

Ethernet Interfaces and Hub MIB Working Group
INTERNET DRAFT

Editor of this version:
J. Flick
Hewlett-Packard Company

Editors of previous versions:
J. Flick
Hewlett-Packard Company
J. Johnson
RedBack Networks
F. Kastenholz
Unisphere Networks
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Definitions of Managed Objects for the Ethernet-like Interface Types

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Abstract

This memo defines a portion of the Management Information Base (MIB)

for use with network management protocols in the Internet community. This memo obsoletes [RFC 2665](#) "'Definitions of Managed Objects for the Ethernet-like Interface Types'". This memo updates that specification by including management information useful for the management of 10 Gigabit per second (Gb/s) Ethernet interfaces.

Ethernet technology, as defined by the 802.3 Working Group of the IEEE, continues to evolve, with scalable increases in speed, new types of cabling and interfaces, and new features. This evolution may require changes in the managed objects in order to reflect this new functionality. This document, as with other documents issued by this working group, reflects a certain stage in the evolution of Ethernet technology. In the future, this document might be revised, or new documents might be issued by the Ethernet Interfaces and Hub MIB Working Group, in order to reflect the evolution of Ethernet technology.

Distribution of this memo is unlimited. Please forward comments to hubmib@ietf.org.

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[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 updates the list of managed objects specified in the earlier version of this MIB, [RFC 2665](#) [[RFC2665](#)].

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

[2.](#) The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in [RFC 2571](#) [[RFC2571](#)].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIV1 and described in STD 16, [RFC 1155](#) [[RFC1155](#)], STD 16, [RFC 1212](#) [[RFC1212](#)] and [RFC 1215](#) [[RFC1215](#)]. The second version, called SMIV2, is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, [RFC 1157](#) [[RFC1157](#)]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in [RFC 1901](#) [[RFC1901](#)] and [RFC 1906](#) [[RFC1906](#)]. The third version of the message protocol is called SNMPv3 and described in [RFC 1906](#) [[RFC1906](#)], [RFC 2572](#) [[RFC2572](#)] and [RFC 2574](#) [[RFC2574](#)].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is

described in STD 15, [RFC 1157](#) [[RFC1157](#)]. A second set of protocol operations and associated PDU formats is described in [RFC 1905](#) [[RFC1905](#)].

- o A set of fundamental applications described in [RFC 2573](#) [[RFC2573](#)] and the view-based access control mechanism described in [RFC 2575](#) [[RFC2575](#)].

A more detailed introduction to the current SNMP Management Framework can be found in [RFC 2570](#) [[RFC2570](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. 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 value ethernetCsmacd(6) of the ifType object in the Interfaces MIB [[RFC2863](#)]. Some older implementations may return the values iso88023Csmacd(7) or starLan(11) for ifType for ethernet-like media.

The definitions presented here are based on [Section 30](#), "10 Mb/s, 100 Mb/s 1000 Mb/s and 10 Gb/s Management", and Annex 30A, "GDMO Specification for 802.3 managed object classes" of IEEE Std. 802.3, 2000 Edition [[IEEE802.3](#)], amended by IEEE Draft P802.3ae/D4.3 [[P802.3ae](#)], as originally interpreted by Frank Kastenholz, then of Interlan in [[KASTEN](#)]. Implementors of these MIB objects should note that IEEE Std. 802.3 [[IEEE802.3](#)] 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 [[IEEE802.3](#)] are

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represented by previously defined objects in MIB-2 [[RFC1213](#)] or in the Interfaces MIB [[RFC2863](#)], 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.

3.1. Relation to MIB-2

This section applies only when this MIB is used in conjunction with the "old" [[RFC1213](#)] interface group.

The relationship between an ethernet-like interface and an interface in the context of MIB-2 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 IDENTIFIER ::= { transmission 7 }
```

3.2. Relation to the Interfaces MIB

The Interface MIB [[RFC2863](#)] 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 4 of \[\[RFC2863\]\(#\)\]](#) 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 [[RFC2863](#)] in order to understand the general intent of these areas.

3.2.1. Layering Model

Ordinarily, there are no sublayers for an ethernet-like interface. However there may be implementation-specific requirements which require the use of sublayers. One example is the use of 802.3 link aggregation. In this case, Annex 30C of [[IEEE802.3](#)] describes the

layering model and the use of the ifStackTable for representing aggregated links. Another example is the use of the 802.3 WAN Interface Sublayer. In this case, The 802.3 WIS MIB [[ETHERWIS](#)] describes the layering model and the use of the ifStackTable for representing the WAN sublayer.

3.2.2. Virtual Circuits

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

3.2.3. 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.

3.2.4. ifType

This MIB applies to interfaces which have the ifType value ethernetCsmacd(6). It is REQUIRED 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. Use of the ifType values iso88023Csmacd(7) and starLan(11) are deprecated, however some older implementations may return these values. Management applications should be prepared to receive these deprecated ifType values from older implementations.

There are three other interface types defined in the IANAifType-MIB for Ethernet. They are fastEther(62), fastEtherFX(69), and gigabitEthernet(117). These interface types were registered by individual vendors, not by any IETF working group. A requirement for compliance with this document is that all ethernet-like interfaces MUST return ethernetCsmacd(6) for ifType, and MUST NOT return fastEther(62), fastEtherFX(69), or gigabitEthernet(117). However, as there are fielded implementations that do return these obsolete ifType values, management applications SHOULD be prepared to receive them from older implementations.

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 [[MAU-MIB](#)]. Note that implementation of the 802.3 MAU MIB [[MAU-MIB](#)] is REQUIRED for all ethernet-like interfaces.

[3.2.5.](#) ifXxxOctets

The Interface MIB octet counters, `ifInOctets`, `ifOutOctets`, `ifHCInOctets` and `ifHCOctets`, MUST include all octets in valid frames sent or received on the interface, including the MAC header and FCS, but not the preamble, start of frame delimiter, or extension octets. This corresponds to the definition of `frameSize/8` in [section 4.2.7.1](#) of [[IEEE802.3](#)] (`frameSize` is defined in bits rather than octets, and is defined as $2 \times \text{addressSize} + \text{lengthOrTypeSize} + \text{dataSize} + \text{crcSize}$). They do not include the number of octets in collided or failed transmit attempts, since the MAC layer driver typically does not have visibility to count these octets. They also do not include octets in received invalid frames, since this information is normally not passed to the MAC layer, and since non-promiscuous MAC implementations cannot reliably determine whether an invalid frame was actually addressed to this station.

Note that these counters do include octets in valid MAC control frames sent or received on the interface, as well as octets in otherwise valid received MAC frames that are discarded by the MAC layer for some reason (insufficient buffer space, unknown protocol, etc.).

Note that the octet counters in IF-MIB do not exactly match the definition of the octet counters in IEEE 802.3. `aOctetsTransmittedOK` and `aOctetsReceivedOK` count only the octets in the `clientData` and `Pad` fields, whereas `ifInOctets` and `ifOutOctets` include the entire MAC frame, including MAC header and FCS. However, the IF-MIB counters can be derived from the IEEE 802.3 counters as follows:

