtrExtUsedCntnReqDataMslots and is
            included for back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 15 }

    docsIfCmtsUpChnlCtrCollCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            request data mini-slots subjected to collisions on this
            upstream logical channel.  This includes all contention
            mini-slots for IUC2 applicable to bursts that the CMTS
            detected, but could not correctly receive.  This is the
            32-bit version of
            docsIfCmtsUpChnlCtrExtCollCntnReqDataMslots and is
            included for back compatibility with SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
```

```
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 16 }

    docsIfCmtsUpChnlCtrTotalCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             initial maintenance mini-slots defined for this upstream
             logical channel.  This includes all mini-slots for IUC3
             assigned to a broadcast or multicast SID on the logical
             channel.  This is the 32-bit version of
             docsIfCmtsUpChnlCtrExtTotalCntnInitMaintMslots
             and is included for back compatibility with SNMPv1
             managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 17 }

    docsIfCmtsUpChnlCtrUsedCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             initial maintenance mini-slots utilized on this upstream
             logical channel.  This includes all contention mini-slots
             for IUC3 applicable to bursts that the CMTS correctly
             received.  This is the 32-bit version of
             docsIfCmtsUpChnlCtrExtUsedCntnInitMaintMslots
             and is included for back compatibility with SNMPv1
             managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 18 }

    docsIfCmtsUpChnlCtrCollCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
```

```
            "Current count, from CMTS initialization, of contention
             initial maintenance mini-slots subjected to collisions on
             this upstream logical channel.  This includes all
             contention mini-slots for IUC3 applicable to bursts that
             the CMTS detected, but could not correctly receive.
             This is the 32-bit version of
             docsIfCmtsUpChnlCtrExtCollCntnInitMaintMslots
             and is included for back compatibility with SNMPv1
             managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 19 }

    docsIfCmtsUpChnlCtrExtCollCntnMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of collision
             contention mini-slots on the upstream logical channel.
             For contention regions, these are the mini-slots applicable
             to bursts that the CMTS detected, but could not correctly
             receive.  This is the 64-bit version of
             docsIfCmtsUpChnlCtrCollCntnMslots and will not be
             accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 20 }

    docsIfCmtsUpChnlCtrExtTotalCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request mini-slots defined for this upstream logical
             channel.  This count includes all mini-slots for IUC1
             assigned to a broadcast or multicast SID on the logical
             channel.  This is the 64-bit version of
             docsIfCmtsUpChnlCtrTotalCntnReqMslots and will not be
             accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
```

```
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 21 }

    docsIfCmtsUpChnlCtrExtUsedCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            request mini-slots utilized on this upstream logical
            channel.  This count includes all contention mini-slots for
            IUC1 applicable to bursts that the CMTS correctly
            received.  This is the 64-bit version of
            docsIfCmtsUpChnlCtrUsedCntnReqMslots and will not be
            accessible to SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 22 }

    docsIfCmtsUpChnlCtrExtCollCntnReqMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
            request mini-slots subjected to collisions on this upstream
            logical channel.  This includes all contention mini-slots
            for IUC1 applicable to bursts that the CMTS detected,
            but could not correctly receive.  This is the 64-bit
            version of docsIfCmtsUpChnlCtrCollCntnReqMslots and will
            not be accessible to SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 23 }

    docsIfCmtsUpChnlCtrExtTotalCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request data mini-slots defined for this upstream logical
             channel.  This count includes all mini-slots for IUC2
             assigned to a broadcast or multicast SID on the logical
             channel.  This is the 64-bit version of
             docsIfCmtsUpChnlCtrTotalCntnReqDataMslots and will not be
             accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 24 }

    docsIfCmtsUpChnlCtrExtUsedCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request data mini-slots utilized on this upstream logical
             channel.  This includes all contention mini-slots for IUC2
             applicable to bursts that the CMTS correctly received.
             This is the 64-bit version of
             docsIfCmtsUpChnlCtrUsedCntnReqDataMslots and will not be
             accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 25 }

    docsIfCmtsUpChnlCtrExtCollCntnReqDataMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             request data mini-slots subjected to collisions on this
             upstream logical channel.  This includes all contention
             mini-slots for IUC2 applicable to bursts that the CMTS
             detected, but could not correctly receive.  This is the
             64-bit version of
             docsIfCmtsUpChnlCtrCollCntnReqDataMslots
             and will not be accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
```

```
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 26 }

    docsIfCmtsUpChnlCtrExtTotalCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of initial
            maintenance mini-slots defined for this upstream logical
            channel.  This count includes all mini-slots for IUC3
            assigned to a broadcast or multicast SID on the logical
            channel.  This is the 64-bit version of
            docsIfCmtsUpChnlCtrTotalCntnInitMaintMslots
            and will not be accessible to SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 27 }

    docsIfCmtsUpChnlCtrExtUsedCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "Current count, from CMTS initialization, of initial
            maintenance mini-slots utilized on this upstream logical
            channel.  This includes all contention mini-slots for IUC3
            applicable to bursts that the CMTS correctly received.
            This is the 64-bit version of
            docsIfCmtsUpChnlCtrUsedCntnInitMaintMslots
            and will not be accessible to SNMPv1 managers.
            Discontinuities in the value of this counter can occur
            at reinitialization of the managed system, and at other
            times as indicated by the value of
            ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 28 }

    docsIfCmtsUpChnlCtrExtCollCntnInitMaintMslots OBJECT-TYPE
        SYNTAX      Counter64
        UNITS       "mini-slots"
        MAX-ACCESS  read-only
        STATUS      current
```

