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

Status of This Memo

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

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

Copyright Notice

Abstract

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

Table of Contents

1. The Internet-Standard Management Framework

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

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

2. Glossary

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

2.1. Baseline Privacy

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

2.2. CATV

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

2.3. Channel

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

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

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

2.4. CM or Cable Modem

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

2.5. CMTS or Cable Modem Termination System

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

   controls the scheduling of upstream transmissions by its associated
   CMs.

2.6. Codeword

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

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

2.7. Data Packet

   The payload portion of the MAC Packet.

2.8. dBmV

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

2.9. DOCSIS

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

2.9.1. DOCSIS 1.0

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

2.9.2. DOCSIS 1.1

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

2.9.3. DOCSIS 2.0

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

2.10. Downstream

   The direction from the head-end towards the subscriber.

2.11. Euro-DOCSIS

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

2.12. Head-end

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

2.13. MAC Packet

   A DOCSIS PDU.

2.14. MCNS

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

2.15. Mini-slot

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

2.16. QPSK (Quadrature Phase Shift Keying)

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

2.17. QAM (Quadrature Amplitude Modulation)

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

2.18. RF

   Radio Frequency.

2.19. Symbol-times

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

2.20. Upstream

   The direction from the subscriber towards the head-end.

3. Overview

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

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

3.1. Textual Conventions

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

3.1.1. Textual Conventions in RFC 2670

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

3.1.2. Textual Conventions in RFC 4546

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

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

3.2. Structure of the MIB

   This MIB module is structured as three groups:

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

o Management information pertinent to Cable Modem only
   (docsIfCmObjects).

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

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

3.2.1. docsIfBaseObjects

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

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

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

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

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

3.2.2. docsIfCmObjects

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

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

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

3.2.3. docsIfCmtsObjects

   docsIfCmtsMacTable - Describes the attributes of each CMTS MAC
   interface.

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

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

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

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

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

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

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

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

3.2.4. Relationship to the Interfaces MIB Module

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

3.2.4.1. Layering Model

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

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

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

```
                          | <== to network layer
        +----------------- --+------------------------------+
        |                          RF MAC                    |
        +--+----------------+----------------------+------+
           |                |                      |
    +-------+-----+     +------+------+       +------+------+
    | Downstream1 |     | Upstream1   |       | Upstream2   |
    |             |     |             |       |             |
    +------------+     ++-----------++       ++-----------++
                        |           |         |           |
                   +----+----+ +----+----+ +----+----+ +----+----+
                   |  Ch-1   | |  Ch-2   | |  Ch-1   | |  Ch-2   |
                   |(A/TDMA) | |(S-CDMA) | |(A/TDMA) | |(S-CDMA) |
                   +--------+ +--------+ +--------+ +--------+
```

                          Figure 1

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

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

```
    ifIndex       ifType                    Description

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

                          Figure 2

The corresponding ifStack entries would then be:

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

Figure 3

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

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

3.2.4.2. Virtual Circuits

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

3.2.4.3. ifTestTable

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

3.2.4.4. ifRcvAddressTable

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

3.2.4.5. ifEntry

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

3.2.4.5.1. ifEntry for Downstream Interfaces

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

3.2.4.5.1.1. ifEntry for Downstream Interfaces in Cable Modem
              Termination System

```
   ifTable            Comments
   ==============     =========================================
   ifIndex            Each CATV Downstream interface is represented
                      by an ifEntry.

   ifType             The IANA value of docsCableDownstream(128).

   ifSpeed            Return the speed of this downstream channel.
                      The returned value is the raw bandwidth in bits/s
                      of this interface.  This is the symbol rate
                      multiplied with the number of bits per symbol.

   ifHighSpeed        Return the speed of this downstream channel.
                      The returned value is the raw bandwidth in
                      megabits/s of this interface.  This is the symbol
                      rate multiplied with the number of bits per
                      symbol.

   ifPhysAddress      Return the zero-length OCTET STRING.

   ifAdminStatus      The administrative status of this interface.

   ifOperStatus       The current operational status of this interface.

   ifMtu              The size of the largest frame that can be
                      sent on this interface, specified in octets.
                      The value includes the length of the MAC header.

