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Radio Frequency (RF) Interface Management Information Base for DOCSIS 2.0 compliant RF interfaces
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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines a set of managed objects for SNMP-based management of the Radio Frequency (RF) interfaces for systems compliant with the Data Over Cable Service Interface Specifications (DOCSIS).

This document revises and obsoletes RFC 2670. Please see section 6 for a description of the changes from RFC 2670.

Note to RFC Editor (Remove this paragraph prior to publication) This memo is a product of the IPCDN working group within the Internet Engineering Task Force. Comments are solicited and should be addressed to the working group's mailing list at ipcdn@ietf.org and/or the author.

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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] and 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", now used to refer 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 vary between 25 MHz to 65 MHz, and the lower edge of downstream channel allocations vary 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-I09-050812"

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 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 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 both DOCSIS 1.0 and DOCSIS 1.1.

2.9.3. DOCSIS 2.0

Cable modem systems 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 conforming to the European spectrum lineup and 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 which 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].

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

3.1. Textual Conventions

This MIB module define new textual conventions for CMs and CMTSs indication of DOCSIS 2.0 RFI capabilities, configuration, usage and backward compatible modes of operation 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 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 XXXX

Note to RFC editor: RFC editor to replace XXXX with this RFC number, then, delete note.

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 diferent 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 which 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.

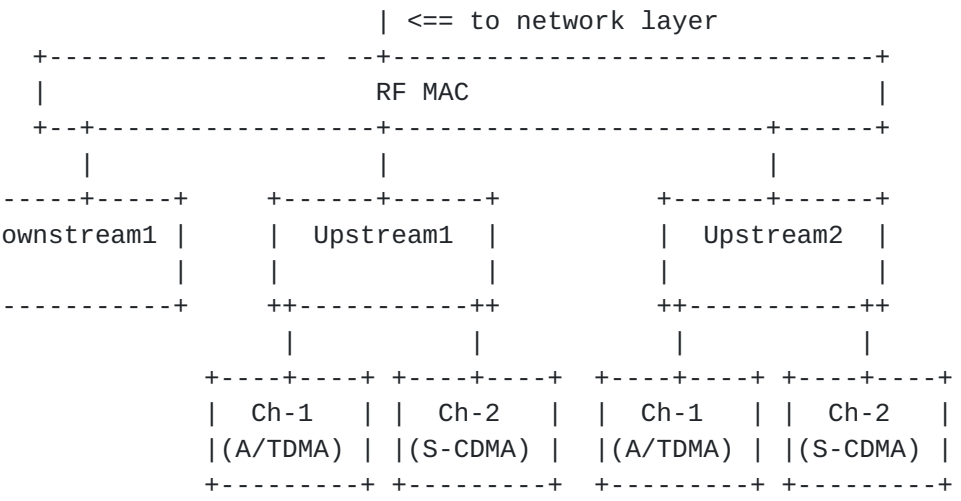

Figure 1

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

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, but 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 which 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 which 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 which 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 which 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, which 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 which 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 which were discarded. Possible reasons are: buffer shortage.

ifOutErrors The number of packets which 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 which 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 which were discarded. Possible reasons are: buffer shortage.
ifOutErrors	The number of packets which 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 yype, mini-slot Size and SCDMA attributes are consistent prior to commit 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 interfaces refers to an upstream logical channel interface.

docsIfUpChannelCloneFrom - This MIB object has the function to associate 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 transfer 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 create with docsIfUpChannelStatus 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:
  - Create the association of the physical interface to the temporary interface.
  - Copy 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 error 'commitFailed'.
- When the temporary interface status is 'active' a SET to docsIfUpChannelUpdate to 'true' transfer 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    "200510240000Z" -- October 24, 2005
        ORGANIZATION    "IETF IPCDN Working Group"
        CONTACT-INFO
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```
     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 Modem and
         Cable Modem Termination System.

         Copyright (C) The Internet Society (2005).  This
         version of this MIB module is part of RFC XXXX; see
         the RFC itself for full legal notices."

    REVISION        "200510240000Z"
    DESCRIPTION
        "Revision of the IETF RF MIB module for DOCSIS 2.0.
         This version published as RFC XXXX.
         This MIB module revision includes 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 interleve values.
         Adjustments to RFC 2670 definitions based on
         the MIB review guidelines from the IETF
         Operations and Management Area (OPS)."
    -- Note to RFC editor:
    -- RFC editor to replace XXXX with this RFC number
    -- Delete this note

    REVISION "199908190000Z"
    DESCRIPTION
        "Initial Version, published as RFC 2670.
         Modified by Mike StJohns 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 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, '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 not information 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 equalizers coefficient are considered signed 16 bit
              integers in the range -32768 (0x8000) to 32767 (0x7FFF).