```
ifInOctets = aOctetsReceivedOK + (18 * aFramesReceivedOK)
ifOutOctets = aOctetsTransmittedOK + (18 * aFramesTransmittedOK)
```

Another difference to keep in mind between the IF-MIB counters and IEEE 802.3 counters is that in the IEEE 802.3 document, the frame counters and octet counters are always incremented together. `aOctetsTransmittedOK` counts the number of octets in frames that were counted by `aFramesTransmittedOK`. `aOctetsReceivedOK` counts the number of octets in frames that were counted by `aFramesReceivedOK`. This is not the case with the IF-MIB counters. The IF-MIB octet counters count the number of octets sent to or received from the layer below

this interface, whereas the packet counters count the number of packets sent to or received from the layer above. Therefore, received MAC Control frames, `ifInDiscards`, and `ifInUnknownProtos` are counted by `ifInOctets`, but not `ifInXcastPkts`. Transmitted MAC Control frames are counted by `ifOutOctets`, but not `ifOutXcastPkts`. `ifOutDiscards` and `ifOutErrors` are counted by `ifOutXcastPkts`, but not `ifOutOctets`.

3.2.6. ifXxxXcastPkts

The packet counters in the IF-MIB do not exactly match the definition of the frame counters in IEEE 802.3. `aFramesTransmittedOK` counts the number of frames successfully transmitted on the interface, whereas `ifOutUcastPkts`, `ifOutMulticastPkts` and `ifOutBroadcastPkts` count the number of transmit requests made from a higher layer, whether or not the transmit attempt was successful. This means that packets counted by `ifOutErrors` or `ifOutDiscards` are also be counted by `ifOutXcastPkts`, but are not be counted by `aFramesTransmittedOK`. This also means that, since MAC Control frames are generated by a sublayer internal to the interface layer rather than by a higher layer, they are not counted by `ifOutXcastPkts`, but are counted by `aFramesTransmittedOK`. Roughly:

$$\begin{aligned} \text{aFramesTransmittedOK} = & \text{ifOutUcastPkts} + \text{ifOutMulticastPkts} + \\ & \text{ifOutBroadcastPkts} + \text{dot3OutPauseFrames} - \\ & (\text{ifOutErrors} + \text{ifOutDiscards}) \end{aligned}$$

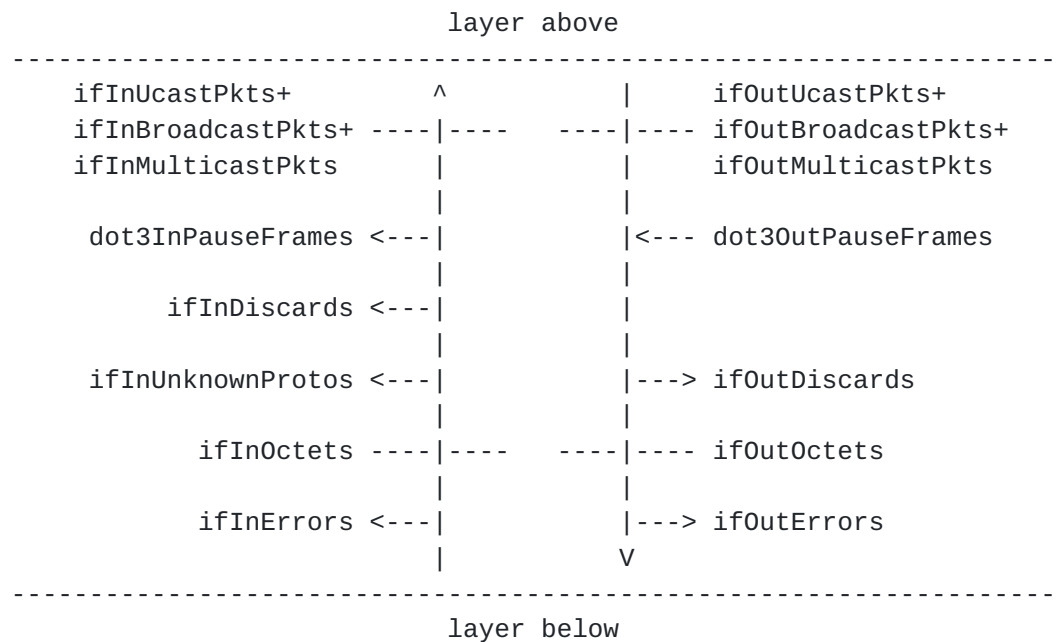
Similarly, `aFramesReceivedOK` counts the number of frames received successfully by the interface, whether or not they are passed to a higher layer, whereas `ifInUcastPkts`, `ifInMulticastPkts` and `ifInBroadcastPkts` count only the number of packets passed to a higher layer. This means that packets counted by `ifInDiscards` or `ifInUnknownProtos` are also counted by `aFramesReceivedOK`, but are not counted by `ifInXcastPkts`. This also means that, since MAC Control frames are consumed by a sublayer internal to the interface layer and not passed to a higher layer, they are not counted by `ifInXcastPkts`, but are counted by `aFramesReceivedOK`. Roughly:

$$\begin{aligned} \text{aFramesReceivedOK} = & \text{ifInUcastPkts} + \text{ifInMulticastPkts} + \\ & \text{ifInBroadcastPkts} + \text{dot3InPauseFrames} + \\ & \text{ifInDiscards} + \text{ifInUnknownProtos} \end{aligned}$$

This specification chooses to treat MAC control frames as being originated and consumed within the interface and not counted by the IF-MIB packet counters. MAC control frames are normally sent as multicast packets. In many network environments, MAC control frames can greatly outnumber multicast frames carrying actual data. If MAC

control frames were included in the `ifInMulticastPkts` and `ifOutMulticastPkts`, the count of data-carrying multicast packets would tend to be drowned out by the count of MAC control frames, rendering those counters considerably less useful.

To better understand the issues surrounding the mapping of of the IF-MIB packet and octet counters to an Ethernet interface, it is useful to refer to a Case Diagram [CASE] for the IF-MIB counters, with modifications to show the proper interpretation for the Ethernet interface layer.



3.2.7. `ifMtu`

The defined standard MTU for ethernet-like interfaces is 1500 octets. However, many implementations today support larger packet sizes than the IEEE 802.3 standard. The value of this object MUST reflect the actual MTU in use on the interface, whether it matches the standard MTU or not.

This value should reflect the value seen by the MAC client interface. When a higher layer protocol, like IP, is running over Ethernet framing, this is the MTU that will be seen by that higher layer protocol. However, most ethernet-like interfaces today run multiple protocols that use a mix of different framing types. For example, an IEEE 802.2 LLC type 1 client protocol will see an MTU of 1497 octets on an interface using the IEEE standard maximum packet size, and a protocol running over SNAP will see an MTU of 1492 octets on an interface using the IEEE standard maximum packet size. However, since specification mandates using the MTU as seen at the MAC client

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interface, the value of ifMtu would be reported as 1500 octets in these cases.

3.2.8. ifSpeed and ifHighSpeed

For ethernet-like interfaces operating at 1000 Megabits per second (Mb/s) or less, ifSpeed will represent the current operational speed of the interface in bits per second. For current interface types, this will be equal to 1,000,000 (1 million), 10,000,000 (10 million), 100,000,000 (100 million), or 1,000,000,000 (1 billion). ifHighSpeed will represent the current operational speed in millions of bits per second. For current ethernet-like interfaces, this will be equal to 1, 10, 100, or 1,000. If the interface implements auto-negotiation, auto-negotiation is enabled for this interface, and the interface has not yet negotiated to an operational speed, these objects SHOULD reflect the maximum speed supported by the interface.

For ethernet-like interfaces operating at greater than 1000 Mb/s, ifHighSpeed will represent the current operational speed of the interface in millions of bits per second. Note that for WAN implementations, this will be the payload data rate over the WAN interface sublayer. For current implementations, this will be equal to 10,000 for LAN implementations of 10 Gb/s, and 9,294 for WAN implementations of the 10 Gb/s MAC over an OC-192 PHY. For these speeds, ifSpeed should report a maximum unsigned 32-bit value of 4,294,967,295 as specified in [[RFC2863](#)].

Note that these 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 duplex mode of the interface may be determined by examining either the dot3StatsDuplexStatus object in this MIB module, or the ifMauType object in the 802.3 MAU MIB [[MAU-MIB](#)].

3.2.9. 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.

3.2.10. Specific Interface MIB Objects

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

Object	Guidelines
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 [RFC2863].
ifType	Refer to section 3.2.4 .
ifMtu	Refer to section 3.2.7 .
ifSpeed	Refer to section 3.2.8 .
ifPhysAddress	Refer to section 3.2.9 .
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 [RFC2863].

ifInOctets	The number of octets in valid MAC frames received on this interface, including the MAC header and FCS. This does include the number of octets in valid MAC Control frames received on this interface. See section 3.2.5 .
ifInUcastPkts	Refer to [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer and are not passed to any higher layer protocol. See section 3.2.6 .
ifInDiscards	Refer to [RFC2863].
ifInErrors	The sum for this interface of dot3StatsAlignmentErrors, dot3StatsFCSErrors, dot3StatsFrameTooLongs, and dot3StatsInternalMacReceiveErrors.
ifInUnknownProtos	Refer to [RFC2863].
ifOutOctets	The number of octets transmitted in valid MAC frames on this interface, including the MAC header and FCS. This does include the number of octets in valid MAC Control frames transmitted on this interface. See section 3.2.5 .
ifOutUcastPkts	Refer to [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See section 3.2.6 .
ifOutDiscards	Refer to [RFC2863].
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 [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer and are not passed to any higher layer protocol. See section 3.2.6 .
ifInBroadcastPkts	Refer to [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See section 3.2.6 .
ifOutMulticastPkts	Refer to [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer and are not passed to any higher layer protocol. See section 3.2.6 .
