Hub MIB Working Group
INTERNET DRAFT

J. Flick
Hewlett-Packard Company
J. Johnson
RedBack Networks
May 1998

Definitions of Managed Objects for the Ethernet-like Interface Types

<draft-ietf-hubmib-etherif-mib-05.txt>

Status of this Memo

This document is an Internet-Draft. Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet- Drafts as reference material or to cite them other than as "work in progress."

To view the entire list of current Internet-Drafts, please check the "1id-abstracts.txt" listing contained in the Internet-Drafts Shadow Directories on ftp.is.co.za (Africa), ftp.nordu.net (Northern Europe), ftp.nis.garr.it (Southern Europe), munnari.oz.au (Pacific Rim), ftp.ietf.org (US East Coast), or ftp.isi.edu (US West Coast).

Copyright Notice

Copyright (C) The Internet Society (1998). All Rights Reserved.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. The origin of this memo is from RFC 1650 ''Definitions of Managed Objects for the Ethernet-like Interface Types using SMIv2.'' This memo extends that specification by including management information useful for the management of 100 Mb/s Ethernet interfaces.

Distribution of this memo is unlimited. Please forward comments to hubmib@hprnd.rose.hp.com.

Table of Contents

1. Introduction 2
2. The SNMP Network Management Framework 2
2.1. Object Definitions 3
3. Change Log 3
4. Overview 4
4.1. Relation to MIB-2 4
4.2. Relation to the Interfaces MIB 5
4.2.1. Layering Model 5
4.2.2. Virtual Circuits 5
4.2.3. ifTestTable 6
4.2.4. ifRcvAddressTable 6
4.2.5. ifPhysAddress 6
4.2.6. ifType 7
4.2.7. Specific Interface MIB Objects 8
4.3. Relation to the 802.3 MAU MIB 11
4.4. Mapping of IEEE 802.3 Managed Objects 11
5. Definitions 12
6. Intellectual Property 35
7. Acknowledgements 35
8. References 36
9. Security Considerations 37
10. Author's Addresses 38
11. Full Copyright Statement 38

1. Introduction

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 objects for managing ethernet-like interfaces.

This memo also includes a MIB module. This MIB module extends the list of managed objects specified in the earlier version of this MIB: RFC1650 [11].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [13].

2. The SNMP Network Management Framework

The SNMP Network Management Framework consists of several components. For the purpose of this specification, the applicable components of the Framework are the SMI and related documents [2, 3, 4], which

define the mechanisms used for describing and naming objects for the purpose of management.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

2.1. Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) [1] defined in the SMI [2]. In particular, each object object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to refer to the object type.

3. Change Log

This section enumerates changes made to RFC 1650 to produce this document.

(1) The MODULE-IDENTITY has been updated to reflect the changes in the MIB.

(2) A new object, dot3StatsSymbolErrors, has been added.

(3) The definition of the object dot3StatsIndex has been converted to use the SMIv2 OBJECT-TYPE macro.

(4) A new conformance group, etherStats100MbsGroup, has been added.

(5) A new compliance statement, ether100MbsCompliance, has been added.

(6) The Acknowledgements were extended to provide a more complete history of the origin of this document.

(7) The discussion of ifType has been expanded.

(8) A section on mapping of Interfaces MIB objects has been added.

(9) A section defining the relationship of this MIB to

the MAU MIB has been added.

(10) A section on the mapping of IEEE 802.3 managed objects to this MIB and the Interfaces MIB has been added.

(11) Converted the dot3Tests, dot3Errors, and dot3ChipSets OIDs to use the OBJECT-IDENTITY macro.

(12) Added to the list of registered dot3ChipSets.

(13) An intellectual property notice and copyright notice were added, as required by RFC 2026.

4. Overview

Instances of these object types represent attributes of an interface to an ethernet-like communications medium. At present, ethernet-like media are identified by the following values of the ifType object in the Interfaces MIB [12]:

```
ethernetCsmacd(6)
iso88023Csmacd(7)
starLan(11)
```

The definitions presented here are based on the IEEE 802.3 Layer Management Specification [5], as originally interpreted by Frank Kastenholz then of Interlan in [7]. Implementors of these MIB objects should note that the IEEE document explicitly describes (in the form of Pascal pseudocode) when, where, and how various MAC attributes are measured. The IEEE document also describes the effects of MAC actions that may be invoked by manipulating instances of the MIB objects defined here.

To the extent that some of the attributes defined in [5] are represented by previously defined objects in MIB-2 [16] or in the Interfaces MIB [12], such attributes are not redundantly represented by objects defined in this memo. Among the attributes represented by objects defined in other memos are the number of octets transmitted or received on a particular interface, the number of frames transmitted or received on a particular interface, the promiscuous status of an interface, the MAC address of an interface, and multicast information associated with an interface.

4.1. Relation to MIB-2

This section applies only when this MIB is used in conjunction with

the "old" (RFC 1213) [16] interface group.

The relationship between an ethernet-like interface and an interface in the context of the Internet-standard MIB is one-to-one. As such, the value of an ifIndex object instance can be directly used to identify corresponding instances of the objects defined herein.

For agents which implement the (now deprecated) ifSpecific object, an instance of that object that is associated with an ethernet-like interface has the OBJECT IDENTIFIER value:

```
dot3    OBJECT IDENTIFER ::= { transmission 7 }
```

4.2. Relation to the Interfaces MIB

The Interface MIB [12] requires that any MIB which is an adjunct of the Interface MIB clarify specific areas within the Interface MIB. These areas were intentionally left vague in the Interface MIB to avoid over constraining the MIB, thereby precluding management of certain media-types.

Section 3.3 of [12] enumerates several areas which a media-specific MIB must clarify. Each of these areas is addressed in a following subsection. The implementor is referred to [12] in order to understand the general intent of these areas.

4.2.1. Layering Model

This MIB does not provide for layering. There are no sublayers.

EDITOR'S NOTE:

One could foresee the development of an 802.2 and enet-transceiver MIB. They could be higher and lower sublayers, respectively. All that THIS document should do is allude to the possibilities and urge the implementor to be aware of the possibility and that they may have requirements which supersede the requirements in this document.

4.2.2. Virtual Circuits

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

4.2.3. ifTestTable

This MIB defines two tests for media which are instrumented with this MIB; TDR and Loopback. Implementation of these tests is not required. Many common interface chips do not support one or both of these tests.

These two tests are provided as a convenience, allowing a common method to invoke the test.

Standard MIBs do not include objects in which to return the results of the TDR test. Any needed objects MUST be provided in the vendor specific MIB.

Note that the ifTestTable is now deprecated. Work is underway to define a replacement MIB for system and interface testing. It is expected that the tests defined in this document will be usable in this replacement MIB.

4.2.4. ifRcvAddressTable

This table contains all IEEE 802.3 addresses, unicast, multicast, and broadcast, for which this interface will receive packets and forward them up to a higher layer entity for local consumption. The format of the address, contained in ifRcvAddressAddress, is the same as for ifPhysAddress.