```
        DESCRIPTION
            "Current count, from CMTS initialization, of contention
             initial maintenance mini-slots subjected to collisions on
             this upstream logical channel.  This includes all
             contention mini-slots for IUC3 applicable to bursts that
             the CMTS detected, but could not correctly receive.
             This is the 64-bit version of
             docsIfCmtsUpChnlCtrCollCntnInitMaintMslots and will not
             be accessible to SNMPv1 managers.
             Discontinuities in the value of this counter can occur
             at reinitialization of the managed system, and at other
             times as indicated by the value of
             ifCounterDiscontinuityTime for the associated ifIndex."
        ::= { docsIfCmtsUpChannelCounterEntry 29 }

   --
   -- notification group is for future extension.
   --

   docsIfNotification OBJECT IDENTIFIER     ::= { docsIfMib 2 }

   --
   -- MIB Compliance statements.
   --

   --
   -- Conformance definitions
   --

   docsIfConformance  OBJECT IDENTIFIER     ::= { docsIfMib 3 }
   docsIfCompliances  OBJECT IDENTIFIER     ::= { docsIfConformance 1 }
   docsIfGroups       OBJECT IDENTIFIER     ::= { docsIfConformance 2 }

   docsIfBasicCompliance MODULE-COMPLIANCE
        STATUS      deprecated
        DESCRIPTION
            "The compliance statement for devices that implement
             DOCSIS 1.x compliant Radio Frequency Interfaces."

   MODULE  -- docsIfMib

   -- unconditionally mandatory groups
   MANDATORY-GROUPS {
        docsIfBasicGroup
        }

   -- conditionally mandatory group
   GROUP docsIfCmGroup
```

```
        DESCRIPTION
            "This group is implemented only in cable modems, not in
             cable modem termination systems."

    -- conditionally mandatory group
    GROUP docsIfCmtsGroup
        DESCRIPTION
            "This group is implemented only in cable modem termination
             systems, not in cable modems."

    OBJECT  docsIfDownChannelFrequency
        WRITE-SYNTAX Integer32 (54000000..860000000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems.  The values above are
             appropriate for a cable plant using a Sub-Split channel
             plan.  If DOCSIS is extended to cover other types of
             channel plans (and frequency allocations), this object
             will be modified accordingly."

    OBJECT  docsIfDownChannelWidth
        WRITE-SYNTAX Integer32 (6000000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is important to implement this object as read-only.
             In cable modems, this object is always implemented as
             read-only.  The above value is appropriate for cable
             plants running under NTSC (National Television
             Standards Committee) standards.  If DOCSIS is extended to
             work with other standards (e.g., European standards), this
             object will be modified accordingly."

    OBJECT  docsIfDownChannelModulation
        WRITE-SYNTAX INTEGER {
                               qam64 (3),
                               qam256 (4)
                             }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

    OBJECT  docsIfDownChannelInterleave
        WRITE-SYNTAX INTEGER {
                     taps8Increment16(3),
                     taps16Increment8(4),
                     taps32Increment4(5),
```

```
                    taps64Increment2(6),
                    taps128Increment1(7)
                     }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

    OBJECT  docsIfDownChannelPower
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

    OBJECT  docsIfUpChannelFrequency
        WRITE-SYNTAX Integer32 (5000000..42000000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems.  The values above are
             appropriate for a cable plant using a Sub-Split channel
             plan.  If DOCSIS is extended to cover other types of
             channel plans (and frequency allocations), this object
             will be modified accordingly."

    OBJECT  docsIfUpChannelWidth
        WRITE-SYNTAX Integer32 (200000..3200000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems.  The above value is appropriate
             for cable plants running under NTSC (National Television
             Standards Committee) standards.  If DOCSIS is extended to
             work with other standards (e.g., European standards), this
             object will be modified accordingly."

    OBJECT  docsIfUpChannelModulationProfile
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

    OBJECT  docsIfUpChannelSlotSize
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."
```

```
   OBJECT  docsIfUpChannelRangingBackoffStart
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelRangingBackoffEnd
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelTxBackoffStart
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelTxBackoffEnd
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfQosProfPriority
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfMaxUpBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfGuarUpBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfMaxDownBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

    OBJECT  docsIfQosProfMaxTxBurst
         MIN-ACCESS  read-only
         DESCRIPTION
             "This object is always read-only in cable modems.
              It is compliant to implement this object as read-only
              in cable modem termination systems."

    OBJECT  docsIfQosProfBaselinePrivacy
         MIN-ACCESS  read-only
         DESCRIPTION
             "This object is always read-only in cable modems.
              It is compliant to implement this object as read-only
              in cable modem termination systems."

    OBJECT  docsIfQosProfStatus
         MIN-ACCESS  read-only
         DESCRIPTION
             "This object is always read-only in cable modems.
              It is compliant to implement this object as read-only
              in cable modem termination systems."

    OBJECT  docsIfCmtsServiceAdminStatus
         MIN-ACCESS  read-only
         DESCRIPTION
             "It is compliant to implement this object as read-only."