ifOutBroadcastPkts	Refer to [RFC2863]. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See section 3.2.6 .
ifHCInOctets ifHCOctets	64-bit versions of counters. Required for ethernet-like interfaces that are capable of operating at 20 Mb/s or faster, even if the interface is currently operating at less than 20 Mb/s.
ifHCInUcastPkts ifHCInMulticastPkts ifHCInBroadcastPkts ifHCOutUcastPkts ifHCOutMulticastPkts ifHCOutBroadcastPkts	64-bit versions of packet counters. Required for ethernet-like interfaces that are capable of operating at 640 Mb/s or faster, even if the interface is currently operating at less than 640 Mb/s.
ifLinkUpDownTrapEnable	Refer to [RFC2863]. Default is 'enabled'
ifHighSpeed	Refer to section 3.2.8 .

ifPromiscuousMode	Refer to [RFC2863].
ifConnectorPresent	This will normally be 'true'. It will be 'false' in the case where this interface uses the WAN Interface Sublayer. See [ETHERWIS] for details.
ifAlias	Refer to [RFC2863].
ifCounterDiscontinuityTime	Refer to [RFC2863]. Note that a discontinuity in the Interface MIB counters may also indicate a discontinuity in some or all of the counters in this MIB that are associated with that interface.
ifStackHigherLayer	Refer to section 3.2.1 .
ifStackLowerLayer	
ifStackStatus	
ifRcvAddressAddress	Refer to section 3.2.3 .
ifRcvAddressStatus	
ifRcvAddressType	

[3.3.](#) Relation to the 802.3 MAU MIB

Support for the mauModIfCompl3 compliance statement of the MAU-MIB [[MAU-MIB](#)] 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, and to control autonegotiation and duplex mode for the interface. Implementing this MIB module without implementing the MAU-MIB would leave applications with no standard way to determine the media type in use, and no standard way to control the duplex mode of the interface.

[3.4.](#) dot3StatsEtherChipSet

This document defines an object called dot3StatsEtherChipSet, which is used to identify the MAC hardware used to communicate on an interface. Previous versions of this document contained a number of OID assignments for some existing Ethernet chipsets. Maintaining that list as part of this document has proven to be problematic, so the OID assignments contained in previous versions of this document have now been moved to a separate document [[RFC2666](#)].

The dot3StatsEtherChipSet object has now been deprecated.

Implementation feedback indicates that this object is much more useful in theory than in practice. The object's utility in debugging network problems in the field appears to be limited. In those cases where it may be useful, it is not sufficient, since it identifies only the MAC chip, and not the PHY, PMD, or driver. The administrative overhead involved in maintaining a central registry of chipset OIDs cannot be justified for an object whose usefulness is questionable at best.

Implementations which continue to support this object for the purpose of backwards compatability may continue to use the values defined in [RFC2666]. For chipsets not listed in [RFC2666], implementors that wish to support this object and return a valid OBJECT IDENTIFIER value may assign OBJECT IDENTIFIERS within that part of the registration tree delegated to individual enterprises.

3.5. 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*

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.aFrameTooLongErrors	dot3StatsFrameTooLongs
.aReadWriteMACAddress	IF-MIB - ifPhysAddress
.aCollisionFrames	dot3CollFrequencies
.aDuplexStatus	dot3StatsDuplexStatus
.aRateControlAbility	dot3StatsRateControlAbility
.aRateControlStatus	dot3StatsRateControlStatus
.acAddGroupAddress	IF-MIB - ifRcvAddressTable
.acDeleteGroupAddress	IF-MIB - ifRcvAddressTable
.acExecuteSelfTest	dot3TestLoopBack
oPHYEntity	
.aPHYID	dot3StatsIndex or IF-MIB - ifIndex
.aSQUETestErrors	dot3StatsSQUETestErrors
.aSymbolErrorDuringCarrier	dot3StatsSymbolErrors
oMACControlEntity	
.aMACControlID	dot3StatsIndex or IF-MIB - ifIndex
.aMACControlFunctionsSupported	dot3ControlFunctionsSupported and dot3ControlFunctionsEnabled
.aUnsupportedOpcodesReceived	dot3ControlInUnknownOpcodes
oPAUSEEntity	
.aPAUSEMACCtrlFramesTransmitted	dot3OutPauseFrames
.aPAUSEMACCtrlFramesReceived	dot3InPauseFrames

* Note that the octet counters in IF-MIB do not exactly match the definition of the octet counters in IEEE 802.3. See [section 3.2.5](#) for details.

Also note that the packet counters in the IF-MIB do not exactly match the definition of the frame counters in IEEE 802.3. See [section 3.2.6](#) for details.

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 [[RFC1369](#)] for the detailed reasoning on why these objects were removed.

In addition, the following IEEE 802.3 managed objects have not been included in this MIB for the following reasons.

IEEE 802.3 Managed Object	Disposition
oMACTEntity	
.aMACCapabilities	Can be derived from MAU-MIB - ifMauTypeListBits
.aStretchRatio	Implementation constant.
oPHYEntity	
.aPhyType	Can be derived from MAU-MIB - ifMauType
.aPhyTypeList	Can be derived from MAU-MIB - ifMauTypeListBits
.aMIIDetect	Not considered useful.
.aPhyAdminState	Can already obtain interface state from IF-MIB - ifAdminStatus and MAU state from MAU-MIB - ifMauStatus. Providing an additional state for the PHY was not considered useful.
.acPhyAdminControl	Can already control interface state from IF-MIB - ifAdminStatus and MAU state from MAU-MIB - ifMauStatus. Providing separate admin control of the PHY was not considered useful.
oMACControlEntity	
.aMACControlFramesTransmitted	Can be determined by summing the OutFrames counters for the individual control functions
.aMACControlFramesReceived	Can be determined by summing the InFrames counters for the individual control functions
oPAUSEEntity	
.aPAUSELinkDelayAllowance	Not considered useful.

4. Definitions

EtherLike-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, OBJECT-IDENTITY,
Counter32, Counter64, mib-2, transmission
FROM SNMPv2-SMI

MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF

TruthValue

FROM SNMPv2-TC

ifIndex, InterfaceIndex
FROM IF-MIB;

etherMIB MODULE-IDENTITY

LAST-UPDATED "200205100000Z" -- May 10, 2002

ORGANIZATION "IETF Ethernet Interfaces and Hub MIB
Working Group"

CONTACT-INFO

"WG E-mail: hubmib@ietf.org

To subscribe: hubmib-request@ietf.org

Chair: Dan Romascanu

Postal: Avaya Inc.

Atidum Technology Park, Bldg. 3

Tel Aviv 61131

Israel

Tel: +972 3 645 8414

E-mail: dromasca@avaya.com

Editor: John Flick

Postal: Hewlett-Packard Company

8000 Foothills Blvd. M/S 5557

Roseville, CA 95747-5557

USA

Tel: +1 916 785 4018

Fax: +1 916 785 1199

E-mail: johnf@rose.hp.com"

DESCRIPTION "The MIB module to describe generic objects for
ethernet-like network interfaces.

The following reference is used throughout this
MIB module:

[IEEE 802.3 Std] refers to:

IEEE Std 802.3, 2000 Edition: 'IEEE Standard

for Information technology -
Telecommunications and information exchange
between systems - Local and metropolitan
area networks - Specific requirements -
Part 3: Carrier sense multiple access with
collision detection (CSMA/CD) access method
and physical layer specifications', as
amended by IEEE Draft P802.3ae/D4.3:
'Supplement to Carrier Sense Multiple Access
with Collision Detection (CSMA/CD) Access
Method & Physical Layer Specifications -
Media Access Control (MAC) Parameters,
Physical Layer, and Management Parameters
for 10 Gb/s Operation', April, 2002.

Of particular interest is Clause 30, '10 Mb/s,
100 Mb/s, 1000 Mb/s, and 10 Gb/s Management'."

REVISION "200205100000Z" -- May 10, 2002
DESCRIPTION "Updated to include support for 10 Gb/sec
interfaces.
This version published as RFC XXXX."

REVISION "9908240400Z" -- August 24, 1999
DESCRIPTION "Updated to include support for 1000 Mb/sec
interfaces and full-duplex interfaces.
This version published as [RFC 2665](#)."

REVISION "9806032150Z" -- June 3, 1998
DESCRIPTION "Updated to include support for 100 Mb/sec
interfaces.
This version published as [RFC 2358](#)."

REVISION "9402030400Z" -- February 3, 1994
DESCRIPTION "Initial 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.
There will be one row in this table for each
ethernet-like interface in the 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,
dot3StatsDuplexStatus	INTEGER,
dot3StatsRateControlAbility	TruthValue,
dot3StatsRateControlStatus	INTEGER

}

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."