In the event that the interface is part of a MAC bridge, this table does not include unicast addresses which are accepted for possible forwarding out some other port. This table is explicitly not intended to provide a bridge address filtering mechanism.

4.2.5. ifPhysAddress

This object contains the IEEE 802.3 address which is placed in the source-address field of any Ethernet, Starlan, or IEEE 802.3 frames that originate at this interface. Usually this will be kept in ROM on the interface hardware. Some systems may set this address via software.

In a system where there are several such addresses the designer has a tougher choice. The address chosen should be the one most likely to be of use to network management (e.g. the address placed in ARP responses for systems which are primarily IP systems).

If the designer truly can not chose, use of the factory- provided ROM

address is suggested.

If the address can not be determined, an octet string of zero length should be returned.

The address is stored in binary in this object. The address is stored in "canonical" bit order, that is, the Group Bit is positioned as the low-order bit of the first octet. Thus, the first byte of a multicast address would have the bit 0x01 set.

4.2.6. ifType

This MIB applies to interfaces which have any of the following ifType values:

```
ethernetCsmacd(6)
iso88023Csmacd(7)
starLan(11)
```

It is RECOMMENDED that all Ethernet-like interfaces use an ifType of ethernetCsmacd(6) regardless of the speed that the interface is running or the link-layer encapsulation in use. iso88023Csmacd(7) and starLan(11) are supported for backwards compatability.

There are two other interface types defined in the IANAifType-MIB for 100 Mbit Ethernet. They are fastEther(62), and fastEtherFX(69). This document takes the position that an Ethernet is an Ethernet, and Ethernet interfaces SHOULD always have the same value of ifType. Information on the particular flavor of Ethernet that an interface is running is available from ifSpeed in the Interfaces MIB, and ifMauType in the 802.3 MAU MIB. An Ethernet-like interface SHOULD NOT use the fastEther(62) or fastEtherFX(69) ifTypes.

Interfaces with any of the supported ifType values map to the EtherLike-MIB in the same manner. Which compliance statement an interface should implement is dependent on the maximum speed supported on the interface. The EtherLike-MIB etherCompliance compliance statement applies to all Ethernet-like interfaces whose maximum supported speed is 10 Mbit/sec or less. There are no implementation differences. Similarly, the EtherLike-MIB ether100MbsCompliance compliance statement applies to all Ethernet-like interfaces whose maximum supported speed is 100Mbit/sec.

An interface that is capable of operating at 100Mbit/sec MUST implement the ether100MbsCompliance compliance statement, even if it is currently operating at a lower speed. Counters in the ether100MbsCompliance compliance statement that only apply to 100

Mbit interfaces would simply not increment when the interface is operating at a lower speed.

4.2.7. Specific Interface MIB Objects

The following table provides specific implementation guidelines for applying the interface group objects to ethernet-like media.

Object	
ifIndex	Each ethernet-like interface is represented by an ifEntry. The dot3StatsTable in this MIB module is indexed by dot3StatsIndex. The interface identified by a particular value of dot3StatsIndex is the same interface as identified by the same value of ifIndex.
ifDescr	Refer to [12].
ifType	Refer to section 4.2.6.
ifMtu	1500 octets.
ifSpeed	The current operational speed of the interface in bits per second. For current ethernet-like interfaces, this will be equal to 1,000,000 (1 million), 10,000,000 (10 million), or 100,000,000 (100 million). If the interface implements auto-negotiation, auto-negotiation is enabled for this interface, and the interface has not yet negotiated to an operational speed, this object SHOULD reflect the maximum speed supported by the interface. Note that this object MUST NOT indicate a doubled value when operating in full-duplex mode. It MUST indicate the correct line speed regardless of the current duplex mode. The correct object to use to determine the duplex mode of the interface is the ifMauType object in the 802.3 MAU MIB.
ifPhysAddress	Refer to section 4.2.5.

ifAdminStatus	Write access is not required. Support for 'testing' is not required.
ifOperStatus	The operational state of the interface. Support for 'testing' is not required. The value 'dormant' has no meaning for an ethernet-like interface.
ifLastChange	Refer to [12].
ifInOctets	The number of octets in valid MAC frames received on this interface, including the MAC header and FCS.
ifInUcastPkts	Refer to [12].
ifInDiscards	Refer to [12].
ifInErrors	The sum for this interface of dot3StatsAlignmentErrors, dot3StatsFCSErrors, dot3StatsFrameTooLongs, dot3StatsInternalMacReceiveErrors and dot3StatsSymbolErrors.
ifInUnknownProtos	Refer to [12].
ifOutOctets	The number of octets transmitted in valid MAC frames on this interface, including the MAC header and FCS.
ifOutUcastPkts	Refer to [12].
ifOutDiscards	Refer to [12].
ifOutErrors	The sum for this interface of: dot3StatsSQETestErrors, dot3StatsLateCollisions, dot3StatsExcessiveCollisions, dot3StatsInternalMacTransmitErrors and dot3StatsCarrierSenseErrors.
ifName	Locally-significant textual name for the interface (e.g. lan0).
ifInMulticastPkts	Refer to [12].
ifInBroadcastPkts	Refer to [12].

ifOutMulticastPkts	Refer to [12].
ifOutBroadcastPkts	Refer to [12].
ifHCInOctets ifHCOutOctets	64-bit versions of counters. Required for ethernet-like interfaces that are capable of operating at 20Mbit/sec or faster, even if the interface is currently operating at less than 20Mbit/sec.
ifHCInUcastPkts ifHCInMulticastPkts ifHCInBroadcastPkts ifHCOutUcastPkts ifHCOutMulticastPkts ifHCOutBroadcastPkts	64-bit versions of packet counters. Support for these counters is not required for the interface types supported by this MIB. They are only required for interfaces capable of operating at 640Mbit/sec or faster. Note that a future revision of this document may support faster interfaces, and therefore may require support for these counters.
ifLinkUpDownTrapEnable	Refer to [12]. Default is 'enabled'
ifHighSpeed	The current operational speed of the interface in millions of bits per second. For current ethernet-like interfaces, this will be equal to 1, 10, or 100. If the interface implements auto-negotiation, auto-negotiation is enabled for this interface, and the interface has not yet negotiated to an operational speed, this object SHOULD reflect the maximum speed supported by the interface. Note that this object MUST NOT indicate a doubled value when operating in full-duplex mode. It MUST indicate the correct line speed regardless of the current duplex mode. The correct object to use to determine the duplex mode of the interface is the ifMauType object in the 802.3 MAU MIB.
ifPromiscuousMode	Refer to [12].
ifConnectorPresent	This will normally be 'true'.
ifAlias	Refer to [12].

ifCounterDiscontinuityTime Refer to [12].

ifStackHigherLayer Refer to section 4.2.1.
ifStackLowerLayer
ifStackStatus

ifRcvAddressAddress Refer to section 4.2.4.
ifRcvAddressStatus
ifRcvAddressType

4.3. Relation to the 802.3 MAU MIB

Support for the mauModIfCompl compliance statement of the MAU-MIB [14] is REQUIRED for Ethernet-like interfaces. This MIB is needed in order to allow applications to determine the current MAU type in use by the interface. The MAU type indicates not only the media type in use, but also indicates whether the interface is operating in half-duplex or full-duplex mode. Implementing this MIB module without implementing the MAU-MIB would leave applications with no standard way to determine the duplex mode of the interface.

