          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) |
              +---------+ +---------+  +---------+ +---------+
```
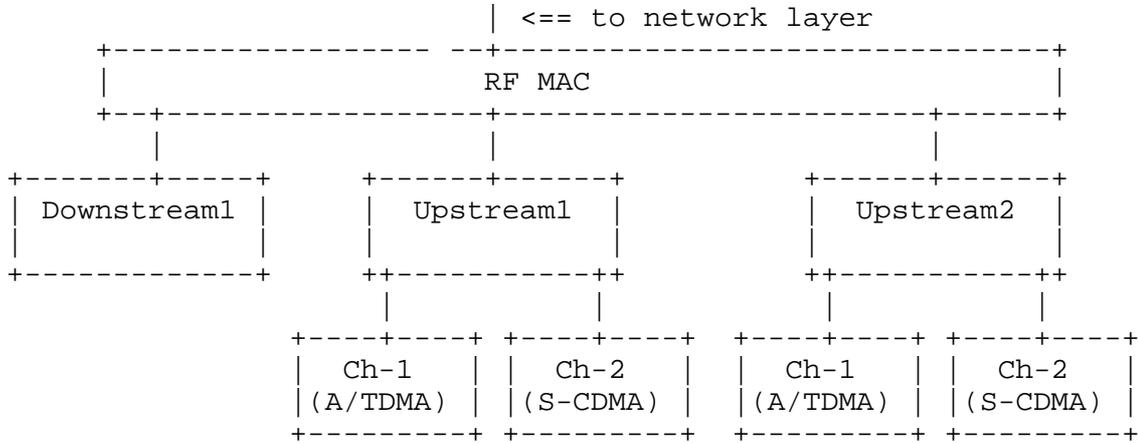
                             Figure 1

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"
         CONTACT-INFO

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