REFERENCE "[RFC 2863](#), ifIndex"

::= { dot3StatsEntry 1 }

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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 pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter does not increment for group encoding schemes greater than 4 bits per group.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsAlignmentErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.7,
aAlignmentErrors"
::= { 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. This count does not include frames received with frame-too-long or frame-too-short error."

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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 pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Note: Coding errors detected by the physical layer for speeds above 10 Mb/s will cause the frame to fail the FCS check.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsFCSErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.6,
aFrameCheckSequenceErrors."
::= { dot3StatsEntry 3 }

dot3StatsSingleCollisionFrames OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of frames that are involved in a single collision, and are subsequently transmitted successfully.

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.

This counter does not increment when the

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interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.3,
aSingleCollisionFrames."

::= { dot3StatsEntry 4 }

dot3StatsMultipleCollisionFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames that are involved in more than one collision and are subsequently transmitted successfully.

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.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.4,
aMultipleCollisionFrames."

::= { dot3StatsEntry 5 }

dot3StatsSQETestErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of times that the SQE TEST ERROR is received on a particular interface. The SQE TEST ERROR is set in accordance with the rules for verification of the SQE detection mechanism in the PLS Carrier Sense Function as

described in IEEE Std. 802.3, 2000 Edition,
[section 7.2.4.6](#).

This counter does not increment on interfaces
operating at speeds greater than 10 Mb/s, or on
interfaces operating in full-duplex mode.

Discontinuities in the value of this counter can
occur at re-initialization of the management
system, and at other times as indicated by the
value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 7.2.4.6, also 30.3.2.1.4,
aSQETestErrors."
::= { 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.

This counter does not increment when the
interface is operating in full-duplex mode.

Discontinuities in the value of this counter can
occur at re-initialization of the management
system, and at other times as indicated by the
value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.9,
aFramesWithDeferredXmissions."
::= { 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
one slotTime into the transmission of a packet.

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.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.10,
aLateCollisions."
::= { 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.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.11,
aFramesAbortedDueToXSColls."
::= { 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.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsInternalMacTransmitErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.12,
aFramesLostDueToIntMACXmitError."
::= { 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.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.13,
aCarrierSenseErrors."

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```
 ::= { dot3StatsEntry 11 }

-- { dot3StatsEntry 12 } is not assigned

dot3StatsFrameTooLong 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 pertain are,
                according to the conventions of IEEE 802.3
                Layer Management, counted exclusively according
                to the error status presented to the LLC.

                For interfaces operating at 10 Gb/s, this
                counter can roll over in less than 80 minutes if
                it is incrementing at its maximum rate. Since
                that amount of time could be less than a
                management station's poll cycle time, in order
                to avoid a loss of information, a management
                station is advised to poll the
                dot3HCStatsFrameTooLong object for 10 Gb/s
                or faster interfaces.

                Discontinuities in the value of this counter can
                occur at re-initialization of the management
                system, and at other times as indicated by the
                value of ifCounterDiscontinuityTime."
    REFERENCE   "[IEEE 802.3 Std.], 30.3.1.1.25,
                aFrameTooLongErrors."
    ::= { 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.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsInternalMacReceiveErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.15,
aFramesLostDueToIntMACRcvError."
::= { dot3StatsEntry 16 }

dot3StatsEtherChipSet OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION "***** THIS OBJECT IS DEPRECATED *****"

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 "For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present.

For an interface operating in half-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than slotTime, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' or 'carrier extend error' on the GMII.

For an interface operating in full-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' on the GMII.

For an interface operating at 10 Gb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Receive Error' on the XGMII.

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. This count does not increment if a collision is present.

This counter does not increment when the interface is operating at 10 Mb/s.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsSymbolErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.2.1.5,
aSymbolErrorDuringCarrier."
::= { dot3StatsEntry 18 }

dot3StatsDuplexStatus OBJECT-TYPE

SYNTAX INTEGER {
 unknown(1),
 halfDuplex(2),
 fullDuplex(3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION "The current mode of operation of the MAC entity. 'unknown' indicates that the current duplex mode could not be determined.

Management control of the duplex mode is accomplished through the MAU MIB. When an interface does not support autonegotiation, or when autonegotiation is not enabled, the duplex mode is controlled using ifMauDefaultType. When autonegotiation is supported and enabled, duplex mode is controlled using ifMauAutoNegAdvertisedBits. In either case, the currently operating duplex mode is reflected both in this object and in ifMauType.

Note that this object provides redundant

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information with ifMauType. Normally, redundant objects are discouraged. However, in this instance, it allows a management application to determine the duplex status of an interface without having to know every possible value of ifMauType. This was felt to be sufficiently valuable to justify the redundancy."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.32,
aDuplexStatus."

::= { dot3StatsEntry 19 }

dot3StatsRateControlAbility OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION "'true' for interfaces operating at speeds above 1000 Mb/s that support Rate Control through lowering the average data rate of the MAC sublayer, with frame granularity, and 'false' otherwise."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.33,
aRateControlAbility."

::= { dot3StatsEntry 20 }

dot3StatsRateControlStatus OBJECT-TYPE

SYNTAX INTEGER {
rateControlOff(1),
rateControlOn(2),
unknown(3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION "The current Rate Control mode of operation of the MAC sublayer of this interface."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.34,
aRateControlStatus."

::= { dot3StatsEntry 21 }

-- 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."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.30, aCollisionFrames."

::= { 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.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