    OBJECT  docsIfCmtsSyncInterval
         MIN-ACCESS  read-only
         DESCRIPTION
             "It is compliant to implement this object as read-only."

    OBJECT  docsIfCmtsUcdInterval
         MIN-ACCESS  read-only
         DESCRIPTION
             "It is compliant to implement this object as read-only."

    OBJECT  docsIfCmtsInsertInterval
         MIN-ACCESS  read-only
         DESCRIPTION
             "It is compliant to implement this object as read-only."

    OBJECT  docsIfCmtsInvitedRangingAttempts
         MIN-ACCESS  read-only
         DESCRIPTION
```

```
            "It is compliant to implement this object as read-only."

    OBJECT  docsIfCmtsQosProfilePermissions
         WRITE-SYNTAX     BITS {
             createByManagement(0),
             updateByManagement(1)
            }
         MIN-ACCESS  read-only
         DESCRIPTION
             "It is compliant to implement this object as read-only."

    OBJECT docsIfCmtsModType
         WRITE-SYNTAX INTEGER {
                         qpsk (2),
                         qam16 (3)
                          }
         DESCRIPTION
             "A management station MAY only set 16QAM or QPSK modulation,
              but others might be possible, based on device
              configuration."

    OBJECT  docsIfCmtsModPreambleLen
         SYNTAX Integer32 (0..1024)
         DESCRIPTION
             "The range of the values for this MODULE-COMPLIANCE
              is 0..1024."

    OBJECT  docsIfCmtsModFECErrorCorrection
            SYNTAX Integer32 (0..10)
            DESCRIPTION
                "The range of the values for this MODULE-COMPLIANCE
                 is 0..10."

         ::= { docsIfCompliances 1 }

    docsIfBasicComplianceV2 MODULE-COMPLIANCE
         STATUS      current
         DESCRIPTION
             "The compliance statement for devices that implement
              DOCSIS 2.0 Radio Frequency Interfaces."

    MODULE  -- docsIfMib

    -- unconditionally mandatory groups
    MANDATORY-GROUPS {
         docsIfBasicGroupV2
         }
```

```
   -- conditionally mandatory group
   GROUP docsIfCmGroupV2
        DESCRIPTION
            "This group is implemented only in cable modems, not in
             cable modem termination systems."

   -- conditionally mandatory group
   GROUP docsIfCmtsGroupV2
        DESCRIPTION
            "This group is implemented only in cable modem termination
             systems, not in cable modems."


   OBJECT  docsIfDownChannelFrequency
        WRITE-SYNTAX Integer32 (47000000..862000000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-write in cable modem termination systems;
             read-only in cable modems.
             A range of 54MHz to 860MHz is appropriate for a cable
             plant using a North American Sub-Split channel plan.
             The spectrum range has been expanded to accommodate
             a lower edge of 47MHz and an upper edge of 862MHz
             for some European channel plans.
             If DOCSIS is extended to cover other types of channel
             plans (and frequency allocations), this object will be
             modified accordingly."

   OBJECT  docsIfDownChannelWidth
        WRITE-SYNTAX Integer32 (6000000 | 8000000)
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is important to implement this object as read-only.
             In cable modems, this object is always implemented as
             read-only.  The value of 6 MHz is appropriate for cable
             plants running under NTSC (National Television
             Standards Committee) standards.  The value of 8 MHz is
             appropriate for cable plants running under ETSI
             standards.  For other regional standards, this
             object will be modified accordingly."

   OBJECT  docsIfDownChannelModulation
        WRITE-SYNTAX INTEGER {
                               qam64 (3),
                               qam256 (4)
                             }
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
            "Read-write in cable modem termination systems;
             read-only in cable modems."

    OBJECT  docsIfDownChannelInterleave
         WRITE-SYNTAX INTEGER {
                     taps8Increment16(3),
                     taps16Increment8(4),
                     taps32Increment4(5),
                     taps64Increment2(6),
                     taps128Increment1(7),
                     taps12increment17(8)
                      }
         MIN-ACCESS  read-only
         DESCRIPTION
             "Read-write in cable modem termination systems;
              read-only in cable modems."

    OBJECT  docsIfDownChannelPower
         MIN-ACCESS  read-only
         DESCRIPTION
             "Read-write in cable modem termination systems;
              read-only in cable modems."

    OBJECT  docsIfUpChannelFrequency
         WRITE-SYNTAX Integer32 (5000000..65000000)
         MIN-ACCESS  read-only
         DESCRIPTION
             "Read-create in cable modem termination systems;
              read-only in cable modems.
              A range of 5MHz to 42MHz is appropriate for a cable
              plant using a North American Sub-Split channel plan.
              The spectrum range has been expanded to accommodate
              an upper edge of 65MHz for some European channel plans.
              If DOCSIS is extended to cover other types of channel
              plans (and frequency allocations), this object will
              be modified accordingly."