4.4. Mapping of IEEE 802.3 Managed Objects

IEEE 802.3 Managed Object	Corresponding SNMP Object
oMacEntity	
.aMACID	dot3StatsIndex or IF-MIB - ifIndex
.aFramesTransmittedOK	IF-MIB - ifOutUCastPkts + ifOutMulticastPkts + ifOutBroadcastPkts
.aSingleCollisionFrames	dot3StatsSingleCollisionFrames
.aMultipleCollisionFrames	dot3StatsMultipleCollisionFrames
.aFramesReceivedOK	IF-MIB - ifInUcastPkts + ifInMulticastPkts + ifInBroadcastPkts
.aFrameCheckSequenceErrors	dot3StatsFCSErrors
.aAlignmentErrors	dot3StatsAlignmentErrors
.aOctetsTransmittedOK	IF-MIB - ifOutOctets
.aFramesWithDeferredXmissions	dot3StatsDeferredTransmissions
.aLateCollisions	dot3StatsLateCollisions
.aFramesAbortedDueToXSColls	dot3StatsExcessiveCollisions
.aFramesLostDueToIntMACXmitError	dot3StatsInternalMacTransmitErrors
.aCarrierSenseErrors	dot3StatsCarrierSenseErrors
.aOctetsReceivedOK	IF-MIB - ifInOctets
.aFramesLostDueToIntMACRcvError	dot3StatsInternalMacReceiveErrors

```
 .aPromiscuousStatus              IF-MIB - ifPromiscuousMode
 .aReadMulticastAddressList       IF-MIB - ifRcvAddressTable
 .aMulticastFramesXmittedOK       IF-MIB - ifOutMulticastPkts
 .aBroadcastFramesXmittedOK       IF-MIB - ifOutBroadcastPkts
 .aMulticastFramesReceivedOK      IF-MIB - ifInMulticastPkts
 .aBroadcastFramesReceivedOK      IF-MIB - ifInBroadcastPkts
 .aFrameTooLongErrors             dot3StatsFrameTooLongs
 .aReadWriteMACAddress            IF-MIB - ifPhysAddress
 .aCollisionFrames                dot3CollFrequencies
 .acAddGroupAddress               IF-MIB - ifRcvAddressTable
 .acDeleteGroupAddress            IF-MIB - ifRcvAddressTable
 .acExecuteSelfTest               dot3TestLoopBack

oPHYEntity
 .aSQETestErrors                  dot3StatsSQETestErrors
 .aSymbolErrorDuringCarrier       dot3StatsSymbolErrors
```

The following IEEE 802.3 managed objects have been removed from this MIB module as a result of implementation feedback:

```
oMacEntity
  .aFramesWithExcessiveDeferral
  .aInRangeLengthErrors
  .aOutOfRangeLengthField
  .aMACEnableStatus
  .aTransmitEnableStatus
  .aMulticastReceiveStatus
  .acInitializeMAC
```

Please see [15] for the detailed reasoning on why these objects were removed.