```
::= { dot3CollEntry 3 }
```

dot3ControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3ControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "A table of descriptive and status information about the MAC Control sublayer on the ethernet-like interfaces attached to a particular system. There will be one row in this table for each ethernet-like interface in the system which implements the MAC Control sublayer. If some, but not all, of the ethernet-like interfaces in the system implement the MAC Control sublayer, there will be fewer rows in this table than in the dot3StatsTable."

```
::= { dot3 9 }
```

dot3ControlEntry OBJECT-TYPE

SYNTAX Dot3ControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "An entry in the table, containing information about the MAC Control sublayer on a single ethernet-like interface."

INDEX { dot3StatsIndex }

```
::= { dot3ControlTable 1 }
```

Dot3ControlEntry ::=

```
SEQUENCE {
```



```

        dot3ControlFunctionsSupported      BITS,
        dot3ControlInUnknownOpcodes       Counter32,
        dot3HCControlInUnknownOpcodes      Counter64
    }

```

dot3ControlFunctionsSupported OBJECT-TYPE

```

SYNTAX      BITS {
                pause(0)  -- 802.3 flow control
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "A list of the possible MAC Control functions
            implemented for this interface."
REFERENCE   "[IEEE 802.3 Std.], 30.3.3.2,
            aMACControlFunctionsSupported."
 ::= { dot3ControlEntry 1 }

```

dot3ControlInUnknownOpcodes OBJECT-TYPE

```

SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "A count of MAC Control frames received on this
            interface that contain an opcode that is not
            supported by this device.

```

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCControlInUnknownOpcodes object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

```

REFERENCE   "[IEEE 802.3 Std.], 30.3.3.5,
            aUnsupportedOpcodesReceived"
 ::= { dot3ControlEntry 2 }

```

dot3HCControlInUnknownOpcodes OBJECT-TYPE

```

SYNTAX      Counter64
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "A count of MAC Control frames received on this

```

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interface that contain an opcode that is not supported by this device.

This counter is a 64 bit version of dot3ControlInUnknownOpcodes. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.3.5,
aUnsupportedOpcodesReceived"
::= { dot3ControlEntry 3 }

dot3PauseTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3PauseEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A table of descriptive and status information about the MAC Control PAUSE function on the ethernet-like interfaces attached to a particular system. There will be one row in this table for each ethernet-like interface in the system which supports the MAC Control PAUSE function (i.e., the 'pause' bit in the corresponding instance of dot3ControlFunctionsSupported is set). If some, but not all, of the ethernet-like interfaces in the system implement the MAC Control PAUSE function (for example, if some interfaces only support half-duplex), there will be fewer rows in this table than in the dot3StatsTable."
::= { dot3 10 }

dot3PauseEntry OBJECT-TYPE

SYNTAX Dot3PauseEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry in the table, containing information about the MAC Control PAUSE function on a single ethernet-like interface."
INDEX { dot3StatsIndex }
::= { dot3PauseTable 1 }

Dot3PauseEntry ::=

SEQUENCE {
dot3PauseAdminMode INTEGER,

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```
dot3PauseOperMode          INTEGER,
dot3InPauseFrames          Counter32,
dot3OutPauseFrames         Counter32,
dot3HCInPauseFrames        Counter64,
dot3HCOutPauseFrames       Counter64
}
```