    OBJECT  docsIfUpChannelWidth
         WRITE-SYNTAX Integer32 (200000..6400000)
         MIN-ACCESS  read-only
         DESCRIPTION
             "Read-create in cable modem termination systems,
              read-only in cable modems.  The above value is appropriate
              for cable plants running under NTSC (National Television
              Standards Committee) standards.  If DOCSIS is extended to
              work with other standards (e.g., European standards), this
              object will be modified accordingly."
```

```
   OBJECT  docsIfUpChannelModulationProfile
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelSlotSize
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfUpChannelRangingBackoffStart
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelRangingBackoffEnd
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelTxBackoffStart
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelTxBackoffEnd
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelScdmaActiveCodes
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems.
             The number of active codes when SCDMA is in use MUST range
             from 64 to 128 and MUST be a non-Prime value.
             Providing this range allows for the following features
             and capabilities:
                1) Power management in S-CDMA spreader-on frames
                   (with a 3 dB spread).
```

```
                2) Avoidance of code 0.
                3) Flexible mini-slot sizes with and without the use of
                   code 0."

   OBJECT  docsIfUpChannelScdmaCodesPerSlot
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelScdmaFrameSize
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelScdmaHoppingSeed
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelCloneFrom
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelUpdate
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."

   OBJECT  docsIfUpChannelStatus
           MIN-ACCESS  read-only
           DESCRIPTION
               "Read-create in Cable Modem Termination Systems;
                read-only in Cable Modems.
                Entries associated to physical interfaces only support
                the read-only value 'active'."


   OBJECT  docsIfUpChannelPreEqEnable
        MIN-ACCESS  read-only
        DESCRIPTION
            "Read-create in cable modem termination systems;
             read-only in cable modems."
```

```
   OBJECT  docsIfQosProfPriority
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfMaxUpBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfGuarUpBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfMaxDownBandwidth
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfBaselinePrivacy
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfStatus
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."

   OBJECT  docsIfQosProfMaxTransmitBurst
        MIN-ACCESS  read-only
        DESCRIPTION
            "This object is always read-only in cable modems.
             It is compliant to implement this object as read-only
             in cable modem termination systems."
```

```
   OBJECT  docsIfCmRangingTimeout
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT docsIfCmStatusModulationType
       SYNTAX          INTEGER {
           unknown(0),
           tdma(1),
           atdma(2),
           scdma(3)
       }
        DESCRIPTION
            "CM does not use both modulation burst profiles of a
             'tdmAndAtdma' ChannelType; therefore, 'tdmAndAtdma'is
             not supported."

   OBJECT  docsIfCmtsServiceAdminStatus
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT  docsIfCmtsSyncInterval
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT  docsIfCmtsUcdInterval
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT  docsIfCmtsInsertInterval
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT  docsIfCmtsInvitedRangingAttempts
        MIN-ACCESS  read-only
        DESCRIPTION
            "It is compliant to implement this object as read-only."

   OBJECT  docsIfCmtsQosProfilePermissions
        WRITE-SYNTAX     BITS {
            createByManagement(0),
            updateByManagement(1)
           }
        MIN-ACCESS  read-only
```

```
        DESCRIPTION
            "It is compliant to implement this object as read-only."

    OBJECT docsIfCmtsModType
         WRITE-SYNTAX      INTEGER {
             qpsk(2),
             qam16(3),
             qam64(6)
         }
         DESCRIPTION
             "A management station MAY only set 64QAM, 16QAM, or QPSK
              modulation for Time or Code division Multiple Access,
              but others might be possible based on device
              configuration."

    OBJECT docsIfCmtsCmStatusModulationType
        SYNTAX          INTEGER {
            unknown(0),
            tdma(1),
            atdma(2),
            scdma(3)
        }
         DESCRIPTION
             "CM does not use both modulation burst profiles of a
              'tdmAndAtdma' ChannelType; therefore, 'tdmAndAtdma'is
              not supported."

         ::= { docsIfCompliances 2 }

    docsIfBasicGroup OBJECT-GROUP
         OBJECTS {
             docsIfDownChannelId,
             docsIfDownChannelFrequency,
             docsIfDownChannelWidth,
             docsIfDownChannelModulation,
             docsIfDownChannelInterleave,
             docsIfDownChannelPower,
             docsIfUpChannelId,
             docsIfUpChannelFrequency,
             docsIfUpChannelWidth,
             docsIfUpChannelModulationProfile,
             docsIfUpChannelSlotSize,
             docsIfUpChannelTxTimingOffset,
             docsIfUpChannelRangingBackoffStart,
             docsIfUpChannelRangingBackoffEnd,
             docsIfUpChannelTxBackoffStart,
             docsIfUpChannelTxBackoffEnd,
             docsIfQosProfPriority,
```

```
            docsIfQosProfMaxUpBandwidth,
            docsIfQosProfGuarUpBandwidth,
            docsIfQosProfMaxDownBandwidth,
            docsIfQosProfMaxTxBurst,
            docsIfQosProfBaselinePrivacy,
            docsIfQosProfStatus,
            docsIfSigQIncludesContention,
            docsIfSigQUnerroreds,
            docsIfSigQCorrecteds,
            docsIfSigQUncorrectables,
            docsIfSigQSignalNoise,
            docsIfSigQMicroreflections,
            docsIfSigQEqualizationData
        }
        STATUS      deprecated
        DESCRIPTION
            "Group of objects implemented in both cable modems and
             cable modem termination systems."
        ::= { docsIfGroups 1 }