5. Definitions

```
EtherLike-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY,
        Counter32, mib-2, transmission
            FROM SNMPv2-SMI
        MODULE-COMPLIANCE, OBJECT-GROUP
            FROM SNMPv2-CONF
        ifIndex, InterfaceIndex
            FROM IF-MIB;

    etherMIB MODULE-IDENTITY
```

```
        LAST-UPDATED "9805122107Z"  -- May 12, 1998
        ORGANIZATION "IETF 802.3 Hub MIB Working Group"
        CONTACT-INFO
            "WG E-mail: hubmib@hprnd.rose.hp.com
          To subscribe: hubmib-request@hprnd.rose.hp.com

                 Chair: Dan Romascanu
                Postal: LANNET Ltd.
                        Atidum Technology Park, Bldg. 3
                        Tel Aviv 61131
                        Israel
                   Tel: +972 3 645 8414
                E-mail: dromasca@lannet.com

              Editor: John Flick
              Postal: Hewlett-Packard Company
                      8000 Foothills Blvd. M/S 5556
                      Roseville, CA 95747-5556
                      USA
                 Tel: +1 916 785 4018
                 Fax: +1 916 785 3583
              E-mail: johnf@hprnd.rose.hp.com

              Editor: Jeffrey Johnson
              Postal: RedBack Networks
                      2570 North First Street, Suite 410
                      San Jose, CA, 95131
                      USA
                 Tel: +1 408 571 2699
                 Fax: +1 408 571 2698
              E-Mail: jeff@redbacknetworks.com"

        DESCRIPTION "The MIB module to describe generic objects for
                     Ethernet-like network interfaces. This MIB is an
                     updated version of the Ethernet-like MIB in RFC
                     1650."

        REVISION    "9802260008Z"
        DESCRIPTION "Updated to include support for 100 Mb/sec
                     interfaces."

        REVISION    "9402030400Z"
        DESCRIPTION "Version published as RFC 1650."
        ::= { mib-2 35 }

    etherMIBObjects OBJECT IDENTIFIER ::= { etherMIB 1 }

    dot3    OBJECT IDENTIFIER ::= { transmission 7 }
```

```
       -- the Ethernet-like Statistics group

       dot3StatsTable OBJECT-TYPE
           SYNTAX     SEQUENCE OF Dot3StatsEntry
           MAX-ACCESS not-accessible
           STATUS     current
           DESCRIPTION "Statistics for a collection of ethernet-like
                        interfaces attached to a particular system."
           ::= { dot3 2 }

       dot3StatsEntry OBJECT-TYPE
           SYNTAX     Dot3StatsEntry
           MAX-ACCESS not-accessible
           STATUS     current
           DESCRIPTION "Statistics for a particular interface to an
                        ethernet-like medium."
           INDEX      { dot3StatsIndex }
           ::= { dot3StatsTable 1 }

       Dot3StatsEntry ::=
           SEQUENCE {
               dot3StatsIndex                      InterfaceIndex,
               dot3StatsAlignmentErrors            Counter32,
               dot3StatsFCSErrors                  Counter32,
               dot3StatsSingleCollisionFrames      Counter32,
               dot3StatsMultipleCollisionFrames    Counter32,
               dot3StatsSQETestErrors              Counter32,
               dot3StatsDeferredTransmissions      Counter32,
               dot3StatsLateCollisions             Counter32,
               dot3StatsExcessiveCollisions        Counter32,
               dot3StatsInternalMacTransmitErrors  Counter32,
               dot3StatsCarrierSenseErrors         Counter32,
               dot3StatsFrameTooLongs              Counter32,
               dot3StatsInternalMacReceiveErrors   Counter32,
               dot3StatsEtherChipSet               OBJECT IDENTIFIER,
               dot3StatsSymbolErrors               Counter32
           }

       dot3StatsIndex OBJECT-TYPE
           SYNTAX      InterfaceIndex
           MAX-ACCESS  read-only
           STATUS      current
           DESCRIPTION "An index value that uniquely identifies an
                        interface to an ethernet-like medium.  The
                        interface identified by a particular value of
                        this index is the same interface as identified
                        by the same value of ifIndex."
           ::= { dot3StatsEntry 1 }
```

```
    dot3StatsAlignmentErrors OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of frames received on a particular
                    interface that are not an integral number of
                    octets in length and do not pass the FCS check.

                    The count represented by an instance of this
                    object is incremented when the alignmentError
                    status is returned by the MAC service to the
                    LLC (or other MAC user). Received frames for
                    which multiple error conditions obtain are,
                    according to the conventions of IEEE 802.3
                    Layer Management, counted exclusively according
                    to the error status presented to the LLC."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 2 }

    dot3StatsFCSErrors OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of frames received on a particular
                    interface that are an integral number of octets
                    in length but do not pass the FCS check.

                    The count represented by an instance of this
                    object is incremented when the frameCheckError
                    status is returned by the MAC service to the
                    LLC (or other MAC user). Received frames for
                    which multiple error conditions obtain are,
                    according to the conventions of IEEE 802.3
                    Layer Management, counted exclusively according
                    to the error status presented to the LLC."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 3 }

    dot3StatsSingleCollisionFrames OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of successfully transmitted frames on
                    a particular interface for which transmission
                    is inhibited by exactly one collision.

                    A frame that is counted by an instance of this
                    object is also counted by the corresponding
```

```
                    instance of either the ifOutUcastPkts,
                    ifOutMulticastPkts, or ifOutBroadcastPkts,
                    and is not counted by the corresponding
                    instance of the dot3StatsMultipleCollisionFrames
                    object."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 4 }


    dot3StatsMultipleCollisionFrames OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of successfully transmitted frames on
                    a particular interface for which transmission
                    is inhibited by more than one collision.

                    A frame that is counted by an instance of this
                    object is also counted by the corresponding
                    instance of either the ifOutUcastPkts,
                    ifOutMulticastPkts, or ifOutBroadcastPkts,
                    and is not counted by the corresponding
                    instance of the dot3StatsSingleCollisionFrames
                    object."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 5 }


    dot3StatsSQETestErrors OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of times that the SQE TEST ERROR
                    message is generated by the PLS sublayer for a
                    particular interface. The SQE TEST ERROR
                    message is defined in section 7.2.2.2.4 of
                    ANSI/IEEE 802.3-1985 and its generation is
                    described in section 7.2.4.6 of the same
                    document."
        REFERENCE   "ANSI/IEEE Std 802.3-1985 Carrier Sense
                    Multiple Access with Collision Detection Access
                    Method and Physical Layer Specifications"
        ::= { dot3StatsEntry 6 }

    dot3StatsDeferredTransmissions OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
```

```
            DESCRIPTION "A count of frames for which the first
                        transmission attempt on a particular interface
                        is delayed because the medium is busy.

                        The count represented by an instance of this
                        object does not include frames involved in
                        collisions."
            REFERENCE   "IEEE 802.3 Layer Management"
            ::= { dot3StatsEntry 7 }

        dot3StatsLateCollisions OBJECT-TYPE
            SYNTAX      Counter32
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION "The number of times that a collision is
                        detected on a particular interface later than
                        512 bit-times into the transmission of a
                        packet.

                        Five hundred and twelve bit-times corresponds
                        to 51.2 microseconds on a 10 Mbit/s system. A
                        (late) collision included in a count
                        represented by an instance of this object is
                        also considered as a (generic) collision for
                        purposes of other collision-related
                        statistics."
            REFERENCE   "IEEE 802.3 Layer Management"
            ::= { dot3StatsEntry 8 }

        dot3StatsExcessiveCollisions OBJECT-TYPE
            SYNTAX      Counter32
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION "A count of frames for which transmission on a
                        particular interface fails due to excessive
                        collisions."
            REFERENCE   "IEEE 802.3 Layer Management"
            ::= { dot3StatsEntry 9 }

        dot3StatsInternalMacTransmitErrors OBJECT-TYPE
            SYNTAX      Counter32
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION "A count of frames for which transmission on a
                        particular interface fails due to an internal
                        MAC sublayer transmit error. A frame is only
                        counted by an instance of this object if it is