   ifInOctets
   ifHCInOctets       Return zero.
```

ifInUcastPkts
ifHCInUcastPkts   Return zero.

ifInMulticastPkts
ifHCInMulticastPkts
                   Return zero.

ifInBroadcastPkts
ifHCInBroadcastPkts
                   Return zero.

ifInDiscards   Return zero.

ifInErrors   Return zero.

ifInUnknownProtos Return zero.

ifOutOctets
ifHCOutOctets   The total number of octets transmitted on this
                   interface. This includes MAC packets as well as
                   data packets, and includes the length of the MAC
                   header.
ifOutUcastPkts
ifHCOutUcastPkts   The number of unicast packets transmitted on this
                   interface. This includes MAC packets as well as
                   data packets.

ifOutMulticastPkts
ifHCOutMulticastPkts
                   Return the number of multicast packets
                   transmitted on this interface.
                   This includes MAC packets as well as data
                   packets.

ifOutBroadcastPkts
ifHCOutBroadcastPkts
                   Return the number of broadcast packets transmitted
                   on this interface. This includes MAC packets as
                   well as data packets.

ifOutDiscards   The total number of outbound packets which
                   were discarded. Possible reasons are:
                   buffer shortage.

ifOutErrors   The number of packets that could not be
                   transmitted due to errors.

ifPromiscuousMode Return false.

3.2.4.5.1.2. ifEntry for Downstream Interfaces in Cable Modem

```
   ifTable           Comments
   ==============    ==========================================
   ifIndex           Each CATV Downstream interface is represented
                     by an ifEntry.


   ifType            The IANA value of docsCableDownstream(128).

   ifSpeed           Return the speed of this downstream channel.
                     The returned value the raw bandwidth in bits/s
                     of this interface.  This is the symbol rate
                     multiplied with the number of bits per symbol.

   ifHighSpeed       Return the speed of this downstream channel.
                     The returned value the raw bandwidth in megabits/s
                     of this interface.  This is the symbol rate
                     multiplied with the number of bits per symbol.

   ifPhysAddress     Return the zero-length OCTET STRING.

   ifAdminStatus     The administrative status of this interface.

   ifOperStatus      The current operational status of this interface.

   ifMtu             The size of the largest frame that can be
                     received from this interface, specified in octets.
                     The value includes the length of the MAC header.

   ifInOctets
   ifHCInOctets      The total number of octets received on this
                     interface.  This includes data packets as well as
                     MAC packets, and includes the length of the
                     MAC header.

   ifInUcastPkts
   ifHCInUcastPkts   The number of unicast packets received on this
                     interface.  This includes data packets as well as
                     MAC packets.

   ifInMulticastPkts
   ifHCInMulticastPkts
                     Return the number of multicast packets received
                     on this interface.  This includes data packets as
                     well as MAC packets.
```

```
      ifInBroadcastPkts
      ifHCInBroadcastPkts
                        Return the number of broadcast packets received
                        on this interface.  This includes data packets
                        as well as MAC packets.

      ifInDiscards      The total number of received packets that have
                        been discarded.
                        The possible reasons are: buffer shortage.

      ifInErrors        The number of inbound packets that contained
                        errors preventing them from being deliverable
                        to higher layers.
                        Possible reasons are: MAC FCS error.

      ifInUnknownProtos The number of frames with an unknown packet type.
                        These are MAC frames with an unknown packet type.

      ifOutOctets       Return zero.
      ifHCOutOctets

      ifOutUcastPkts    Return zero.
      ifHCOutUcastPkts

      ifOutMulticastPkts
      ifHCOutMulticastPkts
                        Return zero.

      ifOutBroadcastPkts
      ifHCOutBroadcastPkts
                        Return zero.

      ifOutDiscards     Return zero.

      ifOutErrors       Return zero.

      ifPromiscuousMode Refer to the Interfaces MIB.
```

3.2.4.5.2. ifEntry for Upstream Interfaces

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

3.2.4.5.2.1. ifEntry for Upstream Interfaces in Cable Modem Termination
              System

```
   ifTable           Comments
   ==============    ==========================================
   ifIndex           Each RF Cable Upstream interface is represented
                     by an ifEntry.

   ifType            The IANA value of docsCableUpstream (129).

   ifSpeed           Return the maximum channel throughput (not payload
                     throughput) supported by the interface.
                     The maximum throughput is calculated for the case
                     where upstream channels are configured to maximize
                     interface throughput.

   ifHighSpeed       Return the maximum channel throughput (not payload
                     throughput) supported by the interface.
                     The maximum throughput is calculated for the case
                     where upstream channels are configured to maximize
                     interface throughput.  Units for this object are
                     (1/1 000 000) * IfSpeed.

   ifPhysAddress     Return the zero-length OCTET STRING.

   ifAdminStatus     The administrative status of this interface.