    docsIfCmGroup OBJECT-GROUP
        OBJECTS {
            docsIfCmCmtsAddress,
            docsIfCmCapabilities,
            docsIfCmRangingTimeout,
            docsIfCmStatusValue,
            docsIfCmStatusCode,
            docsIfCmStatusTxPower,
            docsIfCmStatusResets,
            docsIfCmStatusLostSyncs,
            docsIfCmStatusInvalidMaps,
            docsIfCmStatusInvalidUcds,
            docsIfCmStatusInvalidRangingResponses,
            docsIfCmStatusInvalidRegistrationResponses,
            docsIfCmStatusT1Timeouts,
            docsIfCmStatusT2Timeouts,
            docsIfCmStatusT3Timeouts,
            docsIfCmStatusT4Timeouts,
            docsIfCmStatusRangingAborteds,
            docsIfCmServiceQosProfile,
            docsIfCmServiceTxSlotsImmed,
            docsIfCmServiceTxSlotsDed,
            docsIfCmServiceTxRetries,
            docsIfCmServiceTxExceededs,
            docsIfCmServiceRqRetries,
            docsIfCmServiceRqExceededs
        }
        STATUS      deprecated
```

```
        DESCRIPTION
            "Group of objects implemented in cable modems."
        ::= { docsIfGroups 2 }

    docsIfCmtsGroup OBJECT-GROUP
        OBJECTS {
            docsIfCmtsCapabilities,
            docsIfCmtsSyncInterval,
            docsIfCmtsUcdInterval,
            docsIfCmtsMaxServiceIds,
            docsIfCmtsInvitedRangingAttempts,
            docsIfCmtsInsertInterval,
            docsIfCmtsStatusInvalidRangeReqs,
            docsIfCmtsStatusRangingAborteds,
            docsIfCmtsStatusInvalidRegReqs,
            docsIfCmtsStatusFailedRegReqs,
            docsIfCmtsStatusInvalidDataReqs,
            docsIfCmtsStatusT5Timeouts,
            docsIfCmtsCmStatusMacAddress,
            docsIfCmtsCmStatusIpAddress,
            docsIfCmtsCmStatusDownChannelIfIndex,
            docsIfCmtsCmStatusUpChannelIfIndex,
            docsIfCmtsCmStatusRxPower,
            docsIfCmtsCmStatusTimingOffset,
            docsIfCmtsCmStatusEqualizationData,
            docsIfCmtsCmStatusValue,
            docsIfCmtsCmStatusUnerroreds,
            docsIfCmtsCmStatusCorrecteds,
            docsIfCmtsCmStatusUncorrectables,
            docsIfCmtsCmStatusSignalNoise,
            docsIfCmtsCmStatusMicroreflections,
            docsIfCmtsServiceCmStatusIndex,
            docsIfCmtsServiceAdminStatus,
            docsIfCmtsServiceQosProfile,
            docsIfCmtsServiceCreateTime,
            docsIfCmtsServiceInOctets,
            docsIfCmtsServiceInPackets,
            docsIfCmtsModType,
            docsIfCmtsModControl,
            docsIfCmtsModPreambleLen,
            docsIfCmtsModDifferentialEncoding,
            docsIfCmtsModFECErrorCorrection,
            docsIfCmtsModFECCodewordLength,
            docsIfCmtsModScramblerSeed,
            docsIfCmtsModMaxBurstSize,
            docsIfCmtsModGuardTimeSize,
            docsIfCmtsModLastCodewordShortened,
            docsIfCmtsModScrambler,
```

```
            docsIfCmtsQosProfilePermissions,
            docsIfCmtsCmPtr
        }
        STATUS      deprecated
        DESCRIPTION
            "Group of objects implemented in Cable Modem Termination
             Systems."
        ::= { docsIfGroups 3 }

    -- obsolete group
    -- RFC 2670 already had a obsolete group, even though RFC2670
    -- was the first version of this MIB Module.

    docsIfObsoleteGroup OBJECT-GROUP
        OBJECTS {
            docsIfCmRangingRespTimeout,
            docsIfCmtsInsertionInterval
        }
        STATUS      obsolete
        DESCRIPTION
            "Group of objects obsoleted."
        ::= { docsIfGroups 4 }

    docsIfBasicGroupV2 OBJECT-GROUP
        OBJECTS {
            docsIfDownChannelId,
            docsIfDownChannelFrequency,
            docsIfDownChannelWidth,
            docsIfDownChannelModulation,
            docsIfDownChannelInterleave,
            docsIfDownChannelPower,
            docsIfDownChannelAnnex,
            docsIfUpChannelId,
            docsIfUpChannelFrequency,
            docsIfUpChannelWidth,
            docsIfUpChannelModulationProfile,
            docsIfUpChannelSlotSize,
            docsIfUpChannelTxTimingOffset,
            docsIfUpChannelRangingBackoffStart,
            docsIfUpChannelRangingBackoffEnd,
            docsIfUpChannelTxBackoffStart,
            docsIfUpChannelTxBackoffEnd,
            docsIfUpChannelScdmaActiveCodes,
            docsIfUpChannelScdmaCodesPerSlot,
            docsIfUpChannelScdmaFrameSize,
            docsIfUpChannelScdmaHoppingSeed,
            docsIfUpChannelType,
            docsIfUpChannelCloneFrom,
```