dot3PauseAdminMode OBJECT-TYPE

```
SYNTAX      INTEGER {
                disabled(1),
                enabledXmit(2),
                enabledRcv(3),
                enabledXmitAndRcv(4)
            }
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION "This object is used to configure the default administrative PAUSE mode for this interface.

This object represents the administratively-configured PAUSE mode for this interface. If auto-negotiation is not enabled or is not implemented for the active MAU attached to this interface, the value of this object determines the operational PAUSE mode of the interface whenever it is operating in full-duplex mode. In this case, a set to this object will force the interface into the specified mode.

If auto-negotiation is implemented and enabled for the MAU attached to this interface, the PAUSE mode for this interface is determined by auto-negotiation, and the value of this object denotes the mode to which the interface will automatically revert if/when auto-negotiation is later disabled. Note that when auto-negotiation is running, administrative control of the PAUSE mode may be accomplished using the ifMauAutoNegCapAdvertisedBits object in the MAU-MIB.

Note that the value of this object is ignored when the interface is not operating in full-duplex mode.

An attempt to set this object to 'enabledXmit(2)' or 'enabledRcv(3)' will fail

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on interfaces that do not support operation
at greater than 100 Mb/s."
 ::= { dot3PauseEntry 1 }

dot3PauseOperMode OBJECT-TYPE

SYNTAX INTEGER {
disabled(1),
enabledXmit(2),
enabledRcv(3),
enabledXmitAndRcv(4)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION "This object reflects the PAUSE mode currently
in use on this interface, as determined by
either (1) the result of the auto-negotiation
function or (2) if auto-negotiation is not
enabled or is not implemented for the active MAU
attached to this interface, by the value of
dot3PauseAdminMode. Interfaces operating at
100 Mb/s or less will never return
'enabledXmit(2)' or 'enabledRcv(3)'. Interfaces
operating in half-duplex mode will always return
'disabled(1)'. Interfaces on which
auto-negotiation is enabled but not yet
completed should return the value
'disabled(1)'."

::= { dot3PauseEntry 2 }

dot3InPauseFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of MAC Control frames received on this
interface with an opcode indicating the PAUSE
operation.

This counter does not increment when the
interface is operating in half-duplex mode.

For interfaces operating at 10 Gb/s, this
counter can roll over in less than 5 minutes if
it is incrementing at its maximum rate. Since
that amount of time could be less than a
management station's poll cycle time, in order
to avoid a loss of information, a management
station is advised to poll the
dot3HCInPauseFrames object for 10 Gb/s or

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faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.4.3,
aPAUSEMACCtrlFramesReceived."

::= { dot3PauseEntry 3 }

dot3OutPauseFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation.

This counter does not increment when the interface is operating in half-duplex mode.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCOutPauseFrames object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.4.2,
aPAUSEMACCtrlFramesTransmitted."

::= { dot3PauseEntry 4 }

dot3HCInPauseFrames OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation.

This counter does not increment when the

interface is operating in half-duplex mode.

This counter is a 64 bit version of dot3InPauseFrames. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.4.3,
aPAUSEMACCtrlFramesReceived."
 ::= { dot3PauseEntry 5 }

dot3HCOutPauseFrames OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation.

This counter does not increment when the interface is operating in half-duplex mode.

This counter is a 64 bit version of dot3OutPauseFrames. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.4.2,
aPAUSEMACCtrlFramesTransmitted."
 ::= { dot3PauseEntry 6 }

dot3HCStatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3HCStatsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A table containing 64-bit versions of error counters from the dot3StatsTable. The 32-bit versions of these counters may roll over quite quickly on higher speed ethernet interfaces. The counters that have 64-bit versions in this table are the counters that apply to full-duplex

interfaces, since 10 Gb/s and faster ethernet-like interfaces do not support half-duplex, and very few 1000 Mb/s ethernet-like interfaces support half-duplex.

Entries in this table are recommended for interfaces capable of operating at 1000 Mb/s or faster, and are required for interfaces capable of operating at 10 Gb/s or faster. Lower speed ethernet-like interfaces do not need entries in this table, in which case there may be fewer entries in this table than in the dot3StatsTable. However, implementations containing interfaces with a mix of speeds may choose to implement entries in this table for all ethernet-like interfaces."

::= { dot3 11 }

dot3HCStatsEntry OBJECT-TYPE

SYNTAX Dot3HCStatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "An entry containing 64-bit statistics for a single ethernet-like interface."

INDEX { dot3StatsIndex }

::= { dot3HCStatsTable 1 }

Dot3HCStatsEntry ::=

SEQUENCE {

dot3HCStatsAlignmentErrors Counter64,

dot3HCStatsFCSErrors Counter64,

dot3HCStatsInternalMacTransmitErrors Counter64,

dot3HCStatsFrameTooLongs Counter64,

dot3HCStatsInternalMacReceiveErrors Counter64,

dot3HCStatsSymbolErrors Counter64

}

dot3HCStatsAlignmentErrors OBJECT-TYPE

SYNTAX Counter64

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 pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter does not increment for group encoding schemes greater than 4 bits per group.

This counter is a 64 bit version of dot3StatsAlignmentErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.7,
aAlignmentErrors"

::= { dot3HCStatsEntry 1 }

dot3HCStatsFCSErrors OBJECT-TYPE

SYNTAX Counter64

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. This count does not include frames received with frame-too-long or frame-too-short error.

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 pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Note: Coding errors detected by the physical layer for speeds above 10 Mb/s will cause the frame to fail the FCS check.

This counter is a 64 bit version of dot3StatsFCSErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.6,
aFrameCheckSequenceErrors."
::= { dot3HCStatsEntry 2 }

dot3HCStatsInternalMacTransmitErrors OBJECT-TYPE

SYNTAX Counter64
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.

This counter is a 64 bit version of dot3StatsInternalMacTransmitErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.12,
aFramesLostDueToIntMACXmitError."
::= { dot3HCStatsEntry 3 }

dot3HCStatsFrameTooLongs OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of frames received on a particular interface that exceed the maximum permitted frame size.

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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 pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter is a 64 bit version of dot3StatsFrameTooLongs. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.25,
aFrameTooLongErrors."

::= { dot3HCStatsEntry 4 }

dot3HCStatsInternalMacReceiveErrors OBJECT-TYPE

SYNTAX Counter64

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.

This counter is a 64 bit version of dot3StatsInternalMacReceiveErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management

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system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.1.1.15, aFramesLostDueToIntMACRcvError."

::= { dot3HCStatsEntry 5 }

dot3HCStatsSymbolErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present.

For an interface operating in half-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than slotTime, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' or 'carrier extend error' on the GMII.

For an interface operating in full-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' on the GMII.

For an interface operating at 10 Gb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Receive Error' on the XGMII.

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. This count does not increment if a collision is present.

This counter is a 64 bit version of dot3StatsSymbolErrors. It should be used on interfaces operating at 10 Gb/s or faster.

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Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "[IEEE 802.3 Std.], 30.3.2.1.5, aSymbolErrorDuringCarrier."

::= { dot3HCStatsEntry 6 }

-- 802.3 Tests

dot3Tests OBJECT IDENTIFIER ::= { dot3 6 }

dot3Errors OBJECT IDENTIFIER ::= { dot3 7 }

-- TDR Test

dot3TestTdr OBJECT-IDENTITY

STATUS deprecated

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 deprecated

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 provide more information as values for an appropriate test result code object."

```
::= { dot3Tests 2 }
```

```
dot3ErrorInitError OBJECT-IDENTITY
```

```
    STATUS      deprecated
```

```
    DESCRIPTION "Couldn't initialize MAC chip for test."
```

```
    ::= { dot3Errors 1 }
```

```
dot3ErrorLoopbackError OBJECT-IDENTITY
```

```
    STATUS      deprecated
```

```
    DESCRIPTION "Expected data not received (or not received  
                correctly) in loopback test."
```

```
    ::= { dot3Errors 2 }
```

```
-- { dot3 8 }, the dot3ChipSets tree, is defined in [31]
```

```
-- conformance information
```

```
etherConformance OBJECT IDENTIFIER ::= { etherMIB 2 }
```

```
etherGroups      OBJECT IDENTIFIER ::= { etherConformance 1 }
```

```
etherCompliances OBJECT IDENTIFIER ::= { etherConformance 2 }
```

```
-- compliance statements
```

```
etherCompliance MODULE-COMPLIANCE
```

```
    STATUS      deprecated
```

```
    DESCRIPTION "***** THIS COMPLIANCE IS DEPRECATED *****"
```

The compliance statement for managed network entities which have ethernet-like network interfaces.

This compliance is deprecated and replaced by
dot3Compliance."

```
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          deprecated
    DESCRIPTION "***** THIS COMPLIANCE IS DEPRECATED *****

                The compliance statement for managed network
                entities which have 100 Mb/sec ethernet-like
                network interfaces.

                This compliance is deprecated and replaced by
                dot3Compliance."

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 }

dot3Compliance MODULE-COMPLIANCE
    STATUS          deprecated
    DESCRIPTION "***** THIS COMPLIANCE IS DEPRECATED *****

                The compliance statement for managed network
                entities which have ethernet-like network
                interfaces."