   ifOperStatus      The current operational status of this interface.
                     This reflects the total status of all the channels
                     under this interface.  So if at least one channel
                     has a physical connection this interface has
                     connection.

   ifMtu             The size of the largest frame that can be
                     transmitted on this interface, specified in
                     octets.  The value includes the length of the MAC
                     header.  This is the maximum of all the ifMtu of
                     all the channels under this interface.

   ifInOctets
   ifHCInOctets      The total (sum) number of octets received on all
                     the upstream channels under this
                     interface.  This includes data packets as well as
                     MAC packets, and includes the length of the
                     MAC header.
```

      ifInUcastPkts
      ifHCInUcastPkts   The total number of unicast packets received on
                         all the upstream channels under this
                         interface. This includes data packets as well as
                         MAC packets.

      ifInMulticastPkts
      ifHCInMulticastPkts
                         Return the total number of multicast packets
                         received on all the upstream channels under this
                         interface. This includes data packets as well as
                         MAC layer packets.

      ifInBroadcastPkts
      ifHCInBroadcastPkts
                         Return the total number of broadcast packets
                         received on all the upstream channels under this
                         interface. This includes data packets as well as
                         MAC packets.

      ifInDiscards   The total number of received packets that have
                         been discarded on all the upstream channels under
                         this interface.
                         The possible reasons are: buffer shortage.

      ifInErrors   The total number of inbound packets that contained
                         errors preventing them from being deliverable
                         to higher layers.
                         Possible reasons are: MAC FCS error.

      ifInUnknownProtos The total number of frames with an unknown packet
                         type. These are MAC frames with an unknown packet
                         type.

      ifOutOctets   Return zero.
      ifHCOutOctets

      ifOutUcastPkts   Return zero.
      ifHCOutOctets

      ifOutMulticastPkts
      ifHCOutMulticastPkts
                         Return zero.

      ifOutBroadcastPkts
      ifHCOutBroadcastPkts
                         Return zero.

    ifOutDiscards   Return zero.

    ifOutErrors   Return zero.

3.2.4.5.2.2. ifEntry for Upstream Interfaces in Cable Modem

    ifTable   Comments
    ==============   ===
    ifIndex   Each RF Cable Upstream interface is represented
                       by an ifEntry.

    ifType   The IANA value of docsCableUpstream (129).

    ifSpeed   Return the speed of this upstream interface.
                       The returned value is the raw bandwidth
                       in bits/s of this interface.

    ifHighSpeed   Return the speed of this upstream interface.
                       The returned value is the raw bandwidth
                       in megabits/s of this interface.

    ifPhysAddress   Return the zero-length OCTET STRING.

    ifAdminStatus   The administrative status of this interface.

    ifOperStatus   The current operational status of this interface.

    ifMtu   The size of the largest frame that can be
                       transmitted on this interface, specified in
                       octets. The value includes the length of the MAC
                       header.

    ifInOctets   Return zero.
    ifHCInOctets

    ifInUcastPkts   Return zero.
    ifHCInUcastPkts

    ifInMulticastPkts
    ifHCInMulticastPkts
                       Return zero.

    ifInBroadcastPkts
    ifHCInBroadcastPkts
                       Return zero.

    ifInDiscards   Return zero.

   ifInErrors   Return zero.

   ifInUnknownProtos Return zero.

   ifOutOctets
   ifHCOutOctets   The total number of octets transmitted on this
                       interface. This includes MAC packets as well as
                       data packets, and includes the length of the MAC
                       header.

   ifOutUcastPkts
   ifHCOutUcastPkts   The number of unicast packets transmitted on this
                       interface. This includes MAC packets as well as
                       data packets.

   ifOutMulticastPkts
   ifHCOutMulticastPkts
                       Return the number of multicast packets transmitted
                       on this interface.
                       This includes MAC packets as well as data packets.

   ifOutBroadcastPkts
   ifHCOutBroadcastPkts
                       Return the number of broadcast packets transmitted
                       on this interface.
                       This includes MAC packets as well as data packets.

   ifOutDiscards   The total number of outbound packets that
                       were discarded. Possible reasons are:
                       buffer shortage.

   ifOutErrors   The number of packets that could not be
                       transmitted due to errors.

   ifPromiscuousMode Return false.

3.2.4.5.3. ifEntry for Upstream Channels

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

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

3.2.4.5.3.1. ifEntry for Upstream Channels in Cable Modem Termination
              System

```
   ifTable           Comments
   ==============    ==========================================
   ifIndex           Each RF Cable Upstream channel is represented
                     by an ifEntry.