                        not counted by the corresponding instance of
```

```
                    either the dot3StatsLateCollisions object, the
                    dot3StatsExcessiveCollisions object, or the
                    dot3StatsCarrierSenseErrors object.

                    The precise meaning of the count represented by
                    an instance of this object is implementation-
                    specific.  In particular, an instance of this
                    object may represent a count of transmission
                    errors on a particular interface that are not
                    otherwise counted."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 10 }

    dot3StatsCarrierSenseErrors OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "The number of times that the carrier sense
                    condition was lost or never asserted when
                    attempting to transmit a frame on a particular
                    interface.

                    The count represented by an instance of this
                    object is incremented at most once per
                    transmission attempt, even if the carrier sense
                    condition fluctuates during a transmission
                    attempt."
        REFERENCE   "IEEE 802.3 Layer Management"
        ::= { dot3StatsEntry 11 }

    -- { dot3StatsEntry 12 } is not assigned

    dot3StatsFrameTooLongs OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of frames received on a particular
                    interface that exceed the maximum permitted
                    frame size.

                    The count represented by an instance of this
                    object is incremented when the frameTooLong
                    status is returned by the MAC service to the
                    LLC (or other MAC user). Received frames for
                    which multiple error conditions obtain are,
                    according to the conventions of IEEE 802.3
                    Layer Management, counted exclusively according
                    to the error status presented to the LLC."
```

```
            REFERENCE   "IEEE 802.3 Layer Management"
            ::= { dot3StatsEntry 13 }

        -- { dot3StatsEntry 14 } is not assigned

        -- { dot3StatsEntry 15 } is not assigned

        dot3StatsInternalMacReceiveErrors OBJECT-TYPE
            SYNTAX      Counter32
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION "A count of frames for which reception on a
                        particular interface fails due to an internal
                        MAC sublayer receive error. A frame is only
                        counted by an instance of this object if it is
                        not counted by the corresponding instance of
                        either the dot3StatsFrameTooLongs object, the
                        dot3StatsAlignmentErrors object, or the
                        dot3StatsFCSErrors object.
                        The precise meaning of the count represented by
                        an instance of this object is implementation-
                        specific.  In particular, an instance of this
                        object may represent a count of receive errors
                        on a particular interface that are not
                        otherwise counted."
            REFERENCE   "IEEE 802.3 Layer Management"
            ::= { dot3StatsEntry 16 }

        dot3StatsEtherChipSet OBJECT-TYPE
            SYNTAX      OBJECT IDENTIFIER
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION "This object contains an OBJECT IDENTIFIER
                        which identifies the chipset used to
                        realize the interface. Ethernet-like
                        interfaces are typically built out of
                        several different chips. The MIB implementor
                        is presented with a decision of which chip
                        to identify via this object. The implementor
                        should identify the chip which is usually
                        called the Medium Access Control chip.
                        If no such chip is easily identifiable,
                        the implementor should identify the chip
                        which actually gathers the transmit
                        and receive statistics and error
                        indications. This would allow a
                        manager station to correlate the
                        statistics and the chip generating
```

```
                    them, giving it the ability to take
                    into account any known anomalies
                    in the chip."
        ::= { dot3StatsEntry 17 }

    dot3StatsSymbolErrors OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "The number of times there was an invalid data
                    symbol when a valid carrier was present on a
                    particular interface.

                    The count represented by an instance of this
                    object is incremented at most once per carrier
                    event, even if multiple symbol errors occur
                    during the carrier event."
        REFERENCE   "IEEE 802.3u-1995 10 & 100 Mb/s Management"
        ::= { dot3StatsEntry 18 }

    -- the Ethernet-like Collision Statistics group

    -- Implementation of this group is optional; it is appropriate
    -- for all systems which have the necessary metering

    dot3CollTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF Dot3CollEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION "A collection of collision histograms for a
                    particular set of interfaces."
        ::= { dot3 5 }


    dot3CollEntry OBJECT-TYPE
        SYNTAX      Dot3CollEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION "A cell in the histogram of per-frame
                    collisions for a particular interface.  An
                    instance of this object represents the
                    frequency of individual MAC frames for which
                    the transmission (successful or otherwise) on a
                    particular interface is accompanied by a
                    particular number of media collisions."
        INDEX       { ifIndex, dot3CollCount }
        ::= { dot3CollTable 1 }
```

```
    Dot3CollEntry ::=
        SEQUENCE {
            dot3CollCount        INTEGER,
            dot3CollFrequencies  Counter32
        }

    -- { dot3CollEntry 1 } is no longer in use

    dot3CollCount OBJECT-TYPE
        SYNTAX      INTEGER (1..16)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION "The number of per-frame media collisions for
                     which a particular collision histogram cell
                     represents the frequency on a particular
                     interface."
        ::= { dot3CollEntry 2 }


    dot3CollFrequencies OBJECT-TYPE
        SYNTAX      Counter32
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION "A count of individual MAC frames for which the
                     transmission (successful or otherwise) on a
                     particular interface occurs after the
                     frame has experienced exactly the number
                     of collisions in the associated
                     dot3CollCount object.

                     For example, a frame which is transmitted
                     on interface 77 after experiencing
                     exactly 4 collisions would be indicated
                     by incrementing only dot3CollFrequencies.77.4.
                     No other instance of dot3CollFrequencies would
                     be incremented in this example."
        ::= { dot3CollEntry 3 }

    --  802.3 Tests

    dot3Tests   OBJECT IDENTIFIER ::= { dot3 6 }

    dot3Errors  OBJECT IDENTIFIER ::= { dot3 7 }


    --  TDR Test

    dot3TestTdr OBJECT-IDENTITY
```

```
            STATUS      current
            DESCRIPTION "The Time-Domain Reflectometry (TDR) test is
                        specific to ethernet-like interfaces of type
                        10Base5 and 10Base2.  The TDR value may be
                        useful in determining the approximate distance
                        to a cable fault.  It is advisable to repeat
                        this test to check for a consistent resulting
                        TDR value, to verify that there is a fault.

                        A TDR test returns as its result the time
                        interval, measured in 10 MHz ticks or 100 nsec
                        units, between the start of TDR test
                        transmission and the subsequent detection of a
                        collision or deassertion of carrier.  On
                        successful completion of a TDR test, the result
                        is stored as the value of an appropriate
                        instance of an appropriate vendor specific MIB
                        object, and the OBJECT IDENTIFIER of that
                        instance is stored in the appropriate instance
                        of the appropriate test result code object
                        (thereby indicating where the result has been
                        stored)."
            ::= { dot3Tests 1 }

        -- Loopback Test

        dot3TestLoopBack OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "This test configures the MAC chip and executes
                        an internal loopback test of memory, data paths,
                        and the MAC chip logic.  This loopback test can
                        only be executed if the interface is offline.
                        Once the test has completed, the MAC chip should
                        be reinitialized for network operation, but it
                        should remain offline.

                        If an error occurs during a test, the
                        appropriate test result object will be set
                        to indicate a failure.  The two OBJECT
                        IDENTIFIER values dot3ErrorInitError and
                        dot3ErrorLoopbackError may be used to provided
                        more information as values for an appropriate
                        test result code object."