MODULE -- this module
    MANDATORY-GROUPS { etherStatsBaseGroup }

    GROUP          etherDuplexGroup
    DESCRIPTION "This group is mandatory for all
                ethernet-like network interfaces which are
```


capable of operating in full-duplex mode.
It is highly recommended for all
ethernet-like network interfaces."

GROUP etherStatsLowSpeedGroup
DESCRIPTION "This group is mandatory for all
ethernet-like network interfaces which are
capable of operating at 10 Mb/s or slower in
half-duplex mode."

GROUP etherStatsHighSpeedGroup
DESCRIPTION "This group is mandatory for all
ethernet-like network interfaces which are
capable of operating at 100 Mb/s or faster."

GROUP etherControlGroup
DESCRIPTION "This group is mandatory for all
ethernet-like network interfaces that
support the MAC Control sublayer."

GROUP etherControlPauseGroup
DESCRIPTION "This group is mandatory for all
ethernet-like network interfaces that
support the MAC Control PAUSE function."

GROUP etherCollisionTableGroup
DESCRIPTION "This group is optional. It is appropriate
for all ethernet-like network interfaces
which are capable of operating in
half-duplex mode and have the necessary
metering. Implementation in systems with
such interfaces is highly recommended."

::= { etherCompliances 3 }

dot3Compliance2 MODULE-COMPLIANCE

STATUS current

DESCRIPTION "The compliance statement for managed network
entities which have ethernet-like network
interfaces."

MODULE -- this module

MANDATORY-GROUPS { etherStatsBaseGroup2 }

GROUP etherDuplexGroup
DESCRIPTION "This group is mandatory for all
ethernet-like network interfaces which are
capable of operating in full-duplex mode.
It is highly recommended for all

ethernet-like network interfaces."

GROUP etherRateControlGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces which are capable of operating at speeds faster than 1000 Mb/s. It is highly recommended for all ethernet-like network interfaces."

GROUP etherStatsLowSpeedGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces which are capable of operating at 10 Mb/s or slower in half-duplex mode."

GROUP etherStatsHighSpeedGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces which are capable of operating at 100 Mb/s or faster."

GROUP etherStatsHalfDuplexGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces which are capable of operating in half-duplex mode."

GROUP etherHCStatsGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces which are capable of operating at 10 Gb/s or faster. It is recommended for all ethernet-like network interfaces which are capable of operating at 1000 Mb/s or faster."

GROUP etherControlGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces that support the MAC Control sublayer."

GROUP etherHCControlGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces that support the MAC Control sublayer and are capable of operating at 10 Gb/s or faster."

GROUP etherControlPauseGroup

DESCRIPTION "This group is mandatory for all ethernet-like network interfaces that support the MAC Control PAUSE function."


```

GROUP      etherHCControlPauseGroup
DESCRIPTION "This group is mandatory for all
            ethernet-like network interfaces that
            support the MAC Control PAUSE function and
            are capable of operating at 10 Gb/s or
            faster."

GROUP      etherCollisionTableGroup
DESCRIPTION "This group is optional. It is appropriate
            for all ethernet-like network interfaces
            which are capable of operating in
            half-duplex mode and have the necessary
            metering. Implementation in systems with
            such interfaces is highly recommended."
::= { etherCompliances 4 }

-- units of conformance

etherStatsGroup OBJECT-GROUP
  OBJECTS      { dot3StatsIndex,
                  dot3StatsAlignmentErrors,
                  dot3StatsFCSErrors,
                  dot3StatsSingleCollisionFrames,
                  dot3StatsMultipleCollisionFrames,
                  dot3StatsSQETestErrors,
                  dot3StatsDeferredTransmissions,
                  dot3StatsLateCollisions,
                  dot3StatsExcessiveCollisions,
                  dot3StatsInternalMacTransmitErrors,
                  dot3StatsCarrierSenseErrors,
                  dot3StatsFrameTooLongs,
                  dot3StatsInternalMacReceiveErrors,
                  dot3StatsEtherChipSet
                }
  STATUS      deprecated
  DESCRIPTION "***** THIS GROUP IS DEPRECATED *****

            A collection of objects providing information
            applicable to all ethernet-like network
            interfaces.

            This object group has been deprecated and
            replaced by etherStatsBaseGroup and
            etherStatsLowSpeedGroup."
::= { etherGroups 1 }

etherCollisionTableGroup OBJECT-GROUP
  OBJECTS      { dot3CollFrequencies

```

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```
    }
    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      deprecated
    DESCRIPTION "***** THIS GROUP IS DEPRECATED *****

                A collection of objects providing information
                applicable to 100 Mb/sec ethernet-like network
                interfaces.

                This object group has been deprecated and
                replaced by etherStatsBaseGroup and
                etherStatsHighSpeedGroup."
    ::= { etherGroups 3 }

etherStatsBaseGroup OBJECT-GROUP
    OBJECTS     { dot3StatsIndex,
                  dot3StatsAlignmentErrors,
                  dot3StatsFCSErrors,
                  dot3StatsSingleCollisionFrames,
                  dot3StatsMultipleCollisionFrames,
                  dot3StatsDeferredTransmissions,
                  dot3StatsLateCollisions,
                  dot3StatsExcessiveCollisions,
                  dot3StatsInternalMacTransmitErrors,
                  dot3StatsCarrierSenseErrors,
                  dot3StatsFrameTooLongs,
                  dot3StatsInternalMacReceiveErrors
```

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```
    }
STATUS      deprecated
DESCRIPTION "***** THIS GROUP IS DEPRECATED *****"

    A collection of objects providing information
    applicable to all ethernet-like network
    interfaces."
::= { etherGroups 4 }

etherStatsLowSpeedGroup OBJECT-GROUP
OBJECTS      { dot3StatsSQETestErrors }
STATUS      current
DESCRIPTION "A collection of objects providing information
    applicable to ethernet-like network interfaces
    capable of operating at 10 Mb/s or slower in
    half-duplex mode."
::= { etherGroups 5 }

etherStatsHighSpeedGroup OBJECT-GROUP
OBJECTS      { dot3StatsSymbolErrors }
STATUS      current
DESCRIPTION "A collection of objects providing information
    applicable to ethernet-like network interfaces
    capable of operating at 100 Mb/s or faster."
::= { etherGroups 6 }

etherDuplexGroup OBJECT-GROUP
OBJECTS      { dot3StatsDuplexStatus }
STATUS      current
DESCRIPTION "A collection of objects providing information
    about the duplex mode of an ethernet-like
    network interface."
::= { etherGroups 7 }

etherControlGroup OBJECT-GROUP
OBJECTS      { dot3ControlFunctionsSupported,
              dot3ControlInUnknownOpcodes
              }
STATUS      current
DESCRIPTION "A collection of objects providing information
    about the MAC Control sublayer on ethernet-like
    network interfaces."
::= { etherGroups 8 }

etherControlPauseGroup OBJECT-GROUP
OBJECTS      { dot3PauseAdminMode,
              dot3PauseOperMode,
              dot3InPauseFrames,
```

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```
        dot3OutPauseFrames
    }
    STATUS      current
    DESCRIPTION "A collection of objects providing information
                about and control of the MAC Control PAUSE
                function on ethernet-like network interfaces."
    ::= { etherGroups 9 }

etherStatsBaseGroup2 OBJECT-GROUP
    OBJECTS      { dot3StatsIndex,
                    dot3StatsAlignmentErrors,
                    dot3StatsFCSErrors,
                    dot3StatsInternalMacTransmitErrors,
                    dot3StatsFrameTooLongs,
                    dot3StatsInternalMacReceiveErrors
                }
    STATUS      current
    DESCRIPTION "A collection of objects providing information
                applicable to all ethernet-like network
                interfaces."
    ::= { etherGroups 10 }

etherStatsHalfDuplexGroup OBJECT-GROUP
    OBJECTS      { dot3StatsSingleCollisionFrames,
                    dot3StatsMultipleCollisionFrames,
                    dot3StatsDeferredTransmissions,
                    dot3StatsLateCollisions,
                    dot3StatsExcessiveCollisions,
                    dot3StatsCarrierSenseErrors
                }
    STATUS      current
    DESCRIPTION "A collection of objects providing information
                applicable only to half-duplex ethernet-like
                network interfaces."
    ::= { etherGroups 11 }

etherHCStatsGroup OBJECT-GROUP
    OBJECTS      { dot3HCStatsAlignmentErrors,
                    dot3HCStatsFCSErrors,
                    dot3HCStatsInternalMacTransmitErrors,
                    dot3HCStatsFrameTooLongs,
                    dot3HCStatsInternalMacReceiveErrors,
                    dot3HCStatsSymbolErrors
                }
    STATUS      current
    DESCRIPTION "A collection of objects providing high-capacity
                statistics applicable to higher-speed
                ethernet-like network interfaces."
```



```
 ::= { etherGroups 12 }

etherHCControlGroup OBJECT-GROUP
    OBJECTS      { dot3HCControlInUnknownOpcodes }
    STATUS       current
    DESCRIPTION   "A collection of objects providing high-capacity
                   statistics for the MAC Control sublayer on
                   higher-speed ethernet-like network interfaces."
    ::= { etherGroups 13 }

etherHCControlPauseGroup OBJECT-GROUP
    OBJECTS      { dot3HCInPauseFrames,
                   dot3HCOutPauseFrames
                 }
    STATUS       current
    DESCRIPTION   "A collection of objects providing high-capacity
                   statistics for the MAC Control PAUSE function on
                   higher-speed ethernet-like network interfaces."
    ::= { etherGroups 14 }

etherRateControlGroup OBJECT-GROUP
    OBJECTS      { dot3StatsRateControlAbility,
                   dot3StatsRateControlStatus
                 }
    STATUS       current
    DESCRIPTION   "A collection of objects providing information
                   about the Rate Control function on ethernet-like
                   interfaces."
    ::= { etherGroups 15 }

END
```