   ifType            The IANA value of docsCableUpstreamChannel (205).

   ifSpeed           Return the speed of this upstream channel.
                     The returned value is the raw bandwidth
                     in bits/s of this channel.

   ifHighSpeed       Return the speed of this upstream channel.
                     The returned value is the raw bandwidth
                     in megabits/s of this channel.

   ifPhysAddress     Return the zero-length OCTET STRING.

   ifAdminStatus     The administrative status of this interface.

   ifOperStatus      The current operational status of this interface.

   ifMtu             The size of the largest frame that can be
                     received on this interface, specified in octets.
                     The value includes the length of the MAC header.

   ifInOctets        The total number of octets received on this
                     interface.  This includes data packets as well as
                     MAC packets, and includes the length of the
                     MAC header.

   ifInUcastPkts
   ifHCInUcastPkts
                     The number of unicast packets received on this
                     interface.  This includes data packets as well as
                     MAC packets.

   ifInMulticastPkts
   ifHCInMulticastPkts
                     Return the number of multicast packets received
                     on this interface.  This includes data packets as
                     well as MAC layer packets.
```

```
   ifInBroadcastPkts
   ifHCInBroadcastPkts
                    Return the number of broadcast packets received
                    on this interface.  This includes data packets
                    as well as MAC packets.

   ifInDiscards      The total number of received packets that have
                    been discarded.
                    The possible reasons are: buffer shortage.

   ifInErrors        The number of inbound packets that contained
                    errors preventing them from being deliverable
                    to higher layers.
                    Possible reasons are: MAC FCS error.

   ifInUnknownProtos The number of frames with an unknown packet type.
                    These are MAC frames with an unknown packet type.

   ifOutOctets       Return zero.
   ifHCOutOctets

   ifOutUcastPkts    Return zero.
   ifHCOutUcastPkts

   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   The total number of octets, received from upper
   ifHCOutOctets   protocol layers and transmitted on this interface.

   ifOutUcastPkts
   ifHCOutUcastPkts   The number of unicast packets, received from upper
                      protocol layers and transmitted on this interface.

   ifOutMulticastPkts
   ifHCOutMulticastPkts
                      Return the number of multicast packets received
                      from upper protocol layers and transmitted on this
                      interface.

   ifOutBroadcastPkts
   ifHCOutBroadcastPkts
                      Return the number of broadcast packets received
                      from upper protocol layers and transmitted on this
                      interface.

   ifOutDiscards   The total number of outbound packets that
                      were discarded. Possible reasons are:
                      buffer shortage.

   ifOutErrors   The number of packets that could not be
                      transmitted due to errors.

   ifPromiscuousMode Refer to the Interfaces MIB.

3.2.5. Offline Upstream Parameters Handling

3.2.5.1. Overview

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

3.2.5.2. Operation

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

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

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

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

The offline upstream parameters handling operation is as follows:

o A temporary interface is created in which docsIfUpChannelStatus is
   set to 'createAndWait', which turns the new create entry status to
   'notReady'.

o A SET to docsIfUpChannelCloneFrom in the temporary interface to
   the physical interface ifIndex value performs two actions:

   * Creates the association of the physical interface to the
      temporary interface.

   * Copies the original upstream parameters from the physical
      interface to the temporary interface, which turns its status to
      'notInService'.

o The operator modifies the temporary interface parameters to the
   desired values.

o At this point, a SET to 'active' to the RowStatus of the temporary
   interface is successful if all parameters in the temporary
   interface are valid for the associated physical interface;
   otherwise, the temporary entry remains with status 'notInservice',
   and the SET returns the error 'commitFailed'.

o When the temporary interface status is 'active', a SET to
   docsIfUpChannelUpdate to 'true' transfers the temporary interface
   parameters values to the physical interface.

o After completion of the update operations, the temporary interface
   is destroyed, setting the docsIfUpChannelStatus to 'destroy'.

3.2.5.3. Relation of docsIfUpChannelStatus and ifMib

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

4. Definitions

   DOCS-IF-MIB DEFINITIONS ::= BEGIN

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

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

   docsIfMib MODULE-IDENTITY
        LAST-UPDATED   "200605240000Z" -- May 24, 2006
        ORGANIZATION   "IETF IPCDN Working Group"
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     IETF IPCDN Working Group
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     Subscribe: http://www.ietf.org/mailman/listinfo/ipcdn
     Archive: ftp://ftp.ietf.org/ietf-mail-archive/ipcdn
     Co-chairs: Richard Woundy, Richard_Woundy@cable.comcast.com
                Jean-Francois Mule, jf.mule@cablelabs.com"
    DESCRIPTION
        "This is the MIB Module for DOCSIS 2.0-compliant Radio
         Frequency (RF) interfaces in Cable Modems and
         Cable Modem Termination Systems.