            ::= { dot3Tests 2 }

        dot3ErrorInitError OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "Couldn't initialize MAC chip for test."
```

```
        ::= { dot3Errors 1 }

    dot3ErrorLoopbackError OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "Expected data not received (or not received
                    correctly) in loopback test."
        ::= { dot3Errors 2 }


    --  802.3 Hardware Chipsets

    -- The object dot3StatsEtherChipSet is provided to
    -- identify the MAC hardware used to communicate on an
    -- interface.  The following hardware chipsets are
    -- registered:

    dot3ChipSets          OBJECT IDENTIFIER ::= { dot3 8 }

    dot3ChipSetAMD        OBJECT IDENTIFIER ::= { dot3ChipSets 1 }

    dot3ChipSetAMD7990 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Advanced
                    Micro Devices Am7990 Local Area Network
                    Controller for Ethernet (LANCE)."
        ::= { dot3ChipSetAMD 1 }

    dot3ChipSetAMD79900 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Advanced
                    Micro Devices Am79900 chip."
        ::= { dot3ChipSetAMD 2 }

    dot3ChipSetAMD79C940 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Advanced
                    Micro Devices Am79C940 Media Access Controller
                    for Ethernet (MACE)."
        ::= { dot3ChipSetAMD 3 }

    dot3ChipSetAMD79C90 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Advanced
                    Micro Devices Am79C90 CMOS Local Area Network
                    Controller for Ethernet (C-LANCE)."
        ::= { dot3ChipSetAMD 4 }

    dot3ChipSetAMD79C960 OBJECT-IDENTITY
```

```
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C960 PCnet-ISA Single Chip
                        Ethernet Controller for ISA."
            ::= { dot3ChipSetAMD 5 }

        dot3ChipSetAMD79C961 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C961 PCnet-ISA+ Single Chip
                        Plug & Play Full-Duplex Ethernet Controller
                        for ISA."
            ::= { dot3ChipSetAMD 6 }

        dot3ChipSetAMD79C961A OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C961A PCnet-ISA II Single Chip
                        Plug & Play Full-Duplex Ethernet Controller
                        for ISA."
            ::= { dot3ChipSetAMD 7 }

        dot3ChipSetAMD79C965 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C965 PCnet-32 Single Chip
                        Ethernet Controller for PCI."
            ::= { dot3ChipSetAMD 8 }

        dot3ChipSetAMD79C970 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C970 PCnet PCI Single Chip
                        Ethernet Controller for PCI Local Bus."
            ::= { dot3ChipSetAMD 9 }

        dot3ChipSetAMD79C970A OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices AM79C970A PCnet PCI II Single Chip
                        Full-Duplex Ethernet Controller for PCI Local
                        Bus."
            ::= { dot3ChipSetAMD 10 }

        dot3ChipSetAMD79C971 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Advanced
                        Micro Devices Am79C971 PCnet-FAST Single Chip
```

```
                    Full-Duplex 10/100 Mbps Ethernet Controller for
                    PCI Local Bus."
        ::= { dot3ChipSetAMD 11 }

    dot3ChipSetAMD79C972 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Advanced
                    Micro Devices Am79C972 PCnet-FAST+ Enhanced
                    10/100 Mbps PCI Ethernet Controller with OnNow
                    Support."
        ::= { dot3ChipSetAMD 12 }

    dot3ChipSetIntel      OBJECT IDENTIFIER ::= { dot3ChipSets 2 }

    dot3ChipSetIntel82586 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Intel
                    82586 IEEE 802.3 Ethernet LAN Coprocessor."
        ::= { dot3ChipSetIntel 1 }

    dot3ChipSetIntel82596 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Intel
                    82596 High-Performance 32-Bit Local Area Network
                    Coprocessor."
        ::= { dot3ChipSetIntel 2 }

    dot3ChipSetIntel82595 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Intel
                    82595 High Integration Ethernet Controller."
        ::= { dot3ChipSetIntel 3 }

    dot3ChipSetIntel82557 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Intel
                    82557 Fast Ethernet PCI Bus Lan Controller."
        ::= { dot3ChipSetIntel 4 }

    dot3ChipSetIntel82558 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Intel
                    82558 Fast Ethernet PCI Bus LAN Controller with
                    Integrated PHY."
        ::= { dot3ChipSetIntel 5 }

    dot3ChipSetSeeq       OBJECT IDENTIFIER ::= { dot3ChipSets 3 }
```

```
    dot3ChipSetSeeq8003 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    8003 chip set."
        ::= { dot3ChipSetSeeq 1 }

    dot3ChipSetSeeq80C03 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    80C03 Full-Duplex CMOS Ethernet Data Link
                    Controller (MAC)."
        ::= { dot3ChipSetSeeq 2 }

    dot3ChipSetSeeq84C30 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    4-Port 84C30 Full-Duplex CMOS Ethernet 10
                    MBit/Sec Data Link Controller (MAC)."
        ::= { dot3ChipSetSeeq 3 }

    dot3ChipSetSeeq8431 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    4-Port 8431 Full-Duplex CMOS Ethernet 10
                    MBit/Sec Data Link Controller (MAC)."
        ::= { dot3ChipSetSeeq 4 }

    dot3ChipSetSeeq80C300 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    80C300 Full-Duplex CMOS Ethernet 10/100
                    Mbit/Sec Data Link Controller (MAC)."
        ::= { dot3ChipSetSeeq 5 }

    dot3ChipSetSeeq84C300 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    4-Port 84C300 Fast Ethernet Controller (MAC)."
        ::= { dot3ChipSetSeeq 6 }

    dot3ChipSetSeeq84301 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the SEEQ
                    4-Port 84301 Fast Ethernet Controller (MAC)."
        ::= { dot3ChipSetSeeq 7 }

    dot3ChipSetSeeq84302 OBJECT-IDENTITY
        STATUS      current
```

```
            DESCRIPTION "The authoritative identifier for the SEEQ
                        4-Port 84302 Fast Ethernet Controller (MAC)."
            ::= { dot3ChipSetSeeq 8 }

        dot3ChipSetSeeq8100 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the SEEQ
                        8100 Gigabit Ethernet Controller (MAC & PCS)."
            ::= { dot3ChipSetSeeq 9 }

        dot3ChipSetNational   OBJECT IDENTIFIER ::= { dot3ChipSets 4 }

        dot3ChipSetNational8390 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP8390 Network Interface
                        Controller."
            ::= { dot3ChipSetNational 1 }

        dot3ChipSetNationalSonic OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83932 Systems-Oriented Network
                        Interface Controller (SONIC)."
            ::= { dot3ChipSetNational 2 }

        dot3ChipSetNational83901 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83901 Serial Network Interface
                        Controller (SNIC)."
            ::= { dot3ChipSetNational 3 }

        dot3ChipSetNational83902 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83902 Serial Network Interface
                        Controller for Twisted Pair (ST-NIC)."
            ::= { dot3ChipSetNational 4 }

        dot3ChipSetNational83905 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83905 AT Local Area Network
                        Twisted-Pair Interface (AT/LANTIC)."
            ::= { dot3ChipSetNational 5 }

        dot3ChipSetNational83907 OBJECT-IDENTITY
```

```
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83907 AT Twisted-Pair Enhanced
                        Coaxial Network Interface Controller
                        (AT/LANTIC II)."
            ::= { dot3ChipSetNational 6 }

        dot3ChipSetNational83916 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83916 Systems-Oriented Network
                        Interface Controller (SONIC-16)."
            ::= { dot3ChipSetNational 7 }

        dot3ChipSetNational83934 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83934 Systems-Oriented Network
                        Interface Controller with Twisted Pair Interface
                        (SONIC-T)."
            ::= { dot3ChipSetNational 8 }

        dot3ChipSetNational83936 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the National
                        Semiconductor DP83936AVUL Full-Duplex Systems-
                        Oriented Network Interface Controller with
                        Twisted Pair Interface (SONIC-T)."
            ::= { dot3ChipSetNational 9 }

        dot3ChipSetFujitsu    OBJECT IDENTIFIER ::= { dot3ChipSets 5 }

        dot3ChipSetFujitsu86950 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Fujitsu
                        86950 chip."
            ::= { dot3ChipSetFujitsu 1 }

        dot3ChipSetFujitsu86960 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Fujitsu
                        MB86960 Network Interface Controller with
                        Encoder/Decoder (NICE)."
            ::= { dot3ChipSetFujitsu 2 }

        dot3ChipSetFujitsu86964 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Fujitsu
```

```
                    MB86964 Ethernet Controller with 10BASE-T
                    Tranceiver."
        ::= { dot3ChipSetFujitsu 3 }

    dot3ChipSetFujitsu86965A OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Fujitsu
                    MB86965A EtherCoupler Single-Chip Ethernet
                    Controller."
        ::= { dot3ChipSetFujitsu 4 }

    dot3ChipSetFujitsu86965B OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Fujitsu
                    MB86965B EtherCoupler Single-Chip Ethernet
                    Controller (supports full-duplex)."
        ::= { dot3ChipSetFujitsu 5 }

    dot3ChipSetDigital    OBJECT IDENTIFIER ::= { dot3ChipSets 6 }

    dot3ChipSetDigitalDC21040 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Digital
                    Semiconductor DC21040 chip."
        ::= { dot3ChipSetDigital 1 }

    dot3ChipSetDigital21041 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Digital