5. 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.

6. Acknowledgements

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Ran Atkinson
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Mike Heard
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This document is based on the Proposed Standard Ethernet MIB, [RFC 2665](#) [[RFC2665](#)], edited by John Flick of Hewlett-Packard and Jeffrey Johnson of RedBack Networks and produced by the Ethernet Interfaces and Hub MIB Working Group. It extends that document by providing support for 10 Gb/s Ethernet interfaces as defined in [[P802.3ae](#)].

[RFC 2665](#), in turn, is based on the Proposed Standard Ethernet MIB, [RFC 2358](#) [[RFC2358](#)], edited by John Flick of Hewlett-Packard and Jeffrey Johnson of RedBack Networks and produced by the 802.3 Hub MIB Working Group. It extends that document by providing support for full-duplex Ethernet interfaces and 1000 Mb/sec Ethernet interfaces as outlined in [[IEEE802.3](#)].

[RFC 2358](#), in turn, is almost completely based on both the Standard Ethernet MIB, [RFC 1643](#) [[RFC1643](#)], and the Proposed Standard Ethernet MIB using the SNMPv2 SMI, [RFC 1650](#) [[RFC1650](#)], both of which were edited by Frank Kastenholz of FTP Software and produced by the Interfaces MIB Working Group. [RFC 2358](#) extends those documents by providing support for 100 Mb/sec ethernet interfaces.

[RFC 1643](#) and [RFC 1650](#), in turn, are based on the Draft Standard

Ethernet MIB, [RFC 1398](#) [[RFC1398](#)], also edited by Frank Kastenholz and produced by the Ethernet MIB Working Group.

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[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 [[KASTEN](#)]. This document was 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 [RFC 1212](#) [[RFC1212](#)] concise format. Anil Rijasinghani 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.

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8. Security Considerations

There are two management objects defined in this MIB that have a MAX-ACCESS clause of read-write. 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.

There are a number of managed objects in this MIB that may be considered to contain sensitive information. In particular, the dot3StatsEtherChipSet object may be considered sensitive in many environments, since it would allow an intruder to obtain information about which vendor's equipment is in use on the network. Note that this object has been deprecated. However, some implementors may still choose to implement it for backwards compatability.

Therefore, it may be important in some environments to control read access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is such an insecure environment. 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 (read) the objects in this MIB.

It is recommended that the implementors consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model [RFC 2574](#) [[RFC2574](#)] and the View-

based Access Control Model [RFC 2575](#) [[RFC2575](#)] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

9. Author's Address

John Flick
Hewlett-Packard Company
8000 Foothills Blvd. M/S 5557
Roseville, CA 95747-5557

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

A. Change Log

A.1. Changes since [RFC 2665](#)

This section enumerates changes made to [RFC 2665](#) to produce this document.

- (1) Updated references to the IEEE 802.3 standard to refer to the 2000 edition.
- (2) Added reference to 802.3ae.
- (3) Updated WG e-mail address.
- (4) The following DESCRIPTION clauses have been updated to reflect behaviour on 10 Gb/s interfaces: dot3StatsAlignmentErrors and dot3StatsSymbolErrors.
- (5) The following objects have been added for management of the Rate Control function in WAN applications of ethernet: dot3StatsRateControlAbility and dot3StatsRateControlStatus.
- (6) The following 64-bit counters have been added to support operation on high-speed ethernet interfaces: dot3HCControlInUnknownOpcodes, dot3HCInPauseFrames,

dot3HCOutPauseFrames, dot3HCStatsAlignmentErrors,
dot3HCStatsFCSErrors, dot3HCStatsFrameTooLongs,

dot3HCStatsInternalMacTransmitErrors,
dot3HCStatsInternalMacReceiveErrors,
dot3StatsSymbolErrors

- (7) Object groups and compliances have been added to contain the new objects.
- (8) The MODULE-IDENTITY clause has been updated to reflect the changes in the MIB module.
- (9) Use of the various ifType values for ethernet has been clarified to emphasize that all ethernet-like interfaces must use the ethernetCsmacd ifType.
- (10) Several clarifications were made to the section on the mapping of the Interface MIB objects to ethernet.
- (11) MIB boilerplate in [section 2](#) has been updated to the latest approved text.

[A.2.](#) Changes between [RFC 2358](#) and [RFC 2665](#)

This section enumerates changes made to [RFC 2358](#) to produce [RFC 2665](#).

- (1) [Section 2](#) has been replaced with the current SNMP Management Framework boilerplate.
- (2) The ifMtu mapping has been clarified.
- (3) The relationship between the IEEE 802.3 octet counters and the IF-MIB octet counters has been clarified.
- (4) REFERENCE clauses have been updated to reflect the actual IEEE 802.3 managed object that each MIB object is based on.
- (5) The following object DESCRIPTION clauses have been updated to reflect that they do not increment in full-duplex mode: dot3StatsSingleCollisionFrames, dot3StatsMultipleCollisionFrames, dot3StatsSQETestErrors, dot3StatsDeferredTransmissions, dot3StatsLateCollisions, dot3StatsExcessiveCollisions, dot3StatsCarrierSenseErrors, dot3CollFrequencies.
- (6) The following object DESCRIPTION clauses have been updated to reflect behaviour on full-duplex and 1000 Mb/s interfaces: dot3StatsAlignmentErrors,

dot3StatsFCSErrors, dot3StatsSQETestErrors,
dot3StatsLateCollisions, dot3StatsSymbolErrors.

- (7) Two new tables, dot3ControlTable and dot3PauseTable, have been added.
- (8) A new object, dot3StatsDuplexStatus, has been added.
- (9) The object groups and compliances have been restructured.
- (10) The dot3StatsEtherChipSet object has been deprecated.
- (11) The dot3ChipSets have been moved to a separate document.

A.3. Changes between [RFC 1650](#) and [RFC 2358](#)

This section enumerates changes made to [RFC 1650](#) to produce [RFC 2358](#).

- (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](#).

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