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

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

            Operations and Management Area (OPS)."

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

    -- Textual Conventions

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

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

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

    DocsisQosVersion ::= TEXTUAL-CONVENTION

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

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

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

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

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

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

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

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

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


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

   --
   -- BASE GROUP
   --


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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

       docsIfQosProfileEntry OBJECT-TYPE
           SYNTAX   DocsIfQosProfileEntry

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

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

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

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

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

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

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

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

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

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

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

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

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

         DEFVAL { 0 }
         ::= { docsIfQosProfileEntry 5 }

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

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

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

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

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

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

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

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

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

   docsIfSigQIncludesContention OBJECT-TYPE
```

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

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

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

```
     ::= { docsIfSignalQualityEntry 3 }

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

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

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

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

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

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

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

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

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

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

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

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

    --
    -- CABLE MODEM GROUP
    --


    --
    -- The CM MAC Table
    --

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    docsIfCmStatusT4Timeouts OBJECT-TYPE
        SYNTAX        Counter32
```

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

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

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

```
       ::= { docsIfCmStatusEntry 15 }

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

          ::= { docsIfCmStatusEntry 16 }

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

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

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

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

    --
    -- The Cable Modem Service Table
    --

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

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

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

```
        }

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

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

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

    docsIfCmServiceTxSlotsDed OBJECT-TYPE
```

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

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

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

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

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

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

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

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

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

    --
    -- CMTS GROUP
    --

    --
    -- The CMTS MAC Table
    --

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

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

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

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

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

    docsIfCmtsSyncInterval OBJECT-TYPE
```

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

   docsIfCmtsStatusFailedRegReqs OBJECT-TYPE
     SYNTAX   Counter32

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

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

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

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


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

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

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

```
            docsIfCmtsCmStatusValueLastUpdate      TimeStamp,
            docsIfCmtsCmStatusHighResolutionTimingOffset Unsigned32
        }

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    docsIfCmtsCmStatusExtCorrecteds OBJECT-TYPE
         SYNTAX   Counter64
         UNITS   "codewords"

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

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

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

    docsIfCmtsCmStatusModulationType OBJECT-TYPE
        SYNTAX      DocsisUpstreamType
```

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

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

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

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

  docsIfCmtsCmStatusHighResolutionTimingOffset OBJECT-TYPE
```

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

    --
    -- The CMTS Service Table.
    --

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

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

    DocsIfCmtsServiceEntry ::= SEQUENCE {
```

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

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

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

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

         ::= { docsIfCmtsServiceEntry 3 }

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

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

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

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

```
        ::= { docsIfCmtsServiceEntry 7 }

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    DocsIfCmtsMacToCmEntry ::= SEQUENCE {
```

```
                docsIfCmtsCmMac        MacAddress,
                docsIfCmtsCmPtr        Integer32
        }

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

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

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

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

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

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

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

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

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

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

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

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

             Upstream Channel Utilization Index:

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

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

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

          Downstream Channel Utilization Index:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    docsIfCmtsUpChnlCtrTotalMslots OBJECT-TYPE
        SYNTAX        Counter32
```

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    docsIfNotification OBJECT IDENTIFIER   ::= { docsIfMib 2 }

    --
    -- MIB Compliance statements.
    --

    --
    -- Conformance definitions
    --

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

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

    MODULE -- docsIfMib

    -- unconditionally mandatory groups
    MANDATORY-GROUPS {
        docsIfBasicGroup
        }

    -- conditionally mandatory group
    GROUP docsIfCmGroup

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

    OBJECT   docsIfCmtsInvitedRangingAttempts
        MIN-ACCESS   read-only
        DESCRIPTION

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

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

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

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

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

       ::= { docsIfCompliances 1 }

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

   MODULE  -- docsIfMib

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

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

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


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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

        ::= { docsIfCompliances 2 }

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

END
```

5. Revision History

5.1. Scope

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

5.2. Extension

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

6. Security Considerations

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

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

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

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

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

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

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

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

o 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:

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

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

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

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

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

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

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

   DOCSIS 1.1 and DOCSIS 2.0 Quality of Service management requirements
   are defined in the DOCSIS management specifications [OSSI1.1] and
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8. References

8.1. Normative References

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8.2. Informative References

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