                    Semiconductor 21041 PCI Ethernet LAN
                    Controller."
        ::= { dot3ChipSetDigital 2 }

    dot3ChipSetDigital21140 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Digital
                    Semiconductor 21140 PCI Fast Ethernet LAN
                    Controller."
        ::= { dot3ChipSetDigital 3 }

    dot3ChipSetDigital21143 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Digital
                    Semiconductor 21143 PCI/CardBus 10/100-Mb/s
                    Ethernet LAN Controller."
        ::= { dot3ChipSetDigital 4 }

    dot3ChipSetDigital21340 OBJECT-IDENTITY
```

```
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Digital
                        Semiconductor 21340 10/100-MB/s managed buffered
                        port switch."
            ::= { dot3ChipSetDigital 5 }

        dot3ChipSetDigital21440 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Digital
                        Semiconductor 21440 Multiport 10/100Mbps
                        Ethernet Controller."
            ::= { dot3ChipSetDigital 6 }

        dot3ChipSetDigital21540 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Digital
                        Semiconductor 21540 PCI/CardBus Ethernet LAN
                        Controller with Modem Interface."
            ::= { dot3ChipSetDigital 7 }

        dot3ChipSetTI         OBJECT IDENTIFIER ::= { dot3ChipSets 7 }

        dot3ChipSetTIE100 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Texas
                        Instruments TNETE100 ThunderLAN PCI Fast
                        Ethernet Controller."
            ::= { dot3ChipSetTI 1 }

        dot3ChipSetTIE110 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Texas
                        Instruments TNETE110 ThunderLAN PCI 10BASE-T
                        Ethernet Adapter."
            ::= { dot3ChipSetTI 2 }

        dot3ChipSetTIX3100 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Texas
                        Instruments TNETX3100 Desktop ThunderSWITCH
                        8/2."
            ::= { dot3ChipSetTI 3 }

        dot3ChipSetTIX3150 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Texas
                        Instruments TNETX3150 ThunderSWITCH 12/3."
            ::= { dot3ChipSetTI 4 }
```

```
    dot3ChipSetTIX3270 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Texas
                    Instruments TNETX3270 ThunderSWITCH 24/3."
        ::= { dot3ChipSetTI 5 }

    dot3ChipSetToshiba    OBJECT IDENTIFIER ::= { dot3ChipSets 8 }

    dot3ChipSetToshibaTC35815F OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Toshiba
                    TC35815F PCI-Based 100/10Mbps Ethernet
                    Controller."
        ::= { dot3ChipSetToshiba 1 }

    dot3ChipSetLucent     OBJECT IDENTIFIER ::= { dot3ChipSets 9 }

    dot3ChipSetLucentATT1MX10 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Lucent
                    Technologies ATT1MX10 (Spinnaker) Quad MAC and
                    Tranceiver for Ethernet Frame Switching."
        ::= { dot3ChipSetLucent 1 }

    dot3ChipSetLucentLUC3M08 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Lucent
                    Technologies LUC3M08 Eight Ethernet MACs for
                    10/100 Mbits/s Frame Switching."
        ::= { dot3ChipSetLucent 2 }

    dot3ChipSetGalileo    OBJECT IDENTIFIER ::= { dot3ChipSets 10 }

    dot3ChipSetGalileoGT48001 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Galileo
                    Technology GT-48001A Switched Ethernet
                    Controller."
        ::= { dot3ChipSetGalileo 1 }

    dot3ChipSetGalileoGT48002 OBJECT-IDENTITY
        STATUS      current
        DESCRIPTION "The authoritative identifier for the Galileo
                    Technology GT-48002A Switched Fast Ethernet
                    Controller."
        ::= { dot3ChipSetGalileo 2 }

    dot3ChipSetGalileoGT48004 OBJECT-IDENTITY
```

```
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Galileo
                        Technology GT-48004A Four Port Fast Ethernet
                        Switch for Multiport 10/100BASE-X Systems."
            ::= { dot3ChipSetGalileo 3 }

        dot3ChipSetGalileoGT48207 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Galileo
                        Technology GT-48207 Low-Cost 10 Port Switched
                        Ethernet Controller for 10+10/100BASE-X."
            ::= { dot3ChipSetGalileo 4 }

        dot3ChipSetGalileoGT48208 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Galileo
                        Technology GT-48208 Advanced 10 Port Switched
                        Ethernet Controller for 10+10/100BASE-X."
            ::= { dot3ChipSetGalileo 5 }

        dot3ChipSetGalileoGT48212 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Galileo
                        Technology GT-48212 Advanced 14 Port Switched
                        Ethernet Controller for 10+10/100BASE-X."
            ::= { dot3ChipSetGalileo 6 }

        dot3ChipSetJato       OBJECT IDENTIFIER ::= { dot3ChipSets 11 }

        dot3ChipSetJatoJT1001 OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the Jato
                        Technologies JT1001 GigEMAC Server
                        10/100/1000Mbps Ethernet Controller with PCI
                        interface."
            ::= { dot3ChipSetJato 1 }

        dot3ChipSetXaQti      OBJECT IDENTIFIER ::= { dot3ChipSets 12 }

        dot3ChipSetXaQtiXQ11800FP OBJECT-IDENTITY
            STATUS      current
            DESCRIPTION "The authoritative identifier for the XaQTI
                        XQ11800FP XMAC II Gigabit Ethernet Media Access
                        Controller."
            ::= { dot3ChipSetXaQti 1 }

        dot3ChipSetXaQtiXQ18110FP OBJECT-IDENTITY
            STATUS      current
```

```
            DESCRIPTION "The authoritative identifier for the XaQTI
                        XQ18110FP GigaPower Protocol Accelerator."
            ::= { dot3ChipSetXaQti 2 }

        -- For those chipsets not represented above, OBJECT IDENTIFIER
        -- assignment is required in other documentation, e.g.,
        -- assignment within that part of the registration tree
        -- delegated to individual enterprises (see RFC 1155 and
        -- RFC 1902).

        -- conformance information

        etherConformance OBJECT IDENTIFIER ::= { etherMIB 2 }

        etherGroups      OBJECT IDENTIFIER ::= { etherConformance 1 }
        etherCompliances OBJECT IDENTIFIER ::= { etherConformance 2 }


        -- compliance statements

        etherCompliance MODULE-COMPLIANCE
            STATUS      current
            DESCRIPTION "The compliance statement for managed network
                        entities which have ethernet-like network
                        interfaces."

            MODULE  -- this module
                MANDATORY-GROUPS { etherStatsGroup }

                GROUP       etherCollisionTableGroup
                DESCRIPTION "This group is optional. It is appropriate
                            for all systems which have the necessary
                            metering. Implementation in such systems is
                            highly recommended."
            ::= { etherCompliances 1 }

        ether100MbsCompliance MODULE-COMPLIANCE
            STATUS      current
            DESCRIPTION "The compliance statement for managed network
                        entities which have 100 Mb/sec ethernet-like
                        network interfaces."

            MODULE  -- this module
                MANDATORY-GROUPS { etherStats100MbsGroup }

                GROUP       etherCollisionTableGroup
                DESCRIPTION "This group is optional. It is appropriate
                            for all systems which have the necessary
```

```
                        metering. Implementation in such systems is
                        highly recommended."
        ::= { etherCompliances 2 }

    -- units of conformance

    etherStatsGroup OBJECT-GROUP
        OBJECTS     { dot3StatsIndex,
                      dot3StatsAlignmentErrors,
                      dot3StatsFCSErrors,
                      dot3StatsSingleCollisionFrames,
                      dot3StatsMultipleCollisionFrames,
                      dot3StatsSQETestErrors,
                      dot3StatsDeferredTransmissions,
                      dot3StatsLateCollisions,
                      dot3StatsExcessiveCollisions,
                      dot3StatsInternalMacTransmitErrors,
                      dot3StatsCarrierSenseErrors,
                      dot3StatsFrameTooLongs,
                      dot3StatsInternalMacReceiveErrors,
                      dot3StatsEtherChipSet
                    }
        STATUS      current
        DESCRIPTION "A collection of objects providing information
                    applicable to all ethernet-like network
                    interfaces."
        ::= { etherGroups 1 }


    etherCollisionTableGroup OBJECT-GROUP
        OBJECTS     { dot3CollFrequencies
                    }
        STATUS      current
        DESCRIPTION "A collection of objects providing a histogram
                    of packets successfully transmitted after
                    experiencing exactly N collisions."
        ::= { etherGroups 2 }


    etherStats100MbsGroup OBJECT-GROUP
        OBJECTS     { dot3StatsIndex,
                      dot3StatsAlignmentErrors,
                      dot3StatsFCSErrors,
                      dot3StatsSingleCollisionFrames,
                      dot3StatsMultipleCollisionFrames,
                      dot3StatsDeferredTransmissions,
                      dot3StatsLateCollisions,
                      dot3StatsExcessiveCollisions,
```

```
                    dot3StatsInternalMacTransmitErrors,
                    dot3StatsCarrierSenseErrors,
                    dot3StatsFrameTooLongs,
                    dot3StatsInternalMacReceiveErrors,
                    dot3StatsEtherChipSet,
                    dot3StatsSymbolErrors
                  }
        STATUS      current
        DESCRIPTION "A collection of objects providing information
                    applicable to 100 Mb/sec ethernet-like network
                    interfaces."
        ::= { etherGroups 3 }


END
```

6. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

7. Acknowledgements

This document was produced by the 802.3 Hub MIB Working Group.

This document is almost completely based on both the Standard Ethernet MIB, RFC 1623 [10], and the Proposed Standard Ethernet MIB using the SNMPv2 SMI, RFC 1650 [11], both of which were edited by Frank Kastenholz of FTP Software and produced by the Ethernet MIB

Working Group. This document extends those documents by providing support for 100 Mb/sec ethernet interfaces as outlined in [6].

RFC 1623 and RFC 1650, in turn, are based on the Draft Standard Ethernet MIB, RFC 1398 [9], also edited by Frank Kastenholz and produced by the Ethernet MIB Working Group.

RFC 1398, in turn, is based on the Proposed Standard Ethernet MIB, RFC 1284 [8], which was edited by John Cook of Chipcom and produced by the Transmission MIB Working Group. The Ethernet MIB Working Group gathered implementation experience of the variables specified in RFC 1284 and used that information to develop this revised MIB.

RFC 1284, in turn, is based on a document written by Frank Kastenholz, then of Interlan, entitled IEEE 802.3 Layer Management Draft M compatible MIB for TCP/IP Networks [7]. This document has been modestly reworked, initially by the SNMP Working Group, and then by the Transmission Working Group, to reflect the current conventions for defining objects for MIB interfaces. James Davin, of the MIT Laboratory for Computer Science, and Keith McCloghrie of Hughes LAN Systems, contributed to later drafts of this memo. Marshall Rose of Performance Systems International, Inc. converted the document into its current concise format. Anil Rijsinghani of DEC contributed text that more adequately describes the TDR test. Thanks to Frank Kastenholz of Interlan and Louis Steinberg of IBM for their experimentation.

8. References

[1] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.

[2] SNMPv2 Working Group, Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1902, January 1996.

[3] SNMPv2 Working Group, Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1903, January 1996.

[4] SNMPv2 Working Group, Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1904, January 1996.

[5] IEEE, IEEE 802.3 Layer Management, November 1988.

[6] IEEE, IEEE 802.3u-1995, "10 & 100 Mb/s Management," Section 30, Supplement to IEEE Std 802.3, October 26, 1995.

[7] Kastenholz, F., "IEEE 802.3 Layer Management Draft compatible MIB for TCP/IP Networks", electronic mail message to mib-wg@nnsc.nsf.net, 9 June 1989.

[8] Cook, J., "Definitions of Managed Objects for Ethernet-Like Interface Types", RFC 1284, Chipcom Corporation, December 1991.

[9] Kastenholz, F., "Definitions of Managed Objects for the Ethernet-like Interface Types", RFC 1398, FTP Software, Inc., January 1993.

[10] Kastenholz, F., "Definitions of Managed Objects for the Ethernet-like Interface Types", RFC 1623, FTP Software, Inc., May 1994.

[11] Kastenholz, F., "Definitions of Managed Objects for the Ethernet-like Interface Types using SMIv2", RFC 1650, FTP Software, Inc., August 1994.

[12] McCloghrie, K., and F. Kastenholz, "The Interfaces Group MIB using SMIv2", RFC 2233, Cisco Systems, FTP Software, November 1997.

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

[14] deGraaf, K., Romascanu, D., McMaster, D., McCloghrie, K., and S. Roberts, "Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs) using SMIv2", RFC 2239, 3Com Corporation, Madge Networks (Israel) Ltd., Cisco Systems Inc., Cisco Systems Inc., Farallon Computing Inc., November 1997.

[15] Kastenholz, F., "Implementation Notes and Experience for The Internet Ethernet MIB", RFC 1369, FTP Software, October 1992.

[16] McCloghrie, K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", STD 17, RFC 1213, Hughes LAN Systems, Performance Systems International, March 1991.

9. Security Considerations

Certain management information defined in this MIB may be considered sensitive in some network environments. Therefore, authentication of received SNMP requests and controlled access to management information should be employed in such environments. The method for this authentication is a function of the SNMP Administrative Framework, and has not been expanded by this MIB.

10. Author's Addresses

John Flick
Hewlett-Packard Company
8000 Foothills Blvd. M/S 5556
Roseville, CA 95747-5556

Phone: +1 916 785 4018
Email: johnf@hprnd.rose.hp.com

Jeffrey Johnson
RedBack Networks
2570 North First Street, Suite 410
San Jose, CA, 95131, USA

Phone: +1 408 571 2699
EMail: jeff@redbacknetworks.com

11. Full Copyright Statement

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING

TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.