              DOCSIS specifications requires 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-I09-050812,
              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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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 represents 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 with the purpose of manipulating
                 the parameters of a physical interface parameters
                 offline, then the parameters are validated prior to
                 update the target physical interface.
```

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

            This mechanism helps to minimize service disruption
            originated in situations where a group of interface
            parameters values need to be inconsistent each other
            in SET operations. Instead, 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-I09-050812,
             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 200,000 Hz currently.
             See the associated conformance object for write conditions
             and limitations."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             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)which 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
             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-I09-050812,
            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, 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-I09-050812,
            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-I09-050812,
            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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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, unknown or in
             case of a TDMA or ATDMA channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
```

```
            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-I09-050812,
             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 error 'wrongValue'."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             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-I09-050812,
             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, that 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 error
             'wrongValue'.
             This object MUST contain a value of zero for physical
             interfaces entries.
             Setting this object in row entries that corresponds to
             physical interfaces returns 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, the interface parameters values are not
             compatible 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 SET
                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 indicated in
                RFC 2670.
                In addition,
                 o ifAdminStatus 'down' is reflected in this object
                   as 'notInService'.
                 o ifOperSatus 'down' while ifAdminStatus 'up' is
                   reflected in this object as 'notInservice'.
             4. Temporary created rows MUST be set to 'active' with
                the purpose of validate the upstream parameters
                consistency prior to transfer 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
                into the temporary row.
             4. Validate that all parameters are consistent by setting
                docsIfUpChannelStatus to 'active'. A Failure to set the
                RowStatus to 'active' returns error 'commitFailed' which
                means the parameters are not compatible to be set to the
                target physical interface.
```

```
            5. With docsIfUpChannelStatus 'active'm trasfer 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, 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-I09-050812,
             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-I09-050812,
             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-I09-050812,
            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-I09-050812,
             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-I09-050812,
             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 to used to create or delete rows in
             this table.  This object MUST NOT be changed from active
             while the row is referenced by the any entry in either
             docsIfCmServiceTable (on the CM), or the
             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-I09-050812,
             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, 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, describes the PHY characteristics of a
             downstream channel.  At the CMTS, 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 Modem.
             For DOCSIS 1.1 Cable Modem Termination System, an entry
             exists for each ifEntry with an ifType of
             docsCableUpstream (129).
             For DOCSIS 2.0 Cable Modem Termination System, 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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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, describes the Signal/Noise of the downstream
             channel.  At the CMTS, describes the average Signal/Noise
             of the upstream channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             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 accurate as possible. "
        REFERENCE
```

```
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             Tables 4-1 and 4-2"
        ::= { docsIfSignalQualityEntry 6 }

    docsIfSigQEqualizationData OBJECT-TYPE
            SYNTAX      DocsEqualizerData
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                "At the CM, 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 different of the zero-length
                   octet string to indicate an equalization average for
                   the upstream channel. Those values have vendor
                   dependent interpretation.
                 - Return the 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-I09-050812,
              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-I09-050812,
             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-I09-050812,
             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-I09-050812,
               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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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 Modem."
        ::= { 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. 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-I09-050812,
             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 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-I09-050812,
            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-I09-050812,
            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-I09-050812,
            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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             Section 9.3.3."
        ::= { docsIfCmStatusEntry 14 }

    docsIfCmStatusDocsisOperMode OBJECT-TYPE
        SYNTAX      DocsisQosVersion
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
             "Indication 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-I09-050812,
             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-I09-050812,
               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-I09-050812,
               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 which 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 which 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-I09-050812,
             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 which 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-I09-050812,
             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-I09-050812,
             Section 9.4."
        ::= { docsIfCmServiceEntry 5 }

   docsIfCmServiceTxExceededs OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "attempts"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of data PDUs 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-I09-050812,
            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
            which 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-I09-050812,
            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 which 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-I09-050812,
            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 which 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 which 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-I09-050812,
             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 which 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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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.  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-I09-050812,
            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-I09-050812,