```
            docsIfUpChannelUpdate,
            docsIfUpChannelStatus,
            docsIfUpChannelPreEqEnable,
            docsIfQosProfPriority,
            docsIfQosProfMaxUpBandwidth,
            docsIfQosProfGuarUpBandwidth,
            docsIfQosProfMaxDownBandwidth,
            docsIfQosProfBaselinePrivacy,
            docsIfQosProfStatus,
            docsIfQosProfMaxTransmitBurst,
            docsIfSigQIncludesContention,
            docsIfSigQUnerroreds,
            docsIfSigQCorrecteds,
            docsIfSigQUncorrectables,
            docsIfSigQSignalNoise,
            docsIfSigQMicroreflections,
            docsIfSigQExtUnerroreds,
            docsIfSigQExtCorrecteds,
            docsIfSigQExtUncorrectables,
            docsIfDocsisBaseCapability
        }
        STATUS      current
        DESCRIPTION
            "Group of objects implemented in both cable modems and
             cable modem termination systems."
        ::= { docsIfGroups 5 }

    docsIfCmGroupV2 OBJECT-GROUP
        OBJECTS {
            docsIfCmCmtsAddress,
            docsIfCmCapabilities,
            docsIfCmRangingTimeout,
            docsIfCmStatusValue,
            docsIfCmStatusCode,
            docsIfCmStatusTxPower,
            docsIfCmStatusResets,
            docsIfCmStatusLostSyncs,
            docsIfCmStatusInvalidMaps,
            docsIfCmStatusInvalidUcds,
            docsIfCmStatusInvalidRangingResponses,
            docsIfCmStatusInvalidRegistrationResponses,
            docsIfCmStatusT1Timeouts,
            docsIfCmStatusT2Timeouts,
            docsIfCmStatusT3Timeouts,
            docsIfCmStatusT4Timeouts,
            docsIfCmStatusRangingAborteds,
            docsIfCmStatusDocsisOperMode,
            docsIfCmStatusModulationType,
```

```
            docsIfCmStatusEqualizationData,
            docsIfCmStatusUCCs,
            docsIfCmStatusUCCFails,
            docsIfCmServiceQosProfile,
            docsIfCmServiceTxSlotsImmed,
            docsIfCmServiceTxSlotsDed,
            docsIfCmServiceTxRetries,
            docsIfCmServiceTxExceededs,
            docsIfCmServiceRqRetries,
            docsIfCmServiceRqExceededs,
            docsIfCmServiceExtTxSlotsImmed,
            docsIfCmServiceExtTxSlotsDed,
            docsIfSigQEqualizationData
        }
        STATUS      current
        DESCRIPTION
            "Group of objects implemented in cable modems."
        ::= { docsIfGroups 6 }

    docsIfCmtsGroupV2 OBJECT-GROUP
        OBJECTS {
            docsIfCmtsCapabilities,
            docsIfCmtsSyncInterval,
            docsIfCmtsUcdInterval,
            docsIfCmtsMaxServiceIds,
            docsIfCmtsInvitedRangingAttempts,
            docsIfCmtsInsertInterval,
            docsIfCmtsMacStorageType,
            docsIfCmtsStatusInvalidRangeReqs,
            docsIfCmtsStatusRangingAborteds,
            docsIfCmtsStatusInvalidRegReqs,
            docsIfCmtsStatusFailedRegReqs,
            docsIfCmtsStatusInvalidDataReqs,
            docsIfCmtsStatusT5Timeouts,
            docsIfCmtsCmStatusMacAddress,
            docsIfCmtsCmStatusDownChannelIfIndex,
            docsIfCmtsCmStatusUpChannelIfIndex,
            docsIfCmtsCmStatusRxPower,
            docsIfCmtsCmStatusTimingOffset,
            docsIfCmtsCmStatusEqualizationData,
            docsIfCmtsCmStatusValue,
            docsIfCmtsCmStatusUnerroreds,
            docsIfCmtsCmStatusCorrecteds,
            docsIfCmtsCmStatusUncorrectables,
            docsIfCmtsCmStatusSignalNoise,
            docsIfCmtsCmStatusMicroreflections,
            docsIfCmtsCmStatusExtUnerroreds,
            docsIfCmtsCmStatusExtCorrecteds,
```