            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.  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-I09-050812,
            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-I09-050812,
            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-I09-050812,
            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-I09-050812,
            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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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 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-I09-050812,
             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-I09-050812,
             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-I07-041210,
             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-I09-050812,
             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-I09-050812,
```

```
            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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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 accurate 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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             Section 6.2.5."
        ::= { docsIfCmtsCmStatusEntry 17 }

   docsIfCmtsCmStatusDocsisRegMode OBJECT-TYPE
           SYNTAX      DocsisQosVersion
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION
               "Indication 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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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
             '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 which, when
             grouped with other Interval Usage Codes, fully
             instantiate all modulation sets for a given upstream
             channel."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             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 '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 '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 neither
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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
             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-I09-050812,
             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 which 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-I09-050812,
             Tables 6-7, and 8-19."
        ::= { docsIfCmtsModulationEntry 11 }

    docsIfCmtsModLastCodewordShortened OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "Indicates if the last FEC codeword is truncated."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             Tables 6-7, and 8-19."
        DEFVAL { true }
        ::= { docsIfCmtsModulationEntry 12 }

    docsIfCmtsModScrambler OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-create
        STATUS      current
```

```
        DESCRIPTION
            "Indicates if the scrambler is employed."
        REFERENCE
            "Data-Over-Cable Service Interface Specifications: Radio
             Frequency Interface Specification SP-RFIv2.0-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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-I09-050812,
             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 which
             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 (ie. 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 (ie. 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 (ie. 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 which 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 which 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 conformant 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 standard (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 standard (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
            "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 conformant 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 standard (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
                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 uses 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
            "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 uses 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.

5.3. Changes from RFC 2670

- Upstream now separated into 'physical interfaces' and 'logical channels'. An instance of the docsIfUpstreamChannelTable exists for each 'logical channel'. The IANA ifType for 'logical channels' is 205. The IANA ifType for 'physical interfaces' remains at 129.

- Object docsIfDownChannelAnnex added to docsIfDownstreamChannelTable. This object originated in the Euro-DOCSIS specifications.

- Nine new objects added to the docsIfUpstreamChannelTable. One describes the channel type in use. Four are specific S-CDMA parameters. Three are used in the creation of a temporary inactive upstream row so parameters of physical channel may be manipulated 'offline'.

- One object has been added to enable/disable pre-equalization on the upstream channel.

- Object docsIfQosProfMaxTransmitBurst has been added to the docsIfQosProfileTable to replace deprecated object docsIfQosProfMaxTxBurst. This fixes a range error caused by switch to recording as bytes instead of mini-slots.

- Three new 64 bit counters added to the docsIfSignalQualityTable to extend the capacity of existing 32 bit counters.

- A new base object docsIfDocsisBaseCapability has been added which mirrors the functionality of the DOCSIS specification [OSSI2.0] defined MIB object docsIfDocsisCapability, extended to include DOCSIS 2.0.

- Five new objects added to the docsIfCmStatusTable. One indicates the current modulation type. The second mirrors the functionality of the DOCSIS specification [OSSI2.0] defined MIB object docsIfDocsisOperMode, while clarifying that it applies to the COS/QOS mode used by the device. The third new object indicates equalization data at the CM. Last two objects indicates total and failed UCC transactions.

- Two new 64 bit counters added to the docsIfCmServiceTable to extend the capacity of existing 32 bit counters.

- Nine new objects added to the docsIfCmtsCmStatusTable. Three are 64 bit counters, two add ipv6 capability, one indicates the CM modulation type in use, one indicates the last update time for the status value, one is a high resolution of the timing offset MIB object and the remaining object, indicates the DOCSIS MAC mode of operation (Cos or QOS).

- One object added to the docsIfCmtsServiceTable to fix a range error in an existing object, that has been deprecated.

- Eight new objects added to the docsIfCmtsModulationTable. Seven of these describe ATDMA/S-CDMA channel parameters, while the other describes modulation attributes common to all modulation types.

- One new object and three new tables added to provide CMTS upstream and downstream channel utilization data.

- Enumerated values for object docsIfDownChannelInterleave have been expanded to include a Euro-DOCSIS value.

- Enumerated values for object docsIfCmtsModIntervalUsageCode have been expanded to include new DOCSIS 2.0 values.

- Enumerated values for object docsIfCmtsModType have been expanded to include new DOCSIS 2.0 values.

- Compliance statements have been updated to reflect new objects and to describe Euro-DOCSIS specific implementation features.

- The descriptions of objects docsIfCmtsStatusInvalidRegReqs and docsIfCmtsStatusFailedRegReqs have been clarified.

- o

- o Added five Textual Conventions: Two for upstream channels types, two for DOCSIS PHY and MAC modes of operation and one for the format of equalization data.

- o One object added to the docsIfCmtsModulationTable to indicate storage type of the table entries to differentiate factory and user configuration.

- o General persistence statements for read-create and read-write objects.

- o Updated DESCRIPTION and UNITS clauses for object docsIfSigQMicroreflections.

- o Corrected DESCRIPTION clause of object docsIfCmStatusValue.

- o Separated references into normative and informative.

- o Expanded security considerations section.

- o Updated IPR Notice and Disclosure to RFC 3667 section 5.1 and RFC 3668 as well as Copyright to RFC 3667 sections 5.4 and 5.5.

6. Security Considerations

This MIB module relates to a system which 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 that 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 objects 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 the physical and link layers 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 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 contain 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. IANA considerations

This document has no actions for IANA.

8. 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) pertain to RFC 2670 are the same as this document update and are contained in 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.

9. References

9.1. Normative References

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9.2. Informative References

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