```
            docsIfCmtsCmStatusExtUncorrectables,
            docsIfCmtsCmStatusDocsisRegMode,
            docsIfCmtsCmStatusModulationType,
            docsIfCmtsCmStatusInetAddressType,
            docsIfCmtsCmStatusInetAddress,
            docsIfCmtsCmStatusValueLastUpdate,
            docsIfCmtsCmStatusHighResolutionTimingOffset,
            docsIfCmtsServiceAdminStatus,
            docsIfCmtsServiceQosProfile,
            docsIfCmtsServiceCreateTime,
            docsIfCmtsServiceInOctets,
            docsIfCmtsServiceInPackets,
            docsIfCmtsServiceNewCmStatusIndex,
            docsIfCmtsModType,
            docsIfCmtsModControl,
            docsIfCmtsModPreambleLen,
            docsIfCmtsModDifferentialEncoding,
            docsIfCmtsModFECErrorCorrection,
            docsIfCmtsModFECCodewordLength,
            docsIfCmtsModScramblerSeed,
            docsIfCmtsModMaxBurstSize,
            docsIfCmtsModGuardTimeSize,
            docsIfCmtsModLastCodewordShortened,
            docsIfCmtsModScrambler,
            docsIfCmtsModByteInterleaverDepth,
            docsIfCmtsModByteInterleaverBlockSize,
            docsIfCmtsModPreambleType,
            docsIfCmtsModTcmErrorCorrectionOn,
            docsIfCmtsModScdmaInterleaverStepSize,
            docsIfCmtsModScdmaSpreaderEnable,
            docsIfCmtsModScdmaSubframeCodes,
            docsIfCmtsModChannelType,
            docsIfCmtsModStorageType,
            docsIfCmtsQosProfilePermissions,
            docsIfCmtsCmPtr,
            docsIfCmtsChannelUtilizationInterval,
            docsIfCmtsChannelUtUtilization,
            docsIfCmtsDownChnlCtrId,
            docsIfCmtsDownChnlCtrTotalBytes,
            docsIfCmtsDownChnlCtrUsedBytes,
            docsIfCmtsDownChnlCtrExtTotalBytes,
            docsIfCmtsDownChnlCtrExtUsedBytes,
            docsIfCmtsUpChnlCtrId,
            docsIfCmtsUpChnlCtrTotalMslots,
            docsIfCmtsUpChnlCtrUcastGrantedMslots,
            docsIfCmtsUpChnlCtrTotalCntnMslots,
            docsIfCmtsUpChnlCtrUsedCntnMslots,
            docsIfCmtsUpChnlCtrExtTotalMslots,
```

```
            docsIfCmtsUpChnlCtrExtUcastGrantedMslots,
            docsIfCmtsUpChnlCtrExtTotalCntnMslots,
            docsIfCmtsUpChnlCtrExtUsedCntnMslots,
            docsIfCmtsUpChnlCtrCollCntnMslots,
            docsIfCmtsUpChnlCtrTotalCntnReqMslots,
            docsIfCmtsUpChnlCtrUsedCntnReqMslots,
            docsIfCmtsUpChnlCtrCollCntnReqMslots,
            docsIfCmtsUpChnlCtrTotalCntnReqDataMslots,
            docsIfCmtsUpChnlCtrUsedCntnReqDataMslots,
            docsIfCmtsUpChnlCtrCollCntnReqDataMslots,
            docsIfCmtsUpChnlCtrTotalCntnInitMaintMslots,
            docsIfCmtsUpChnlCtrUsedCntnInitMaintMslots,
            docsIfCmtsUpChnlCtrCollCntnInitMaintMslots,
            docsIfCmtsUpChnlCtrExtCollCntnMslots,
            docsIfCmtsUpChnlCtrExtTotalCntnReqMslots,
            docsIfCmtsUpChnlCtrExtUsedCntnReqMslots,
            docsIfCmtsUpChnlCtrExtCollCntnReqMslots,
            docsIfCmtsUpChnlCtrExtTotalCntnReqDataMslots,
            docsIfCmtsUpChnlCtrExtUsedCntnReqDataMslots,
            docsIfCmtsUpChnlCtrExtCollCntnReqDataMslots,
            docsIfCmtsUpChnlCtrExtTotalCntnInitMaintMslots,
            docsIfCmtsUpChnlCtrExtUsedCntnInitMaintMslots,
            docsIfCmtsUpChnlCtrExtCollCntnInitMaintMslots,
            docsIfDownChannelStorageType,
            docsIfQosProfStorageType

        }
        STATUS      current
        DESCRIPTION
            "Group of objects implemented in Cable Modem Termination
             Systems."
        ::= { docsIfGroups 7 }

    END
```

5. Revision History

5.1. Scope

The MIB module in this document has been developed to accommodate DOCSIS 2.0 devices and their system capabilities. The MIB module is an update to RFC 2670 [RFC2670] with the additional incorporation of DOCSIS 2.0 [RFI2.0] and Euro-DOCSIS specification requirements [EN-300-429].

5.2. Extension

We have maintained the MIB objects as defined in RFC 2670 [RFC2670]. In some cases new MIB objects have been created with identical functionality but greater capacity (i.e., 32 to 64 bits). In these situations, both the original 32 bit objects and the new 64 bit objects must be implemented.

6. Security Considerations

This MIB module relates to a system that will provide metropolitan public internet access. As such, improper manipulation of the MIB objects represented by this MIB module may result in denial of service to a large number of end-users.

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The CMTS is the controller of most of the parameters of the DOCSIS RFI Interface. Therefore, write access to the CMTS MIB objects may compromise the end-user's services.

In the CM case, the only read-write object of this MIB module is docsIfCmRangingTimeout, which if SET maliciously, may not constitute a critical factor of service degradation.

The rest of the CM-required MIB objects in this MIB module are read-only, either by definition, or by compliance statements.

The CMTS is the controller of most of the parameters of the DOCSIS RFI Interface. Below are the CMTS MIB object's vulnerabilities:

- Objects in the docsIfBasicGroupv2, if SET maliciously, could result in a denial of service. Particularly, SETs to objects in

docsIfDownstreamChannelTable, docsIfUpstreamChannelTable, docsIfCmtsModulationTable, and docsIfQosProfileTable (the last one in conjunction with the MIB object docsIfCmtsQosProfilePermissions) can alter negatively the physical and link layer parameters of upstream and downstream channels.

- The Object docsIfCmtsServiceAdminStatus of the docsIfCmtsGroupv2 group, when SET maliciously by an attacker to 'disabled' or 'destroyed', will interrupt the service of the corresponding cable modem.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. Below are some sensitivity considerations:

- Read access to the MIB objects in tables docsIfCmStatusTable (CM), docsIfSignalQualityTable (CM/CMTS) and in CMTS tables docsIfCmtsCmStatusTable, docsIfCmtsChannelUtilizationTable, docsIfCmtsDownChannelCounterTable, and docsIfCmtsUpChannelCounterTable, could reveal information about the cable modems' distribution among the upstream and downstream channels and their performance, which could be used to gain access to a different tiered service offer. The table docsIfCmtsCmStatusTable also contains the MAC and IP addresses of the cable modems, which can be used for theft of service.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

7. Management Interoperability of DOCSIS 1.0, 1.1, and 2.0

The MIB module contained in this document updates RFC 2670 [RFC2670], primarily to handle the management requirements of the DOCSIS RF Interface of DOCSIS 2.0 [ITU-T_J.122]. RFC 2670 contains the DOCSIS RF Interface management requirements for DOCSIS 1.0 and DOCSIS 1.1.

The management requirements of Class of Service (DOCSIS 1.0) pertaining to RFC 2670 are the same as this document update and are contained in the tables docsIfQosProfileTable, docsIfCmServiceTable, and docsIfCmtsServiceTable.

DOCSIS 1.1 and DOCSIS 2.0 Quality of Service management requirements are defined in the DOCSIS management specifications [OSSI1.1] and [OSSI2.0], respectively.

8. References

8.1. Normative References

[EN-300-429] European Telecommunications Standard Institute, "ETSI Standard EN 300 429, Version 1.2.1: Digital Video Broadcasting (DVB), Framing structure, channel coding and modulation for cable systems", April 1998.

[IANA] Internet Assigned Numbers Authority, "Internet Assigned Numbers Authority", October 2005, <http://www.iana.org/assignments/ianaiftype-mib/>.

[ITU-T_J.112] Telecommunication Standardization Sector of International Telecommunications Union, "Transmission Systems for Interactive Cable Television Services, Annex B.", March 2001, <http://www.itu.int/ITU-T/studygroups/com09/>.

[ITU-T_J.122] Telecommunication Standardization Sector of International Telecommunications Union, "Second-Generation Transmission Systems for Interactive Cable Television Services.", December 2002, <http://www.itu.int/ITU-T/studygroups/com09/>.

[ITU-T_J.83] Telecommunication Standardization Sector of International Telecommunications Union, "ITU-T Recommendation J.83(4/97), Digital multi-programme systems for television sound and data services for cable distribution.", April 1997, <http://www.itu.int/ITU-T/studygroups/com09/>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

[RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", RFC 4001, February 2005.

[RFI1.1] CableLabs, "Data-Over-Cable Service Interface Specifications: Radio Frequency Interface Specification SP-RFIv1.1-C01-050907", September 2005, <http://www.cablemodem.com/specifications/>.

[RFI2.0] CableLabs, "Data-Over-Cable Service Interface Specifications: Radio Frequency Interface Specification SP-RFIv2.0-I09-050812", August 2005, <http://www.cablemodem.com/specifications/>.

8.2. Informative References

[BPI] SCTE Data Standards Subcommittee, "Data-Over-Cable Service Interface Specifications: DOCSIS 1.0 Baseline Privacy Interface Specification SCTE 22-2 2002", 2002, <http://www.scte.org/standards/>.

[BPIPLUS] CableLabs, "Data-Over-Cable Service Interface Specifications: Baseline Privacy Plus Interface Specification SP-BPI+-I12-050812", August 2005, <http://www.cablemodem.com/specifications/>.

[OSSI1.1] CableLabs, "Data-Over-Cable Service Interface Specifications: Operations Support System Interface Specification SP-OSSIv1.1-C01-050907", September 2005, <http://www.cablemodem.com/specifications/>.

[OSSI2.0] CableLabs, "Data-Over-Cable Service Interface Specifications: Operations Support System Interface Specification SP-OSSIv2.0-I09-050812", September 2005, <http://www.cablemodem.com/specifications/>.

[Proakis00] McGraw-Hill, "Digital Communications, 4th Edition", 2000.

[RFC2670] St. Johns, M., "Radio Frequency (RF) Interface Management Information Base for MCNS/DOCSIS compliant RF interfaces", RFC 2670, August 1999.

[RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

[RFI1.0] SCTE Data Standards Subcommittee, "Data-Over-Cable Service Interface Specifications: DOCSIS 1.0 Radio Frequency Interface Specification SCTE 22-1 2002", 2002, <http://www.scte.org/standards/>.

Authors' Addresses

David Raftus
ATI Technologies
340 Terry Fox Drive, Suite 202
Ottawa, Ontario
Canada

Phone: +1 613 592 1052 ext.222
EMail: david.raftus@ati.com

Eduardo Cardona
Cable Television Laboratories, Inc.
858 Coal Creek Circle
Louisville, CO 80020
USA

Phone: +1 303 661 3375
EMail: e.cardona@cablelabs.com

Full Copyright Statement

Intellectual Property

Acknowledgement

Funding for the RFC Editor function is provided by the IETF Administrative Support Activity (IASA).